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Functional Analysis of Motor and Vocal Stereotypy: It's Not Always Automatic

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Abstract

This study systematically evaluated social variables to determine their influence on automatically reinforced, stereotypical behaviors. Three experiments were designed to determine the effect of diverse demands, tangibles, and forms of attention on motor and/or vocal stereotypy for seven children diagnosed with autism. Results suggested that specific demands, tangibles, and types of attention can contribute to the maintenance of stereotypy; even after an initial functional analysis indicate that the behaviors are automatically reinforced.

This Dissertation is dedicated to my supportive, patient, and loving family:

Michael Gadberry, Maddalyn Gadberry, Thu Stevenson, David Stevenson

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Functional Analysis of Motor and Vocal Stereotypy: It's Not Always Automatic

Introduction

Motor and vocal stereotypy can take many forms, from rocking and tapping a finger to blurting out nonsensical words and phrases repeatedly. These types of behaviors are common in individuals with autism and developmental delays (DiGennaro-Reed, Hirst & Hyman, 2012). While they may not be damaging their bodies, people who engage in motor and/or vocal stereotypy almost always experience a decrease in quality time spent with family members. As well, these behaviors often interfere with learning opportunities in academic and vocational settings and their occurrence tends to inhibit learning appropriate social behavior.

When isolating the reinforcement function for stereotypical behaviors, the conclusion is typically automatic, as in automatic reinforcement (DiGennaro-Reed, Hirst & Hyman, 2012; Hanley, Iwata & McCord, 2003; Rapp & Vollmer, 2005). The interpretation is the consequences for these behaviors arise from the stimulation generated by making the response itself (DiGennaro-Reed, Hirst & Hyman, 2012; Hanley, Iwata & McCord, 2003; Rapp & Vollmer, 2005).

The assumption that motor and vocal stereotypy is automatically reinforced is not always accurate, however. Wilke, Tarbox, Dixon, Kenzer, Bishop, & Kalavand (2012), for example, conducted an indirect functional assessment of stereotypy with 53 children with autism. The *Questions about Behavioral Function* questionnaire was administered to parents and caregivers, and the results indicated that for 35 out of 53 participants (66%), motor and/or vocal stereotypy was automatically reinforced. For the remaining 18 participants, stereotypy was socially reinforced.

Like Wilke et al. (2012), a growing number of studies indicate that sometimes these behaviors are socially reinforced, for instance, by avoiding or escaping from demands and instructions issued by a parent or teacher (Cunningham & Schriebman, 2008; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Kennedy, Meyer, Knowles, & Shukla, 2000). Despite periodic calls to take greater care in identifying an automatic function for stereotypy, there is still no formal or systematic method for confirming, whether or not social reinforcers are involved (Rapp & Vollmer, 2005). The implications of this omission are discussed in detail below.

This dissertation is focused on an experimental analysis of motor and/or vocal stereotypy with young children with autism. The research necessarily includes a functional behavior assessment (FBA) and an initial functional analysis (FA) indicating that the stereotypical behavior is automatically reinforced. With this information in hand, an analysis was made first, of the FBA procedure for identifying an automatic function, and second, how treatment for several children was affected by the FBA analysis.

We begin with a review of current methods used to assess the various functions of behavior.

The Form, Function, and Treatment of Stereotypy

Motor and vocal stereotypical behaviors comprise a wide range of forms including hand flapping, twirling hair, squinting, staring at lights, humming, rocking, echolia, and repeating random sounds. Typical definitions for these behaviors refer to them as repetitive, proprioceptive, unrelated to the situation, non-functional, invariant, rhythmic, lacking social value, or producing visual, vestibular, tactile, or auditory stimulation (Berkson, 1967; Cunningham & Schriebman, 2008; Lovaas, Koegel,

Simmons & Long, 1973; Lovaas, Newsom, & Hickman, 1987; Rapp & Vollmer, 2005; Repp & Horner, 1999; Rincover, 1978). The behavior is assumed to be reinforced automatically, and for this reason, it is further assumed that the variables controlling the behavior are difficult if not impossible to manipulate (Cunningham & Schreibman, 2008).

Skinner (1953) first utilized the term ‘automatic reinforcement’ to conceptualize, for instance, how scratching an itch or twirling a piece of hair can produce its own reinforcement. The term has been utilized since to distinguish between behaviors that are maintained by nonsocial and social contingencies of reinforcement (Repp & Horner, 1999; Vaughan & Michael, 1982). The difference is between behaviors that require the participation of another person, on the one hand, and those that do not, on the other hand.

According to Vaughan & Michael (1982), Skinner focused on automatic reinforcement to emphasize how easy it is to overlook the wealth of behaviors under the control of this particular source of stimulation. The term, in Vaughan & Michael’s view, was used to counteract “any tendency to restrict the concept of reinforcement to those occasions upon which it has been deliberately arranged by another person or group” (P. 218). Automatic reinforcement is regarded as a natural result of behavior and may be conditioned or unconditioned, positive or negative, or verbal or nonverbal.

When assessing stereotypical behaviors, an automatic function is usually identified and a treatment based on this function is developed. Treatment options for automatic functions include reinforcer substitution (Piazza, Adelinis, Hanley, Goh & Delia, 2000; Rapp, 2006), manipulating motivational operations (Lang, O’Reilly, Sigafos, Lancioni, Machalicek, Rispoli & White, 2009; Roantree & Kennedy, 2006),

differential reinforcement (Kennedy, Meyer, Knowles & Shukla, 2000; Repp, Dietz & Dietz, 1976), punishment (Ahrens, Lerman, Kodak, Worsdell & Keegan, 2011; Anderson, Doughty, Doughty, Williams, Saunders, 2010), and sensory extinction (Kennedy & Souza, 1995; Rincover, 1981). These treatments, alone or in combination, are usually effective in reducing the frequency and duration of automatically reinforced stereotypy.

The question as to whether or not the stereotypical behavior is actually automatically reinforced is seldom raised, however. Could the reinforcement for the behaviors spring from a social source? A handful of researchers have explored this question and have discovered that for some individuals, stereotypy is a socially reinforced behavior. When this is the case, treatment based on a social function, as opposed to a non-social, automatic function is clearly the proper way to proceed.

Research on stereotypical behaviors reinforced by social consequences has yielded several effective treatments, all of which are based on positive reinforcement (Kennedy, Meyer, Knowles & Shukla, 2000; Lancaster, LeBlanc, Carr, Brenske, Peet & Culver, 2004; Mace & Lalli, 1991) and negative reinforcement (Durand & Carr, 1987; Kennedy, Meyer, Knowles & Shukla, 2000; Mace & Belfiore, 1990).

Our point in drawing attention to social and non-social sources of reinforcement and the treatments that follow from these sources for stereotypy is this: When stereotypy is automatic, treatments based on this non-social function are likely to be effective. When stereotypy is instead socially reinforced, treatments based on that function are likely to be effective. The converse is also true: When stereotypy is socially reinforced, treatments

based on an automatic function are unlikely to be effective, and when stereotypy is automatic, treatments based on a social function likewise are unlikely to be effective.

We turn next to the methods utilized in identifying the function of motor and vocal stereotypy.

Identifying the Function of Motor and Vocal Stereotypy

One of three types of FBAs can be utilized to determine what reinforces motor and vocal stereotypy: indirect assessments, descriptive assessments, and functional analysis.

Indirect Assessments. Indirect assessments involve conducting interviews or completing checklists or rating scales with parents, caregivers, or teachers. Commonly asked questions refer to when stereotypy occurs (e.g., does the behavior occur when no one is around, when leisure items are present, or is it cyclical in nature), what happens when it occurs (e.g., redirection, ignore), and how the behavior appears (e.g., does the behavior appear to be self-stimulatory?) (Durand & Crimmins, 1987; Wsiseler, Hanson, Chamberlain & Thompson, 1985; Zarcone, Rodgers, Iwata, Rourke, & Dorsey, 1991). Data gathered during these interviews are based on verbal report, which may or may not be accurate.

Descriptive Assessments. Direct observations of behavior that occur in naturalistic settings are identified as descriptive assessments. Data may be collected throughout the school day, for example, or at home during different parts of the day. Bijou, Peterson & Ault (1968) (see also Touchette, MacDonald, & Langer, 1985) illustrate the approach, which yields counts of observable behaviors, antecedents, and consequences. The function of behavior is not always clear, however. Classrooms and

playgrounds contain many antecedents and consequences that exercise no control over stereotypical behavior. Moreover, sorting through the conditional probabilities that emerge from descriptive assessments to identify a function is cumbersome and time-consuming. Still, when stereotypical behavior occurs regularly and repeatedly throughout observation periods and across a variety of settings and people, it is safe to assume that the behavior is automatically reinforced.

Functional Analysis. The third type of assessment is called an experimental or functional analysis (FA) (Iwata, Dorsey, Slifer, Bauman & Richman, 1982/1994). An FA involves direct observation and measurement of behavior under controlled conditions. These conditions are deliberately created to identify the response-reinforcer relationship. This is done by comparing measures obtained during observations across four reinforcement conditions: social negative reinforcement, social positive reinforcement, automatic negative reinforcement, and automatic positive reinforcement. The condition in which the measures show a consistent slope, trend, and level is identified as the functional reinforcement condition. When vocal stereotypy occurs during the social negative reinforcement condition and not during any other condition, for instance, the conclusion would be that the behavior is reinforced by escape from some person, demand, or instruction. For this case, an intervention would be developed to modify the escape-maintained behavior.

The condition in which an automatic reinforcement function is ordinarily found occurs in what is called the 'alone condition.' A child is literally left alone to behave as s/he sees fit. When the target behavior occurs most frequently in this condition compared to the other conditions, an automatic function is suspected.

How automatic reinforcement is more specifically determined centers on visual inspection of the data. Three criteria are employed. Occurrences of the target behavior in the alone condition, as mentioned above must be highest compared to the other conditions, especially a play condition, which involves access to tangible stimuli and non-contingent attention. The second criterion is that the target behavior must also occur throughout an extended alone condition, this involving an additional ignore session where the participant is once again left alone. The third criterion is that the behavior must be most frequent under less socially stimulating conditions (alone, attention, and tangible conditions) and less frequent under more socially stimulating conditions (demand and play) (Hagopian, Fisher, Thompson, Owen-DeSchryver, Iwata & Wacker, 1997; Roane, Fisher, Kelley, Mevers & Bouxsein, 2013). By following these criteria, however, it is still possible to make the mistake of identifying stereotypical behaviors as automatically reinforced and then compounding this mistake by developing a treatment based upon an erroneous function.

Specific Assessments and Analyses for Motor and Vocal Stereotypy

Kennedy (2000), Miltenberger (2000), and Carr (2000) provide some additional evidence for determining whether or not stereotypy is automatically reinforced after an initial FA. Kennedy suggests identifying idiosyncratic or contrived reinforcers, the specific sources of public or private stimulation, and any possible source of competing stimulation when assessments do not produce clear and conclusive results. Miltenberger recommends including an analysis of within-session behavior patterns, identifying the response class hierarchies, and evaluating biological events that could serve as motivational operations. Taking a different approach, Carr suggests that the selection of

FA conditions be based on the individual conditions under which behaviors occur rather than a ‘one-size-fits-all’ approach. Taken together, these suggestions can help guide the FA process when an automatic function is suspected but not confirmed.

Very few investigators actually assess stereotypical behaviors with this kind of rigorous analysis. Pyles, Riordan, & Bailey (1997) created a descriptive assessment entitled the “Stereotypy Analysis” to examine variables in the social environment (e.g., demands, attention) that correlate with stereotypical behaviors. Specific variables (e.g., activities, demands) in the social environment that occasioned stereotypy were identified by Pyles et al. for three of their five participants. Treatments for the three participants involved providing activities, controlling demands, reinforcing alternative behaviors, and blocking and redirecting stereotypical responses. All treatments effectively decreased stereotypy.

Kennedy, Meyer, Knowles, & Shukla (2000) analyzed the functions of motor stereotypy for five children with autism. An FA revealed that, for four participants, stereotypy was maintained by automatic reinforcement. For the fifth participant, motor stereotypy was maintained by both negative and automatic reinforcement. Treatment for this participant involved teaching the child to request items, which decreased stereotypy to near-zero levels.

Contrucci-Kuhn & Triggs (2009), in another study, analyzed social variables when an FA indicated that the self-injurious behavior (SIB) of a seven-year-old child was automatically reinforced. Contrucci-Kuhn & Triggs showed that the child’s SIB was not automatically reinforced, as was originally claimed, but was instead maintained by positive reinforcement in the form of attention.

More comprehensive assessment for stereotypical behavior has led to developing treatments that are better aligned with the assessment. These assessments are not as refined as those conducted with non-stereotypical behaviors, however. A question as to how precise assessments for non-stereotypical behaviors might contribute to the evaluation and understanding of the conditions under which stereotypical behaviors occur remains unanswered.

Conditional Analyses for Non-Stereotypical Behaviors

When behavior is assumed to be maintained by social negative reinforcement, for instance, what is being stated is that the behavior occurs because it escapes a demand. Little information is ordinarily provided, however, on the types of demands that could reinforce the escape behavior. The same can be said about the relative preference for both tangible stimuli and social attention. A systematic analysis of these types of variables within an FA as to how they may affect motor and vocal stereotypies is needed. How analyses of these sorts of variables occur with non-stereotypical behaviors is the focus of the next section.

Negative Reinforcement Analyses. When assessing whether or not behavior is maintained by negative reinforcement, demands are often selected from individual education plans or home treatment programs. The assumption is that if an individual engages in problem behavior, it is probably maintained by negative reinforcement in the form of escape from instructions or demands. It is possible that there are certain aspects of the demand or demand sequence that maintain problem behavior. For instance, when asking a child to point to a picture of a dog, it may be the case that the child has not yet learned what a dog is or has a poor rapport with the person asking the question. The

function may be to escape from the demand in the first case, while in the second case; the function may be to escape from the person asking the question. While the overall function of behavior would be negative reinforcement, a standard functional analysis would not identify that aspect of the situation that actually reinforced the problem behavior. Several researchers have addressed this issue, particularly with regard to task difficulty in the context of demands.

Roscoe, Rooker, Pence, & Longworth (2009) evaluated the use of a 'demand assessment' to determine which tasks to utilize in a functional analysis for four individuals with disabilities. The assessment was conducted with 12 demands from a variety of skill areas to determine task difficulty. These demands were categorized as demands completed and demands not completed and were utilized in the demand condition of a functional analysis. Results for all participants indicated that task difficulty affected the rates of problematic behavior, with difficult demands producing more frequent occurrences than easy demands. Thus indicating that the difficulty level of demands can influence problem behavior.

Positive Reinforcement Analyses: Tangibles. When determining whether or not the function of behavior is maintained by positive reinforcement in the form of access to tangibles (toys, tablets), items are selected based on information from parents or from stimulus preference assessments. It is possible, however, that parents cannot accurately identify the types of tangibles their child prefers. Further, the child may not engage in problem behavior in the presence of the highest preferred item from a preference assessment. If a child refrains from hitting a playmate in the presence of a highly

preferred toy, for instance, but not in the presence of a moderately preferred toy, then using a highly preferred item in a functional analysis would be unrevealing.

Researchers are beginning to address this problem with the tangible condition of the standard FA. Mueller, Wilczynski, Moore, Fusilier & Trahan (2001) manipulated the types of stimuli available to an eight-year old boy diagnosed with autism after an initial FA noted that aggression was maintained by access to tangible items. Specifically, the authors conducted an analysis of highly preferred, moderately preferred, and least preferred toys to determine the extent to which access to the items effected aggression. Results indicated that behaviors occurred more often when highly preferred items were restricted. This indicated that the types of items in an FA could influence levels of behavior.

Positive Reinforcement Analyses: Attention. When evaluating whether or not the reinforcement function of behavior is attention, more than one form of attention is typically provided during an FA, including, brief physical contact, social disapproval, and a statement of concern. The assumption is that if the participant engages in the target behavior under these conditions, it is most likely maintained by attention. Some participants may be more or less sensitive to certain forms of attention, however, and several researchers have studied this issue by varying the type of attention.

Kodak, Northup, & Kelley (2007), for example, evaluated the effects of six types of attention on aggression, disruption, and inappropriate vocalizations displayed by two children. Results indicated problem behavior occurred when certain forms of attention were provided and did not occur with other types of attention. Refinements to the

attention condition in an FA, according to Kodak and her colleagues, are necessary to determine the actual function of behavior.

Reinforcement Analyses for Motor and Vocal Stereotypy

When it comes to assessing the conditions of FAs, researchers are investigating task difficulty levels, how different types of tangible stimuli influence behavior, and how forms of attention affect behavior. These analyses are conducted to ensure that the response-reinforcer relationship identified during the FA is accurate. There is no such literature on conducting refined analyses with nominally automatically reinforced, motor and/or vocal stereotypy, however. Instead, the literature on motor and vocal stereotypy generally concludes that these behaviors are automatically reinforced (DiGennaro-Redd, Hurst & Hyman, 2012). On this conclusion, treatments for stereotypical behaviors include reinforcer substitution (e.g., playing with shaving cream) to applying sensory extinction (e.g., placing gloves on someone). It is often the case, too, that the terms stereotypical and automatic are used interchangeably in the literature. By using refined methods similar to the analyses mentioned above, it should be possible to isolate social variables that may function as reinforcers for stereotypical behaviors.

The purpose of this study is to systematically analyze those variables that might contribute to the maintenance of motor and/or vocal stereotypy when initial functional analyses indicates that the behaviors are automatically reinforced. Specifically, analyses were conducted for different categories of demands and tangible stimuli as well as different forms of attention to determine their respective effects as reinforcements for motor, vocal, and motor/vocal stereotypy.

Methodology

Participants and Settings

The participants in this study each met the following inclusion criteria: (1) a diagnosis of autism, (2) no visual or physical impairments, (3) between the ages of 4 and 15, (4) a documented history of engaging in a motor, vocal, or motor and vocal stereotypical behavior, and (5) stereotypical behavior was assumed to be automatically reinforced.

Seven individuals participated in this study. One participant engaged in motor stereotypy, one participant engaged in vocal stereotypy, two participants engaged in motor and vocal stereotypy, and three participants engaged in a combination of motor and vocal stereotypy. Each child participated in the three experiments.

Participant 1(P1) was a 9-year-old boy who engaged in a combination of motor and vocal stereotypy. His stereotypical behaviors consisted of high pitched/random vocalizations, rocking back and forth, and waving his fingers in an up and down motion in his face. P1 was able to communicate his wants and needs via a communication device using 1-2 words. He rarely spoke to individuals without prompting and was in a self-contained classroom with inclusion in the typical education classroom during snack time, lunch, recess, library, and music.

Participant 2 (P2) was a 14 year-old-boy who engaged in a combination of motor and vocal stereotypy. His targeted behaviors consisted of repeating sounds and phrases and body pressing. P2 was able to communicate verbally-vocally and he was fully included in his regular classroom setting with minimal support from an aide.

Participant 3 (P3) was a 10-year-old boy who engaged in a combination of motor and vocal stereotypy. His stereotypical behaviors consisted of repeating sounds and phrases and body pressing. P3 was able to communicate his wants and needs via a communication device using 1-2 words. He spoke to individuals without prompting when he wanted items and was in a self-contained classroom with inclusion in the typical education classroom during lunch, recess, library, and music.

Participant 4 (P4) was a 13-year-old boy who engaged vocal stereotypy defined as repeating sounds and phrases. He was able to communicate his wants and needs verbally-vocally and spoke to individuals with minimal prompting. P4 was in a special education classroom for academic support and participated in a regular education classroom for lunch, recess, physical education, library, and music.

Participant 5 (P5) was a 13-year-old boy who engaged motor stereotypy defined as body pressing. He was able to communicate his wants and needs verbally-vocally and spoke to individuals with minimal prompting. P5 was in a special education classroom for academic support and participated in a regular education classroom for lunch, recess, physical education, library, and music.

Participant 6 was an 11-year-old-boy who engaged in both motor and vocal stereotypy separately. These two stereotypies were assessed individually: motor (P6a) and vocal (P6b). His motor stereotypy was defined as body pressing and vocal stereotypy was defined as repeating sounds and phrases. P6 was able to communicate with others using 5-7 word sentences. He was in a self-contained classroom and was interacted with his typically developing peers during lunch and recess.

Participant 7 was a 6-year-old boy who engaged in both motor and vocal stereotypy separately. These two stereotypies were assessed individually: motor (P7a) and vocal (P7b). His motor stereotypy was defined as waving his fingers/hands and rocking back and forth. Vocal stereotypy was defined as repeating sounds. P7 was able to communicate with others using 3-7 word sentences via a communication device and was not verbal-vocal. He was in a self-contained classroom and interacted with his typically developing peers during lunch, recess, and computer time.

Sessions were conducted in a room at the participant's home. The session area contained, at a minimum, a table, chairs, and materials relevant to each session. Access to items that could not be removed was restricted.

Behavior Definitions

Targeted behaviors were motor stereotypy, vocal stereotypy, or a combination of motor and vocal stereotypy. Motor stereotypy was defined as engaging in consistent body movements with no apparent adaptive significance (e.g., moving fingers in front of eyes or rocking back and forth). Vocal stereotypy defined as emitting sounds or words that did not pertain to the given task (e.g., repeating phrases from a television show or uttering random sounds). Table 1 lists the more specific definitions for each stereotypical behavior shown by each of the seven participants.

Data Collection & Response Measurement

Data were collected via laptops with the iObserve data collection system. The proportions of 10-s intervals in which stereotypies occurred were collected via a partial-interval recording method. Data were collected from videotaped sessions.

Interobserver Agreement

Interobserver agreement (IOA) data were collected by an independent, second observer for 35% of all sessions. To assess agreement, sessions were divided into 10-s consecutive intervals. An agreement was defined when both observers scored the same response as occurring in an interval. A disagreement was defined as observers scoring different responses in an interval. IOA was calculated by dividing the number of agreement intervals by the number of agreement plus disagreement intervals and then multiplying by 100%. An IOA value of 96% was achieved, with a range of 90% to 100%.

Procedural Integrity

Procedural integrity (PI) data were collected for 50% of all sessions via the iObserve program. To assess PI, sessions were divided into 10-s consecutive intervals. A 'correct' was defined when the experimenter followed the outline of the session without making an error during an interval. To illustrate, if a child engaged in stereotypy after the presentation of a demand, the experimenter removed demands for 30s. An 'incorrect' would be defined as the experimenter not removing the demands for 30s. Similarly, if the experimenter prompted the child to complete a demand before 30s has elapsed, an incorrect would be scored. Procedural integrity was calculated by dividing the number of correct intervals by the number of correct plus incorrect intervals and then multiplying by 100%. A PI value of 95% was obtained (range: 95% to 100%).

Functional Behavior Assessment

To gather basic information about the participant and their stereotypical behavior, a child's parents completed the Functional Assessment Screening Tool-Revised (Iwata, DeLeon & Rosco, 2013). The purpose of the FAST-R was three-fold: 1) to determine if

the assumed function was to access automatic reinforcement, 2) to establish whether a tangible condition should be included in the FA, and 3) to select which item should be used in the tangible condition.

Functional Analysis

A functional analysis, based on the one described by Iwata et al., 1982/1994, was conducted with all participants for each stereotypical behavior. Instead of a traditional alone condition, however, an ignore condition was conducted for the simple reason that it seemed inappropriate to leave a child alone in a room without supervision. All parents indicated that stereotypical behavior appeared to occur to gain access to a specific item(s). A tangible condition was thus included in the FA.

Previous research on session duration has found that similar results occur with 10 and 15 min FA session lengths (Wallace & Iwata, 1999). Based on this research, sessions were 10 min in length. To enhance the participants' discrimination between each condition, the experimenter wore a different colored shirt that correlated with each FA condition (see Conners, Iwata, Kahng, Hanley, Worsdell, & Thompson, 2000). Specifically, a white shirt was worn during the ignore condition, a black shirt during the tangible condition, a green shirt during the attention condition, a red shirt during the play condition, and a yellow shirt during the demand condition.

In addition to wearing different colored shirts during each condition, a fixed cycle of condition presentations was implemented to control for potential sequence effects that can occur with an FA (see Hammond, Iwata, Rooker, Fritz, & Bloom, 2013). During an ignore condition, for instance, participants do not receive attention, which may alter the effects of attention in later conditions. In the light of these considerations, the order of

conditions for the FAs in the present study was ignore, attention, tangible, play, and - demand.

One set of FA conditions was conducted one to three times per day until the function of behavior was determined. Each condition was a separate session, and no more than 50 sessions were conducted with a participant. A three-to-five minute break occurred between each FA session when multiple sessions were conducted in a given day.

Ignore Condition. This condition served as one test for automatic reinforcement. The experimenter and the participant were seated no more than two feet away from each other. The session began when the child and experimenter were sitting at a table. The child was free to move about the room once the session began. All behaviors were ignored. Extended ignore sessions were conducted once the data indicated that stereotypy was automatically reinforced.

Attention Condition. The attention condition served as a test for social, positive reinforcement, in the form of attention. During this condition, the experimenter and the participant sat at a table no more than two feet away from each other. When seated, the experimenter said, “You have some toys to play with while I complete some work” as they directed the child to the toys. The experimenter pretended to be busy, leaving the child to play with the toys or move about the room. Contingent on the occurrence of stereotypy, a statement of concern was provided (e.g., “I don’t like it when you flap your hands”; “people may not like it when you talk to yourself”), together with a reprimand (e.g., “don’t say things like that”; “don’t flap your hands”), and brief physical contact (e.g., touching the arm or rubbing the back).

Tangible Condition. The tangible condition serves as a test for social, positive reinforcement, in the form of tangibles. During this condition, the experimenter and the participant were at a table no more than two feet away from each other.

Prior to the tangible condition, the participant was given 120s access to the item that the parents indicated was preferred from the FAST-R. The session began after the FT 120s elapsed and after the item was removed. Contingent on the occurrence of stereotypy, the item was returned to the child for 30s. After this period, the item was removed until stereotypy occurred again and so forth throughout the session.

Demand Condition. The demand condition serves as a test for social, negative reinforcement in the form of escape from demands. Tasks for the demand condition included educational activities or daily living skills and were selected from child's individual education placement goals or home therapy program. During this condition, the child and experimenter were seated at a table. Session began with the first presentation of a demand. Demands were presented continuously until stereotypy occurred. When the participant complied with a demand within 3-5s, vocal praise (e.g., "That's the right answer"; "Good job!") was given. If the participant did not comply with the demand within 3-5s, a three-step prompting hierarchy was implemented as follows: (1) the initial demand (e.g., "Touch the dog"; "Wipe your nose"); (2) how to complete the demand was modeled while repeating the demand, and (3) physically guiding the participant to comply with the demand while repeating the demand. When the demand was verbal-vocal, however, the prompting hierarchy included (1) the initial demand (e.g., "Say dog"; "Say blue"), (2) providing a partial verbal-vocal prompt after repeating the demand (e.g., "Say dog – d" or "Say blue – bl"), and (3) supplying the full verbal-vocal

prompt after repeating the demand (e.g., ‘say dog – dog’, ‘say blue – blue’). Contingent on stereotypy, the participant was given a 30s break from demands. Specifically, the experimenter said, “Ok, you don’t have to” or “You don’t have to” and then removed the demand and turned away. After the break, a different demand was presented.

Play Condition. The play condition serves as a control for the four conditions. During this condition, participants were given unrestricted access to leisure items. Attention was delivered every 30s and noncontingently throughout this condition, and no demands or instructions were provided.

The experimenter and the participant were no more than two feet away from each other. The session began by the experimenter directing the participant toward objects on the table while saying to the child, “Here are some toys if you would like to play.” Social praise (e.g., “Great job playing”; “That is cool”) and physical contact (e.g., patting the back, touching the arm) were delivered according to a FT 30s schedule. All of a child’s initiations to interact with the experimenter were reciprocated, however all stereotypical behaviors were ignored.

Experimental Design & Interpreting Functional Analytic Data

A multielement, single subject design was used in this study. Data were visually analyzed based on trend, slope and variability of the data.

Stereotypical behaviors were determined to be automatically reinforced when one of the following criteria were met: 1) data, proportion of intervals, in the ignore condition were higher than other conditions 2) data were high for all conditions and throughout the extended ignore sessions, or 3) data were highest in conditions with low social

stimulation (alone, attention, and tangible conditions) and lowest in conditions with comparably higher social stimulation (demand and play).

Experiment I: Demand Analysis

The purpose of Experiment I was to determine the degree to which motor, vocal, or motor and vocal stereotypy was maintained by negative reinforcement in the form of escape from a specific demand(s). To pursue this hypothesis, a Demand Assessment was conducted with participants to determine task difficulty level. This was done for each demand rather than each skill set as tasks from the same skill set can vary in difficulty. For the Demand Assessment, data were collected on the prompt level (from a three-step prompting hierarchy) necessary for the participant to comply with each task. This prompting hierarchy was the same one used in the demand condition of the FA. To make certain that the most accurate data on difficulty could be gathered, each demand was assessed two to three times.

The Demand Assessment was conducted until there were 20 demands in each category. Once the difficulty level for the task was ascertained, it was placed in one of three categories: easy, moderately difficult, and difficult.

Easy. A demand was easy if the participant readily completed the demand without prompting for two of three presentations.

Moderately Difficult. A demand was moderately difficult if the participant was prompted to complete the demand with the second prompt of the prompting hierarchy for two of three presentations.

Difficult. A demand was difficult if the participant was fully prompted to complete the demand for two of three presentations.

A Demand Analysis (DA) was conducted after the Demand Assessment. All conditions were the same as to the demand condition of the FA with this exception: the demands presented were based on difficulty level (easy, moderately difficult, and difficult conditions). Sixty demands (20 demands per difficulty level) were utilized for the DA for each participant. Sessions of each demand level were conducted in random order. One set of three DA conditions was conducted three to five times per day until it was determined that demand difficulty and stereotypy were functionally related. Each condition was considered a separate session, and no more than 50 sessions were conducted with one participant. Breaks lasting 3-5 minutes were provided when multiple sessions were conducted on a given day.

Treatment Protocol: Participant 1. The DA for Participant 1 shows that stereotypy occurred less often with easy demands and most often with difficult demands (see Figure 10). Treatment for this child involved conducting a baseline with the easy condition in which stereotypy occurred the least. After baseline, easy demands were gradually withdrawn while moderately difficult tasks were gradually introduced. Fading from easy to moderately difficult tasks occurred in four phases, as follows: 15 easy/5 moderately difficult tasks, 10 easy/10 moderately difficult tasks, 5 easy/15 moderately difficult tasks, and 20 moderately difficult tasks. The criteria for moving from one phase to the next included a downward trend in stereotypy, which leveled off at or below baseline levels. After fading the moderately difficult tasks into the session, a mid-treatment DA was conducted.

Once the mid-treatment DA was completed, moderately difficult tasks were removed and difficult tasks were introduced in these four phases: 15 moderately

difficult/5 difficult tasks, 10 moderately difficult/10 difficult tasks, 10 moderately difficult/15 difficult tasks, and 20 difficult tasks. The criteria for moving from one phase to the next included a downward trend in the data, which leveled off at or below baseline levels of stereotypy. A post-treatment DA was conducted once the demand fading for difficult tasks was completed.

Experiment II: Tangible Analysis

The purpose of Experiment II was to determine the degree to which motor, vocal, or motor and vocal stereotypy was maintained by social, positive reinforcement in the form of access to specific tangible items. To pursue this hypothesis, a paired-choice preference assessment (see Fisher Piazza, Bowman, Hagopian, Owens & Slevin, 1992) was conducted with each participant prior to the Tangible Analysis (TA) conditions.

The child's parent selected seven to eight leisure items for assessment. These included items that involved playing simple turn taking games, listening to music and/or sounds, light-up toys, and manipulatives (e.g., cars, action figures). Participants were given access to all of the items prior to each assessment to confirm that they interacted properly with each item. This involved the experimenter watching the child play with the leisure item for 45-60s.

The preference assessment began when the participant was given a choice between playing with one of two items. Each item was paired with every other item in the assessment one time. When a participant selected an item by vocally identifying, pointing to, or reaching for it, s/he was given the item for 45-60s. All participants selected one item each time two items were presented.

Data were collected on which item the participant selected in a presented pair. A rank order of preference was calculated by dividing the number of times an item was selected by the number of times the item was presented and multiplying by 100%. The items were then ordered from the highest percentage to the lowest. This hierarchy data was used to determine the preference level of all items. Preference levels of items were placed in three categories: preferred, moderately preferred, and non-preferred.

Preferred Stimulus. An item was preferred when it was selected 90-100% of the presentations.

Moderately Preferred Stimulus. An item was moderately preferred when it was selected 60-70% of presentations.

Non-Preferred Stimulus. An item was non-preferred when it was selected 0-20% of the presentations.

The TA was conducted after the preference assessments were complete. All conditions were the same as the tangible condition of the FA with this exception: the items presented were based on preference level (preferred, moderately preferred, and non-preferred). Conditions were conducted in random order. One set of three TA conditions were conducted three to five times per day until it was determined that item preference and stereotypy were functionally related. No more than 50 sessions were conducted with one participant. Participants had a 3-5 minute break between each session when multiple sessions were conducted in a given day.

Treatment Protocol: Participant 6a. The TA for participant 6a shows that stereotypy occurred most often with the least preferred toy and least often with the most preferred item (see Figure 36). Treatment involved baseline and a differential

reinforcement of other behavior (DRO) procedure. During baseline, contingent on motor stereotypy, the least preferred tangible item was presented for 30s. The DRO procedure involved providing access to the highly preferred tangible item for 15s when motor stereotypy did not occur in the presence of the least preferred item for a given period. This period of time was gradually increased across the following eight phases: 5s, 10s, 20s, 40s, 80s, 160s, 320s, and 600s. The criteria for moving from one phase to the next included a downward trend in the data, which leveled off at or below baseline levels of stereotypy. A post-treatment TA was conducted once the 600s phase was completed.

Experiment III: Attention Analysis

The purpose of Experiment III was to determine the extent to which motor, vocal, and motor and vocal stereotypy was maintained by social, positive reinforcement in the form of certain types of attention. To pursue this hypothesis, an Attention Analysis (AA) was conducted after the FA was completed. Three forms of attention occurred, as follows: physical attention, statements of concern, and mild verbal reprimands. Each one of these forms of attention were assessed separately for each participant.

Physical Attention. Physical attention involved brief physical touch contingent on stereotypy (e.g., touching the back or shoulder).

Statements of Concern. Statements of concern involved expressing unease over the stereotypic behavior (e.g., “I don’t like it when you flap your hands”; “People may not like it when you talk to yourself”).

Mild Verbal Reprimands. Mild verbal reprimands involved providing vocal statements admonishing the participant for engaging in stereotypy (e.g., “Stop talking to yourself”; “Don’t flap your hands”).

All conditions for the AA were conducted as the attention condition of the FA with this exception: the type of attention presented varied (physical attention, statements of concern, and mild verbal reprimand). Conditions were conducted in random order. One set of three, AA conditions was conducted three to five times per day until it was determined that different types of attention and stereotypy were functionally related. No more than 50 sessions were conducted with one participant. Participants had a break for 3-5 minutes between each session.

Treatment Protocol: Participant 6b. The AA data for Participant 6b showed that his vocal stereotypy occurred most often during the statement of concern and physical touch conditions. Vocal stereotypy showed a downward trend in the reprimand condition and, therefore, a treatment was not warranted.

Treatment for this participant centered in a DRO contingency involving statements of concern contingent on the absence vocal stereotypy, physical touch condition, and differential reinforcement of physical touch in the absence of vocal stereotypy. During Phase 1, contingent on vocal stereotypy, statements of concern were provided. The DRO procedure (Phase 2) involved providing statements related to appropriate talking or not engaging in vocal stereotypy (e.g., being quiet, talking about something relevant, and so on). When vocal stereotypy fell at or below the levels in Phase 1, Phase 3 began. This phase involved physical touch being provided contingent on vocal stereotypy. When behaviors showed an increasing trend, a DRO procedure for physical touch (Phase 4) was implemented. This phase involved physical touch contingent on either appropriate talking or the absence of vocal stereotypy. The criteria

for moving from one phase to the next included a downward trend in the data. A post-treatment AA was conducted once the phases were completed.

Results

Functional Behavior Assessment

The demographic characteristics and behavior definitions for each participant are provided in Table 1. The age range for participants was 6-14 years. All were males, diagnosed with autism, and who did not have any other disabilities or impairments. The parents responses on the FAST-R (see Appendix A) indicated that the behaviors of concern were motor stereotypy for participants 5 (P5), 6a (P6a), and 7a (P7a), vocal stereotypy for participants 4 (P4), 6b (P6b), and 7b (P7b), and motor and vocal stereotypy for participants 1, (P1), 2 (P2), and 3 (P3).

Via the FAST-R, parents for all participants indicated that they believed their child's stereotypical behaviors were maintained by automatic reinforcement (see Table 2) and that all participants engaged in stereotypy to access tangible items.

Functional Analysis

The exact items utilized during the functional analyses are listed in Table 3. The FA results, in general, indicated that stereotypical behaviors, for all participants, were automatically reinforced (see Figures 1-9). Specifically, all participants' data, except P6b (Figure 7) and P7a (Figure 8), met the criteria for stability, with no trends or level changes and occurring throughout the extended ignore sessions (Hagopian et al., 1997; Roane et al., 2013). Data for P6b and P7a demonstrate a trend in that stereotypical behaviors are increasing throughout the assessment. Upon closer examination of the data, however, P6b and P7a engaged in stereotypy for access to the reinforcer and did not

engage in the behavior during the reinforcement interval in the beginning of the analysis. As the analysis continued, the children began to engage in stereotypical behavior throughout the reinforcement intervals.

Experiment I: Demand Analysis

All participants took part in the DA. Prior to the analysis, a Demand Assessment (see Appendix B) was conducted with each participant to determine difficulty of tasks (i.e., easy, moderately difficult, or difficult). The specific demands utilized throughout the DA are presented in tables 4-12 for participants 1-7b, respectively.

The DA results for participants 1-7b are presented in Figures 10-18, separately. Specifically, these results suggest that P6a, P6b, and P7a, (Figures 15-17, respectively) engaged in more stereotypical behaviors when presented with difficult demands compared to easy or moderately difficult demands. Note that P6a and P6b are the same participant and that he engaged in both motor and vocal stereotypy, which did not occur in conjunction. The DA for both motor and vocal stereotypy demonstrate a similar trend. Higher levels of behavior in the difficult condition and a downward trend in stereotypy for the moderately difficult and easy conditions.

P2 (Figure 11) and P7b (Figure 18) showed the most stereotypy when presented with moderately difficult demands. In addition, data for the easy condition was in between the other conditions, demonstrating an upward trend. While levels of behavior during the difficult condition were low. P7b's data indicate levels of vocal stereotypy during the moderately difficult condition to be increasing stereotypical behaviors during the easy and difficult conditions demonstrate a downward trend.

P3's motor and vocal stereotypy (Figure 12) occurred most often when presented with easy and moderately difficult demands relative to difficult demands. In contrast, P1 (Figure 10), P4 (Figure 13), and P5 (Figure 14) emitted more stereotypical behaviors when given difficult and moderately difficult demands relative to easy demands. Both P4 and P5's data indicate that levels of behavior during the moderately difficult and difficult conditions increased. P4's data show an increase in vocal behavior in both the difficult condition and the moderately difficult condition. Stereotypy for P4 during the easy condition remained low. Behavior for P5 increased during the moderately difficult condition and during the difficult condition. The data for P1 shows that levels of motor and vocal stereotypy were high for the difficult condition, increasing for the moderately difficult condition, and low for the easy condition. These data indicate that the function of stereotypy is influenced by the difficulty of demands and the behavior is partially maintained by social negative reinforcement in the form of escape from certain types of demands.

Treatment: Participant 1. Figure 19 shows the treatment data for P1. Since P1's DA demonstrated that he engaged in more motor and vocal stereotypy during the difficult condition followed by the moderately difficult condition and then the easy condition, a demand fading procedure was utilized to gradually increase the difficult level of demands. The first Panel of Figure 19 are the baseline data of motor and vocal stereotypy. Once baseline levels were established, fading out the easy demands and fading in the moderately difficult demands began. These data are presented in Panels 2-5 of Figure 19. The data for 15 easy demands and 5 moderately difficult demands (Panel 2) shows a downward trend, below baseline levels. With the introduction of 10 easy and 10

moderately difficult demands (Panel 3), the levels of behavior continued to decrease. (It is important to note that after the fourth session in Panel 3 the child was sick for two weeks. Even though the data demonstrated a downward trend, a reestablishment of behavior levels was conducted and motor and vocal stereotypy continued to decrease.) The behavior levels in Panel 4 indicate that stereotypy remained low when the demands changed to 5 easy and 15 moderately difficult. When 20 moderately difficult demands (Panel 5) were utilized during sessions, levels of behavior remained low.

Mid-treatment DA data for P1 are depicted in Figure 20 and indicated that the function of motor and vocal stereotypy changed from the initial DA. Specifically, the proportion of stereotypy with difficult demands decreased as did behaviors during the moderately difficult condition.

After the mid-treatment DA, demand fading for difficult demands began. These data are presented in Figure 20, Panels 6-9. Data for 15 moderately difficult demands and 5 difficult demands (Panel 6) indicate that this was the longest phase of treatment. Viewing Panel 6, the data remained generally lower than baseline levels. These data also demonstrate a downward trend after 10 sessions of unstable data. When fading involved 10 moderately difficult and 10 difficult demands (Panel 7), the proportion of behavior dropped and decreased further with 5 moderately difficult demands and 10 difficult demands (Panel 8). Finally, levels of motor and vocal stereotypy were at zero levels when 20 difficult demands were introduced (Panel 9).

A post-treatment DA was conducted at the conclusion of treatment. These data are presented in Figure 21. Data indicate that the proportion of motor and vocal stereotypy for P1 remained generally low.

Experiment II: Tangible Analysis

Figures 22-30 depict the preference assessment outcomes for Participants 1-7b, respectively. Data for Participants 1-7b of the Tangible Analysis (TA) are presented in Figures 31-39, separately. For all participants, Table 13 outlines the specific leisure items utilized for the TA conditions.

The data for P2 (Figure 32) and P7a (Figure 38) indicate that stereotypy was highest for the TA conditions with the least preferred items and lowest with the moderately preferred items. P1's data (Figure 31) for the TA show that motor and vocal stereotypy was most frequent during the highly preferred condition and least frequent during the moderately preferred and least preferred conditions. In contrast, P7b's (Figure 39) data indicated that the different types of tangible items did not influence vocal stereotypy. This is evident, as the levels of behavior were relatively equal during all conditions.

Data for P5 (Figure 35) and P6b (Figure 37) were consistent in that stereotypy was highest during the moderately preferred and least preferred conditions. For P5, levels of motor stereotypy increased in the moderately preferred condition and remained consistent during for the least preferred condition. Stereotypy for P5 decreased in the highly preferred condition. P6b's data show that vocal stereotypy increased the most during the least preferred condition and remained steady during with the highly preferred condition.

The TA data for P3 (Figure 33) indicate that motor and vocal stereotypy increased during the least preferred condition and highly preferred condition. Levels of stereotypy were comparably lower for the moderately preferred condition.

Data obtained on stereotypy for P4 (Figure 34) and P6a (Figure 36) showed that levels of behavior were highest during the least preferred condition and lowest during the highly preferred condition. Stereotypy during the moderately preferred condition ranged between these two conditions. The data for P6a indicated that motor stereotypy most often occurred during the least preferred condition and occurred less often during the highly preferred condition.

Treatment: Participant 6a. A treatment was implemented with P6a whose data are and is presented in Figure 40. The first Panel show baseline data on the proportion of motor stereotypy obtained during the least preferred condition. Panels 2-9 depicts data for the DRO treatment, which involved a DRO 15s of access to the highly preferred item contingent on the absence of motor stereotypy with the least preferred item for a specified period of time. Panel 2 shows the results of the 5s time requirement where stereotypy decreased. When the time requirement increased to 10s (Panel 3), levels of stereotypy increased but eventually trended downward after the fourth treatment session. With the time increased to 20s (Panel 4) the level of behavior decreased. Further decreases were obtained when the time increased to 40s (Panel 5) and when it increased to 80s (Panel 6). When the requirement increased to 160s (Panel 7) stereotypy remained low. The data for the 320s time requirement (Panel 8) and for the 600s (Panel 9) requirement remained low as well.

A post-treatment TA was conducted with P6a to determine how the treatment may have changed the function of motor stereotypy relative to the types of tangible stimuli presented. The data shown in Figure 41 indicate that levels of motor stereotypy were low across all conditions.

Experiment III: Attention Analysis

The AA data for Participants 1-7b are presented in Figures 42-50. The data for P7a (Figure 49) indicate that motor stereotypy was highest during the reprimand condition. Stereotypy during the physical touch and statement of concern conditions each were lower.

For P4 (Figure 45), levels of vocal stereotypy were highest during the reprimand and physical touch conditions and lowest during the statement of concern condition. The proportion of P4's vocal stereotypy decreased during the statement of concern condition. The data for P3 (Figure 44) indicate motor and vocal stereotypy were highest for the statement of concern condition, increased during the physical touch condition, and remained comparably low during the reprimand condition.

The AA data for P1 and P5 shown in Figures 42 & 46, respectively, indicate that stereotypical behaviors occurred most often during the statement of concern condition and least often during the physical touch condition. In contrast, the data sets for P2, P6a, P6b, and P7b (Figures 43, 47, 48, and 50, respectively) each show a common theme: stereotypical behaviors were highest during the physical touch condition, lowest during the reprimand condition, and intermediate during the statement of concern condition.

The first six sessions of the AA for P2 (Figure 43) did not produce a differentiation in motor and vocal stereotypy. After the six initial sessions, however, stereotypy began to separate, suggesting that for P2, the type of attention was affecting stereotypy, with physical touch producing the most stereotypy and reprimands producing the least.

The AA data for P6b (Figure 48) indicated that vocal stereotypy was highest during the physical touch condition, and lowest during the reprimand condition.

Treatment: Participant 6b. A treatment involving either reinforcing talking appropriately or the absence of vocal stereotypy was implemented with P6b and is presented in Figure 51. The data in Panel 1 show that stereotypy was greatest during the statement of concern condition. When reinforcement was contingent on appropriate talking and/or not engaging in vocal stereotypy (Panel 2), stereotypy decreased. Panel 3 shows an increase in behavior when physical attention was contingent on vocal stereotypy. When physical attention was contingent on appropriate talking and/or the absence of vocal stereotypy (Panel 4), the target behavior decreased.

A post-treatment AA (see Figure 52) indicated that the levels of vocal stereotypy change after treatment. Specifically, physical touch contingent on vocal stereotypy increased. While behavior during the statement of concern condition and reprimand condition remained steady.

Discussion

Motor and vocal stereotypical behaviors are common with individuals diagnosed with autism and developmental delays (DiGennaro-Reed, Hirst & Hyman, 2012). The function of these behaviors is typically automatic reinforcement (DiGennaro-Reed, Hirst & Hyman, 2010; Hanley, Iwata, McCord, 2003; Rapp & Vollmer, 2005). However, researchers are discovering that motor and vocal stereotypy can be maintained by social contingencies (Cunningham & Schriebman, 2008; Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994; Kennedy, Meyer, Knowles, & Shukla, 2000; Wilke, Tarbox, Dixon, Kenzer, Bishop, & Kalavand, 2012). However, a systematic method for assessing

the extent to which social reinforcers influence motor and vocal stereotypies does not exist.

As a result, the purpose of this study was to conduct systematic analyses of social variables that could contribute to the reinforcement of motor and/or vocal stereotypy. These analyses were conducted when initial FAs indicated that the behaviors were automatically reinforced. By utilizing information from refined conditional assessment procedures conducted for non-stereotypical behaviors, three experiments were conducted to analyze different categories of demands and tangible stimuli as well as different types of attention. These analyses were conducted to determine their respective functions as reinforcements for motor, vocal, and motor and vocal stereotypies.

The data from this study demonstrate that it is possible to identify specific social variables that reinforce motor and/or vocal stereotypy when initial FA results indicate the behaviors were automatically reinforced. Differentiation in levels of stereotypy was demonstrated for all seven participants for each of the three experiments. The exception was Participant 7b, whose tangible analysis for vocal stereotypy did not show a differentiation in responding, which suggests the behavior is not influenced by access to tangible stimuli. However, his behavior for the demand and attention analyses shows that different types of demands and attention effected vocal stereotypy.

Generally, it is recommended that extended alone conditions should be conducted when levels of behavior are high for all conditions to determine if the behavior is automatically reinforced. However, these data suggest that subsequent analyses to clearly determine the response-reinforcer relationship may be more appropriate to isolate the function of behavior. By conducting a systematic analysis of presumed automatically

reinforced behaviors, it may be possible to ascertain the particular reinforcing or punishing variables. This could allow for the development of more refined and effective treatments for stereotypical behavior as previously suggested.

The FA data for P1, for instance, indicated that motor and vocal stereotypy were maintained by automatic reinforcement. With this initial information, a treatment involving blocking and redirecting or extinction may have been utilized. However, the supplemental demand analysis revealed that the behavior was sensitive to various types of demands: motor and vocal stereotypy increased with difficult demands compared to easy demands. When a treatment that involved demand fading was implemented the levels of stereotypy decreased to zero. A post-treatment demand analysis also indicated that stereotypy was at or near zero levels. It is evident that the behavior decreased to levels that are more acceptable with the demand fading procedure.

When making a general conclusion that motor and vocal stereotypies are automatically reinforced, misidentifying the function may occur. Take for instance the data sets for P6a (motor)/P6b (vocal) and P7a (motor)/P7b (vocal) that were from the same children (e.g., P6a/P6b were one child and P7a/P7b were another child). Both of the children did engage in motor and vocal stereotypy; however, the behaviors did not occur in conjunction. In evaluating the data for P6a/P6b, the FAs indicated that motor and vocal stereotypy were automatically reinforced. The trends for the demand analyses and attention analyses are similar for both behaviors. These analyses reveal difficulty levels of demands and types of attention influence both motor and vocal stereotypy in the same manner. Motor and vocal stereotypies did not show similar patterns during the tangible analyses. Presented with these results, different, effective treatments can be employed to

reduce each behavior. These treatments may have been overlooked if the FA results were considered without the supplemental analyses.

To illustrate, for P6b's vocal stereotypy, the treatment involved differential reinforcement of the absence of the target behavior and/or engaging in appropriate speaking. This treatment was effective in decreasing behavior. The post-treatment AA data indicated that the proportion of vocal stereotypy decreased during each of the conditions. For motor stereotypy (P6a), the treatment also involved a differential reinforcement procedure, except a preferred item was delivered for a fixed time when the target behavior did not occur for a set period. This period was gradually increased until motor stereotypy did not occur for the entire 10 min (600s) session. The post-treatment TA denoted that the proportion of motor stereotypy decreased. It is evident that both motor and vocal stereotypies decreased to acceptable levels with the differential reinforcement procedures.

Data sets from P7a (motor) and P7b (vocal) were also from the same child. Again, the FAs for both motor and vocal stereotypy indicated that the behaviors were automatically reinforced. However, even though the behaviors were both stereotypical, the subsequent analyses did not produce similar results. The DA for this child revealed that vocal stereotypy (P7b) was highest during the moderately difficult condition, lowest for difficult condition and demonstrated a downward trend for the easy condition. This is unlike the DA data for motor stereotypy (P7a) where the behavior was highest for the difficult condition and behaviors were on a downward trend for both the easy and moderately difficult conditions. The movement towards dissimilar levels of motor and vocal stereotypy continued with the tangible and attention analyses. For this child, the

same treatment for motor and vocal stereotypy may not be effective in reducing the behavior since the function of stereotypical behaviors can be different for the same child.

The data from these experiments expand on the current methodology to assess function of behavior to create treatments and reduce the detrimental effects of motor and/or vocal stereotypy. Decreasing stereotypical behaviors can help individuals spend quality time with family members and friends, improve their academic and vocational skills, and they can learn how to engage in appropriate social and play interactions with peers. By utilizing analyses such as those presented in this study, it is possible to implement treatments that can target the improvement of the above-mentioned social skills.

These data also illustrate that one should not assume that stereotypical behaviors are not influenced by social contingencies and may be influenced by multiple variables. This may be especially beneficial since the goal of a functional analysis is the control and prediction of events related to behavior (Skinner, 1938). When behaviors are thought to be 'sensory based', it may be assumed that it is difficult to change the behavior and this may prevent an analysis of the function of stereotypy and, in turn, the reinforcer is not clearly identified.

Even though behaviors may be unaffected by social variables, in that they can occur at high rates for all functional analytic conditions and in extended alone/ignore conditions or the data may be undifferentiated, it does not necessarily mean that they are maintained by automatic reinforcement. By having an assessment tool that assists in separating specific effects, it may be possible to decrease the number of false positive assessments that can lead to ineffective treatments.

These data support and expand the suggestions provided by Rapp & Vollmer (2005), Kennedy (2000), Miltenberger (2000), and Carr (2000) in that, when assessing function, one should 1) begin to create a systematic method for ruling-out social functions for self-stimulatory or automatically reinforced behaviors, 2) assess behaviors based on contingencies that influence the behavior in the natural environment, 3) evaluate the contexts in which behavior occur (how behavior occurs), and 4) assess within session patterns of responding.

For some individuals, motor and/or vocal stereotypy may be a result of intermittent reinforcement in the form of either subtle or indirect contingencies. For instance, Spradlin and Girardeau (1966) noted that the body rocking of adults with developmental disabilities living in an assisted facility increased prior to meal times and when staff changes occurred. The authors then assessed situations and determined that these were the times when the residents received the least amount of attention from staff. By assessing other possible variables, it was discovered that adults were sensitive to the gradual changes in staff presence throughout their day. It was this sensitivity to environmental changes that increased the occurrence of body rocking.

In a second article, Lerman, Iwata, Zarcone, & Ringdahl (1994) found that indirect, intermittent reinforcement (adjunctive behavior) maintained the stereotypical behaviors for a participant. Specifically, adjunctive behavior is a non-contingent behavior maintained by a reinforcing event that is the result of another reinforcing contingency. For this participant, rates of vocal stereotypy increased during conditions when edibles were available intermittently relative to other schedules of reinforcement. This article also points to the fact that other schedules of reinforcement, such as a conjugate schedule,

should be further evaluated when behavior is thought to be maintained by automatic reinforcement.

Even though the data in this study provide information as to how systematic and subsequent analyses can provide relevant information pertaining to the function of motor and vocal stereotypies, there were some limitations. We did not assess other possible variables that could influence stereotypy. The variables that were assessed were derived from pre-assessments to determine level of difficulty with demands and preferences of tangible stimuli. For the attention analysis, the different types of attention utilized during the functional analyses were assessed. While there is a multitude of stimuli that could be assessed with these analyses, we picked those that may influence stereotypy significantly. Conducting these analyses with stimuli that are most relevant for individual participants may be beneficial to others.

We also did not create a hierarchy for types of attention. It is possible to develop an attention categorization assessment to determine which types of attention are most, moderately, and least preferred by presenting various forms of attention and collecting data on behaviors like smiling, pushing away, crying, and laughing. Future studies may benefit in conducting assessments for attention analyses.

The objective of the treatments were to demonstrate a treatment could be derived from each of the three experiments for each behavior, therefore; a treatment was not implemented for each participant. Treatments were implemented, for motor stereotypy with data from the tangible analysis, for vocal stereotypy with information from the attention analysis, and with motor and vocal stereotypy for the demand analysis.

It may be possible to create more systematic assessments and effective treatments by utilizing more direct analyses to determine the specific variables that influence motor and vocal stereotypy. These analyses allow the behaviors to be evaluated with respect to social variables that are accessible to the researcher rather than assuming the variables are covert or are difficult to analyze. It is then feasible to explain the function of behavior and develop treatments that change behavior beyond using reinforcer replacement, punishment, and noncontingent reinforcement.

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Table 1. Demographic characteristics for all participants and definitions of stereotypical behaviors.

<i>Participant</i>	<i>Age</i>	<i>Sex</i>	<i>Diagnosis</i>	<i>Behavior</i>	<i>Definition of Behavior</i>
P1	9 years	Male	Autism	Motor & Vocal Stereotypy	Making high pitched/random vocalizations; rocking; waving fingers in face in an up/down motion
P2	14 years	Male	Autism	Motor & Vocal Stereotypy	Repeating sounds and phrases; body pressing
P3	10 years	Male	Autism	Motor & Vocal Stereotypy	Repeating sounds and phrases; body pressing
P4	13 years	Male	Autism	Vocal Stereotypy	Repeating sounds and phrases
P5	13 years	Male	Autism	Motor Stereotypy	Body pressing
P6a*	11 years	Male	Autism	Motor Stereotypy	Body pressing
P6b*	11 years	Male	Autism	Vocal Stereotypy	Repeating sounds and phrases
P7a**	6 years	Male	Autism	Motor Stereotypy	Waving fingers and hands; rocking
P7b**	6 years	Male	Autism	Vocal Stereotypy	Repeating sounds

*same child who engages in motor and vocal stereotypy separately

**same child who engages in motor and vocal stereotypy separately

Table 2. Functional behavior assessment results for all participants.

<i>Participant</i>	<i>Functional Behavior Assessment Conducted</i>	<i>Result</i>
P1	Functional Analysis Screening Tool – Revised	Automatic
P2	Functional Analysis Screening Tool – Revised	Automatic
P3	Functional Analysis Screening Tool – Revised	Automatic
P4	Functional Analysis Screening Tool – Revised	Automatic
P5	Functional Analysis Screening Tool – Revised	Automatic
P6a	Functional Analysis Screening Tool – Revised	Automatic
P6b	Functional Analysis Screening Tool – Revised	Automatic
P7a	Functional Analysis Screening Tool – Revised	Automatic
P7b	Functional Analysis Screening Tool – Revised	Automatic

Table 3. Summary of items utilized in functional analytic conditions for all participants.

<i>Participant</i>	<i>Ignore</i>	<i>Attention</i>	<i>Tangible</i>	<i>Play</i>	<i>Demand</i>
P1	None	Puzzle, ball popper, honey pot toy	Doll	Spin toy, pillow, drum	Follow directions, identify pictures, matching
P2	None	Magna doodle, robin, chicken, butterfly, dinosaur	Bee	Chicken, duck, toucan, frog, butterfly	Math, comprehension questions, identify emotions
P3	None	Fire truck, ball, ABC apple	IPad	Ball popper, flower book, hammer	Follow directions, identify pictures, body parts
P4	None	Fire truck, floam, light wand	IPhone	Ball, bubbles, tank, play-doh	Follow directions, identify pictures, categories, features
P5	None	Flower book, rain stick, 20 questions, view master	IPad	Hammer, light wand, dragon book, green car	Identify pictures, locations, functions, people
P6a	None	Firetruck, light ball, hammer, dragon book	Little green and red cars	Green squishy, Thomas train, flower book	Identify pictures, categories, shapes, yes/no
P6b	None	Tank, toy story book, 20 questions, view master	IPad	Light wand, coloring book/crayons, mouse book	Identify pictures, categories, features

Table 3 (continued). Summary of items utilized in functional analytic conditions for all participants.

<i>Participant</i>	<i>Ignore</i>	<i>Attention</i>	<i>Tangible</i>	<i>Play</i>	<i>Demand</i>
P7a	None	Light wand, blue ball, tank, book	IPad	20 questions, kaleidoscope, ball, shark toy, paddle ball	Follow directions, identify body parts, 2-step directions
P7b	None	Pom-pom, book, foam, green squishy	IPad	View master, light wand, spin toy, squishy	Follow directions, identify category, pictures, color, features

Table 4. Demands utilized during Demand Analysis conditions for Participant 1.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
A firetruck is red, what color is a firetruck	Do this – pincher grip	What animal says woof
What does a duck say	Touch index fingers	What animal says moo
Say ‘I love you’	Point to sad	What animal says quack
Do this – stomp feet	Point to surprised	What animal says meow
Do this – blow	Point to dump truck	What does a cow say
Say ‘no’	Do this – pointer to palm	What does a dog say
Say ‘hi’	Do this – clasp hands	What comes after spring
Say ‘I like’	Show me thumbs up	What comes before summer
Say ‘I hop’	Do this – wiggle fingers	What comes after a
What does a cat say	Touch pencil	What comes after b
Touch highlighter	Point to truck	What comes before 4
Give me five	Point to angry	What comes before 2
Touch clicker	Point to motorcycle	What comes after 1
Do this – lips together	Point to helicopter	What color is a firetruck
Touch head	Point to tractor	What color is the wall
Do this – jump	Point to doing homework	What color is grass
Do this – open mouth	Point to happy	What color is the sky
Do this –peace sign	Point to cutting	What color is dirt
Do this – clap	Do this – walk forward	Grass is green, what is green
Do this – thumbs up	Touch timer	Sky is blue, what is blue

Table 5. Demands utilized during Demand Analysis conditions for Participant 2.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
What could you do with a muffin?	Why is she angry? Why is she sad?	$5/7 \div 6/7$ $4/4 \div 3/4$
What could you do with a bee?	Why is he sad? What is he sad?	$4/8 \div 2/8$ $5/10 \div 8/10$
What happens before you eat cookies?	Why is he happy? Why is she happy?	$3/8 \div 3/8$ $4/7 \div 7/7$
What happens before you cook?	What happened before the puzzle?	$2/8 \div 7/8$ Simplify 10/45
What happens before you eat veggies?	What could do with a cable car?	Simplify 12/68 Simplify 15/85
What happens before you play with blocks?	What happened before sleeping?	Simplify 6/14 Simplify 4/18
What happened before they were unhappy?	What happened before dancing?	Simplify 4/32 Simplify 10/36
What happen before she was happy?	What happened before he fell?	Make into fraction $8 \frac{6}{13}$ Make into fraction $6 \frac{2}{17}$
What happened before they visited grandma? Why did they argue?	What happened before laughing? What happened before planting a tree?	Make into fraction $5 \frac{9}{11}$ Make into fraction $2 \frac{6}{17}$ Make into fraction $8 \frac{6}{13}$
Why are they arguing over the animal?	Why are they selfish?	Make into fraction $3 \frac{2}{9}$
Why are they taking a test?	Why are they sharing?	
Why is she disgusted?	Why is the car in trouble?	
Why is he disgusted?	Why are they building?	
Why is he angry?	Why are they looking at pictures?	
What could you do with a pie?	Why are they reading?	
What could you do with blueberries?	Why is she surprised?	
What could you do with a piano?		
Why is she surprised?		
Why are they doing homework?		

Table 6. Demands utilized during Demand Analysis conditions for Participant 3.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Say 'yo'	Identify clothing	Identify desk
Say 'pay'	Identify food	Identify crib
Say 'bi'	Identify toys	Identify van
Say 'pow'	Identify apple	Identify bed
Say 've'	Identify fruit	Identify boat
Say 'boo'	Identify banana	Identify dirt
Say 'bou'	Close eyes	Identify comb
Touch shoulders	Touch leg	Identify stairs
Say 'bay'	Stick out tongue	Identify candy
Identify cookies	Touch toes	Identify dress
Identify food	Identify peanut butter	Say 'dog'
Identify transportation	Identify watermelon	What's wrong? Different color
Identify clothing	Identify corn dog	What's wrong? Third eye
Identify food	Identify airplane	What's wrong? Broken
Identify broccoli	Identify bed	What's wrong? Eating CD
Identify cheese	Identify hot dog	What's wrong? Hat on
Sit down	Identify jello	What's wrong? In road
Stand up	Identify cereal	What's wrong? Flower
Touch head	Identify butter	What's wrong? Hat
Identify corn	Identify teddy bear	Say '5'

Table 7. Demands utilized during Demand Analysis conditions for Participant 4.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Identify category	Identify sad	What happened after the girls visited grandma?
Identify clarinet	Identify nuts	Identify rolling pin
Identify flamingo	Why is he concentrating?	Identify measuring cup
Identify mouth	Identify cymbals	Why is she scared?
Identify trumpet	Identify pen	Why is she happy?
Identify disgusted	Where can you buy blueberries?	Why is he excited?
Identify transportation	Where can you buy nails?	Why is she happy?
Identify food	Identify balloon	What is wrong? stuffed animal to clean
Identify food	Identify harvester	What is wrong? paint on her face
Identify transportation	Identify mail man	What is wrong? fly is in the juice
Why is she in bed?	Identify lawyer	What is wrong? swing is broken
Why is she sad?	Where can you find cars?	What is wrong? trash is not in the can
Identify angry	Where can you find a barn?	Where can you buy pajamas?
Identify disgusted	Which one is over?	What happened after they played with block?
Identify angry	Identify librarian	What happened after the mom played with the baby?
Identify instrument	Which one is beside?	What happened after they cooked together?
Identify transportation	Where can you find them arguing?	What happened when the boy fell off the bike?
Identify crab	What is wrong? eating a shoe	
Identify arm	What is wrong? double headed toothbrush	
Identify ladybug	Identify surprised	

Table 8. Demands utilized during Demand Analysis conditions for Participant 5.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Identify category	Identify space shuttle	What happened after they read a book
Identify nose	Where can you buy it?	What is she happy?
Identify blender	Where can you buy it?	What is she upset?
Identify quail	Identify grasshopper	Identify earwig
Identify food	Identify deer	Identify forklift
Identify category	Why is she practicing	Identify centipede
Identify puffin	Identify back	Identify roach
Identify ray	Why is she happy	What happened after she cleaned her room?
Identify praying mantis	Where can you find them sharing?	What is wrong? Banana as phone
Identify saw	Where can you find a nurse?	What is wrong? Different boots
Identify happy	Which one is between?	What is wrong? Eyes different
Identify category	Which one is below?	What is wrong? Doll to erase
Identify category	Identify lifeguard	What happened after they hugged?
Identify everyday objects	Where can you find a roller coaster?	What happened after they played?
Identify food	Where can you find a harp?	What happened after they planted a tree?
Why is he happy	Where can you find a bee?	Where can you buy pie?
Why is she angry	Identify screw	What happened after the fight?
Why is he excited	What is wrong? Cow with boots	What happened after eating vegetables?
Why is he happy	What is wrong? Warm clothes at beach	Why is he happy?
Why is he sad	Identify unicycle	What is wrong? Golf ball
What body part		

Table 9. Demands utilized during Demand Analysis conditions for Participant 6a.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Do this – wave	Identify category	Which one is around?
Identify toothpaste	Identify male	What does ‘a’ say?
Identify balloon	Identify vase	Which one is toward?
Identify fingers	Identify female	Identify golf cart
Identify clownfish	Identify sea turtle	Say ‘orange’
Identify category	Show me hugging	Which one is opposite
Identify food	Identify female	Identify lawyer
Which one is in?	Identify rat	Identify manatee
Identify kiwi	Identify shoulder	Identify farm item
Identify male	Identify female	Identify wheelchair
Identify paper towels	Identify male	Identify mechanic
Identify category	Identify animal	Identify steak
Identify logger	How is she feeling?	Which one is up
Identify category	Identify janitor	Which one is before
Identify 17	Identify envelope	Identify instrument
Identify animal	Which one is behind	Identify hamster
Which one is outside?	Identify taxi cab	Identify category
Identify female	What is she doing?	Identify newscaster
Show me clapping	Identify barn	Identify artichoke
Identify camel	Identify lifeguard	Identify motor home

Table 10. Demands utilized during Demand Analysis conditions for Participant 6b.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Identify female	Identify male	Which one is beneath?
Identify starfish	Rub your hands and tap teeth	Which one is through?
Identify 10	Identify category	Identify category
Which one is inside?	Identify female	Which one is against?
Identify female	Identify nurse	Which one is down?
Identify scooter	Identify globe	Identify category
Identify category	Identify pelican	Identify station wagon
Identify eagle	Which one is on?	Which one is near?
Which one is under?	Identify swan	Identify musician
Identify category	Identify killer whale	Identify male
Identify transportation	Identify transportation	Identify tool
Show me scratching	Identify light bulb	Identify fly
Touch nose	Pointer finger to palm and rub hands	Identify ferret
Identify pear	Identify female	How is she feeling?
Which one is off?	Identify male	Identify scorpion
Identify category	What is she doing?	Identify category
Identify ear	How is she feeling?	Identify jockey
Identify 14	Make a peace sign and tap teeth	Identify trombone
Identify hay	Identify toilet paper	Identify bacon
Identify category	Identify everyday object	Identify fork lift

Table 11. Demands utilized during Demand Analysis conditions for Participant 7a.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Identify red	Identify ship	Say 'c'
Identify j	Identify chair	What says tweet?
Identify m	Identify bulldozer	Say 'bye'
Identify apple	Identify hexagon	A, B ____
Clap hands	Identify arrow	Say 'boo'
Identify brown	Clap hands and tap legs	Say 'key'
Identify t	Open and close hands	Nod head
Identify black	Say 'b'	W, X, Y, ____
Identify flower	Identify shoes	Identify mouth
Identify rectangle	Identify spoon	The cat says ____
Stand up	Identify u	Look left
Identify goat	Identify z	Hickory, dickory, ____
Identify gummy bears	Identify corn	What says 'baa'
Identify o	Tap legs	Say 'bo'
Touch mouth	Identify jacket	Row, row, row, your ____
Identify blue	Identify tiger	Touch ear
Identify moon	Close mouth	The cow says ____
Identify bed	Touch fingers together	Say 'bay'
Touch head	Chomp teeth	Identify head
Touch nose	Identify fire truck	Touch pointer finger to thumb

Table 12. Demands utilized during Demand Analysis conditions for Participant 7b.

<i>Easy Demand</i>	<i>Moderately Difficult Demands</i>	<i>Difficult Demands</i>
Identify lion	Clap and clasp hands	Say 'bee'
Identify soap	Open mouth	Wave
Identify gray	Identify mouth	Ready, set, ___
Clap	Identify flower	Say 'bo'
Identify star	Identify car	What says neigh?
Identify I	Open hands	Say 'b'
Identify tomatoes	Identify ice cream	Wiggle fingers
Put lips together	Identify cookies	The pig says ___
Identify w	Identify motorcycle	London bridge is falling
Identify ball	Identify s	___ Say 'ca'
Identify white	Identify circle	Touch shoulders
Identify leg	Touch fingers	Identify eye
Identify elephant	Clasp hands	Twinkle, twinkle, little ___
Identify green	Identify bird	Say 'ki'
Identify n	Identify k	What says hoot?
Identify orange	Identify cupcake	Smile
Identify oval	Identify ear	The dog says ___
Identify p	Identify rhino	Identify chin
Rub chest	Identify alligator	1, 2, ___
Sit down	Identify duck	Say 'bi'

Table 13. Leisure items utilized in the Tangible Analyses for all participants.

	<i>Highly Preferred</i>	<i>Moderately Preferred</i>	<i>Least Preferred</i>
P1	Bunny	Blue spike ball	Elmo phone
P2	Magna doodle	Robin	Duck
P3	Pin toy	Kaleidoscope	Guitar
P4	IPad	Yellow squishy toy	Connecting shark toy
P5	Play doh	IPod	Magic 8 ball
P6a	IPad	Bean box	White board/crayons
P6b	Edward train	Story cubes	Wand
P7a	ABC text & go	IPad	Book
P7b	Squishy	Blue car	Spirograph

Figure 1. Results of the Functional Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

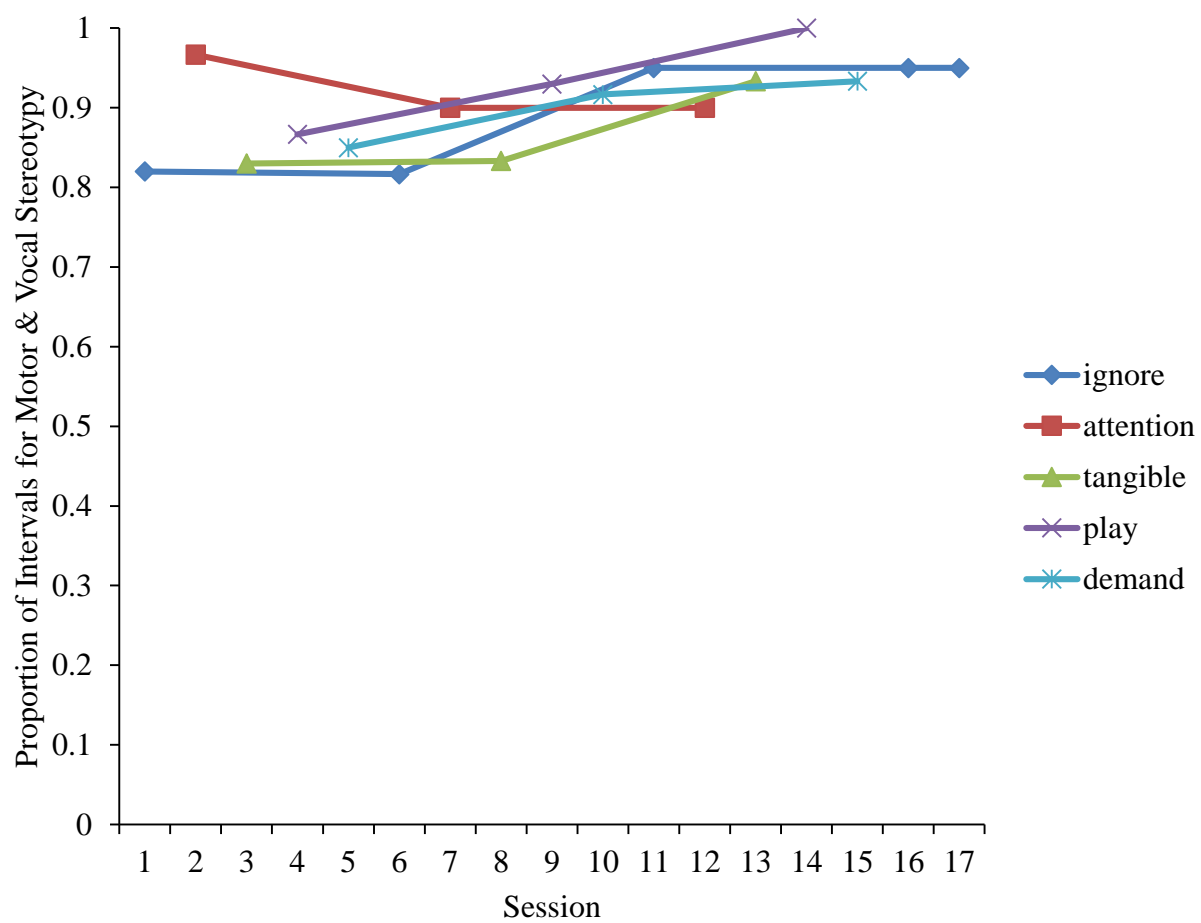


Figure 2. Results of the Functional Analysis for Participant 2. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

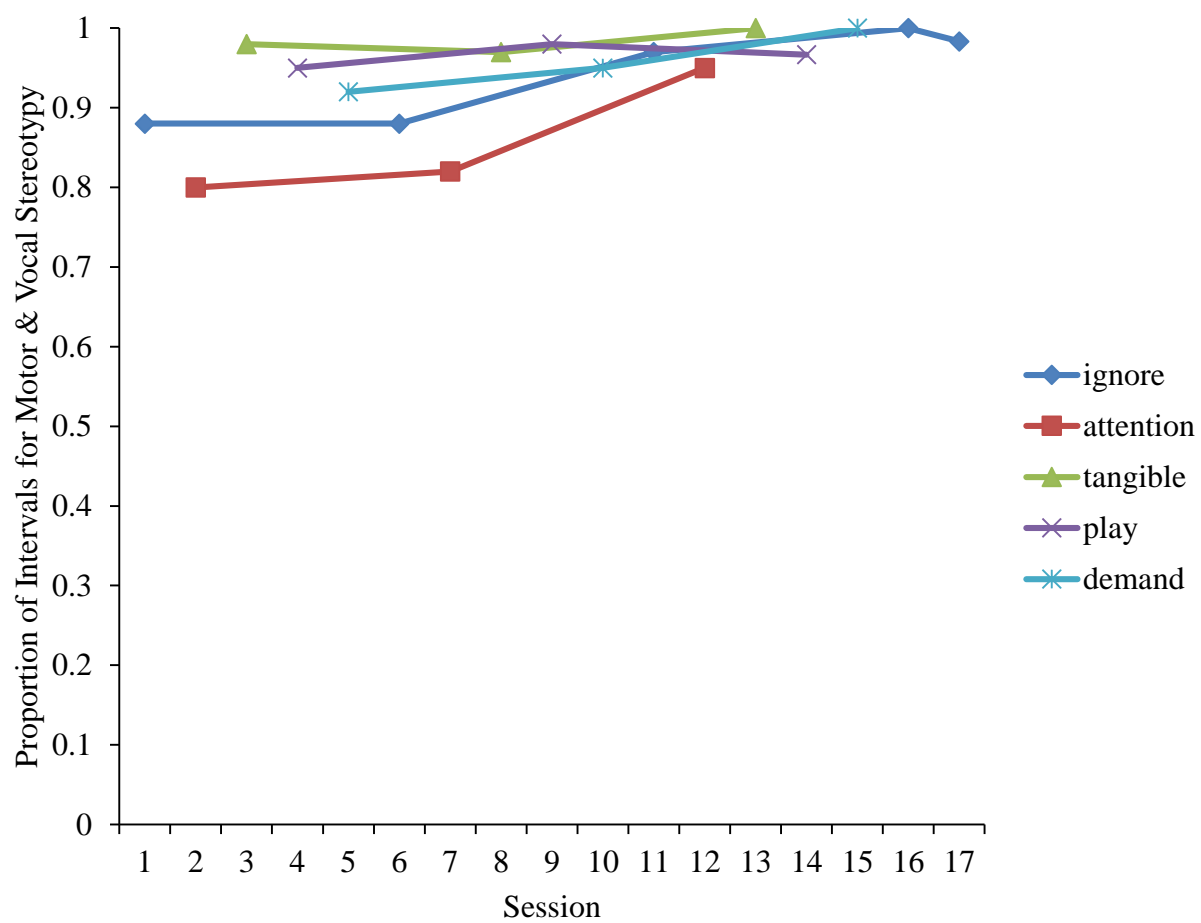


Figure 3. Results of the Functional Analysis for Participant 3. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

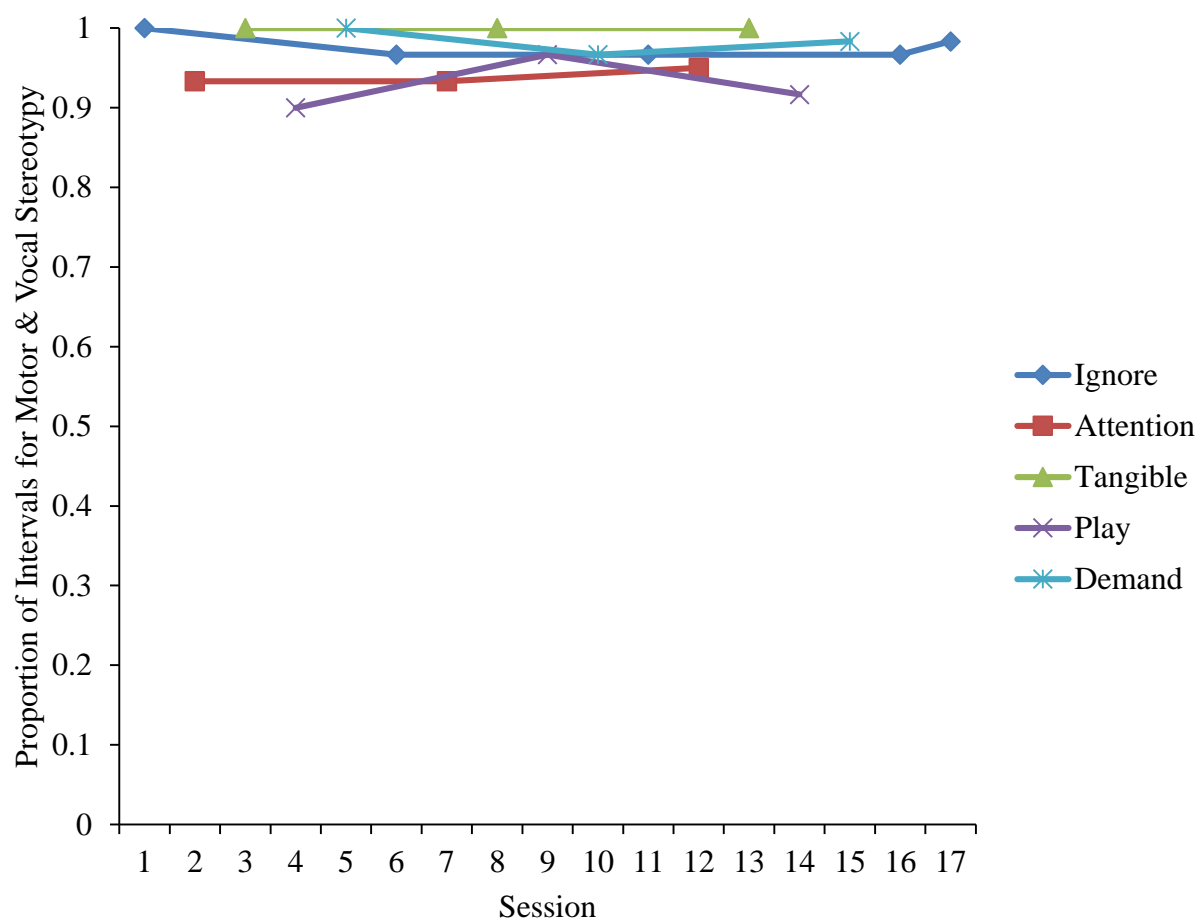


Figure 4. Results of the Functional Analysis for Participant 4. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

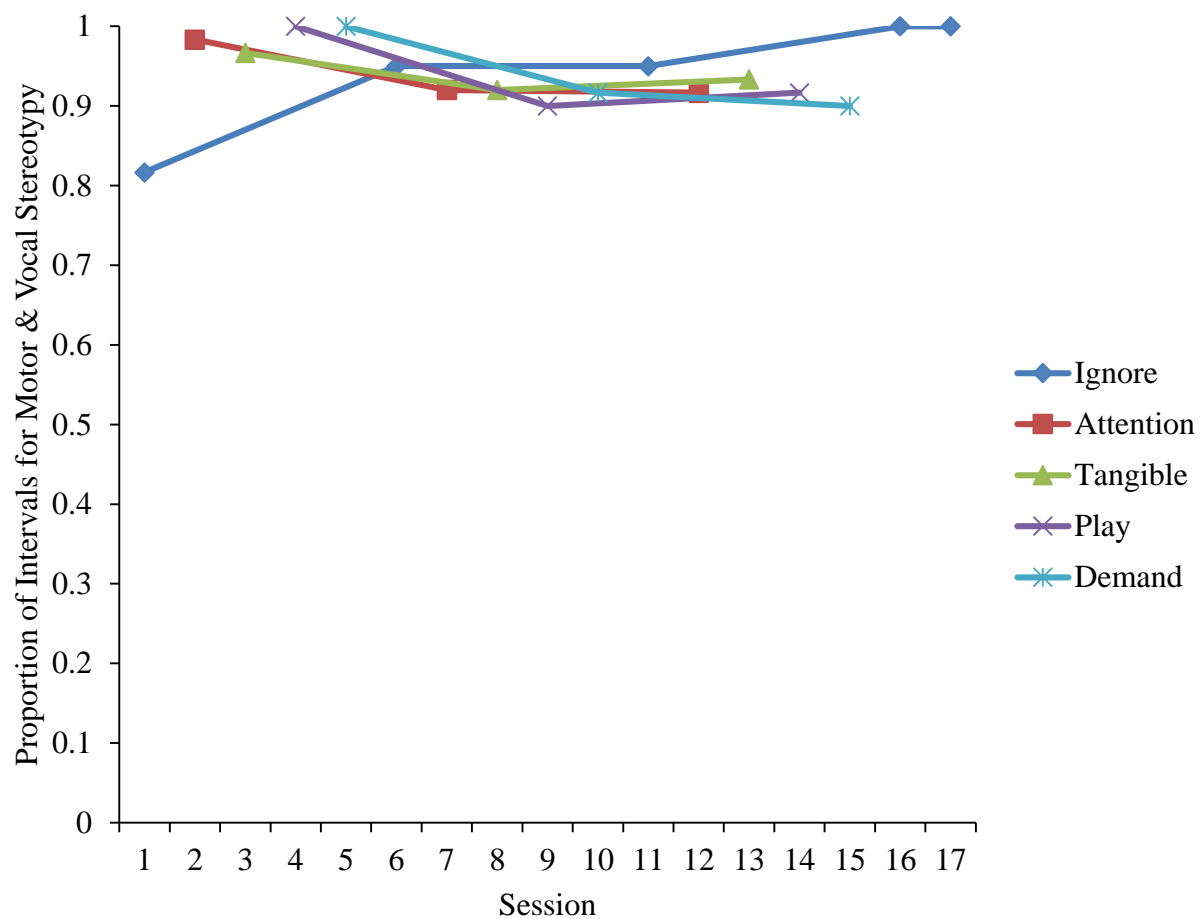


Figure 5. Results of the Functional Analysis for Participant 5. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

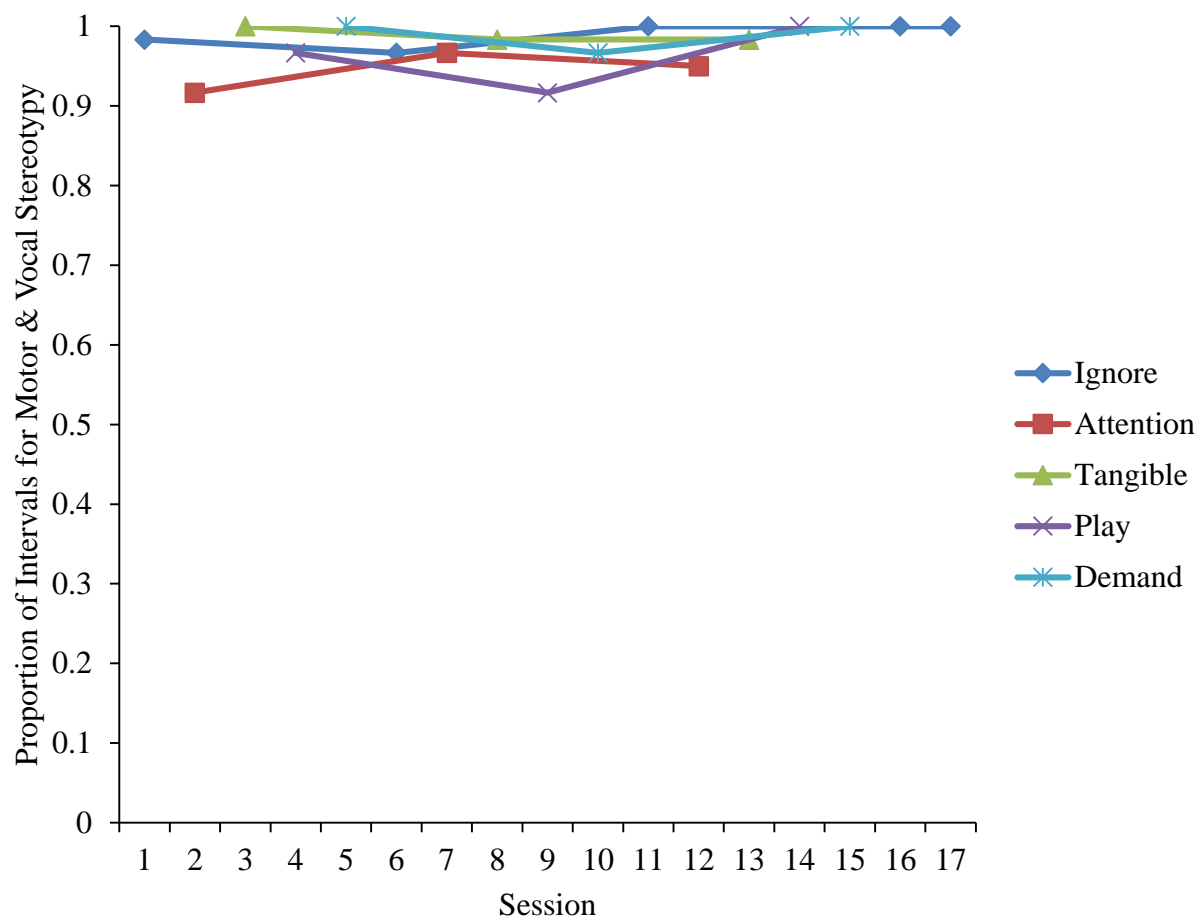


Figure 6. Results of the Functional Analysis for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

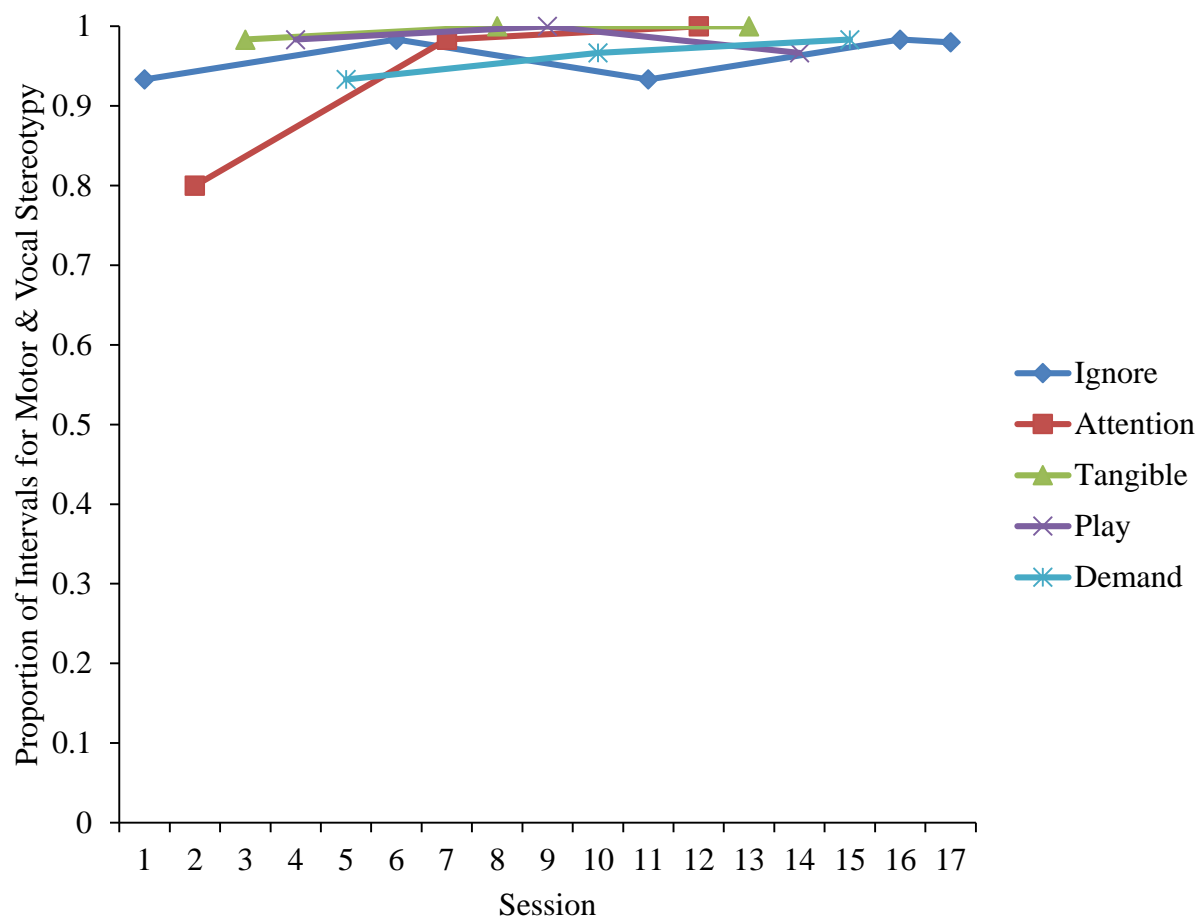


Figure 7. Results of the Functional Analysis for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

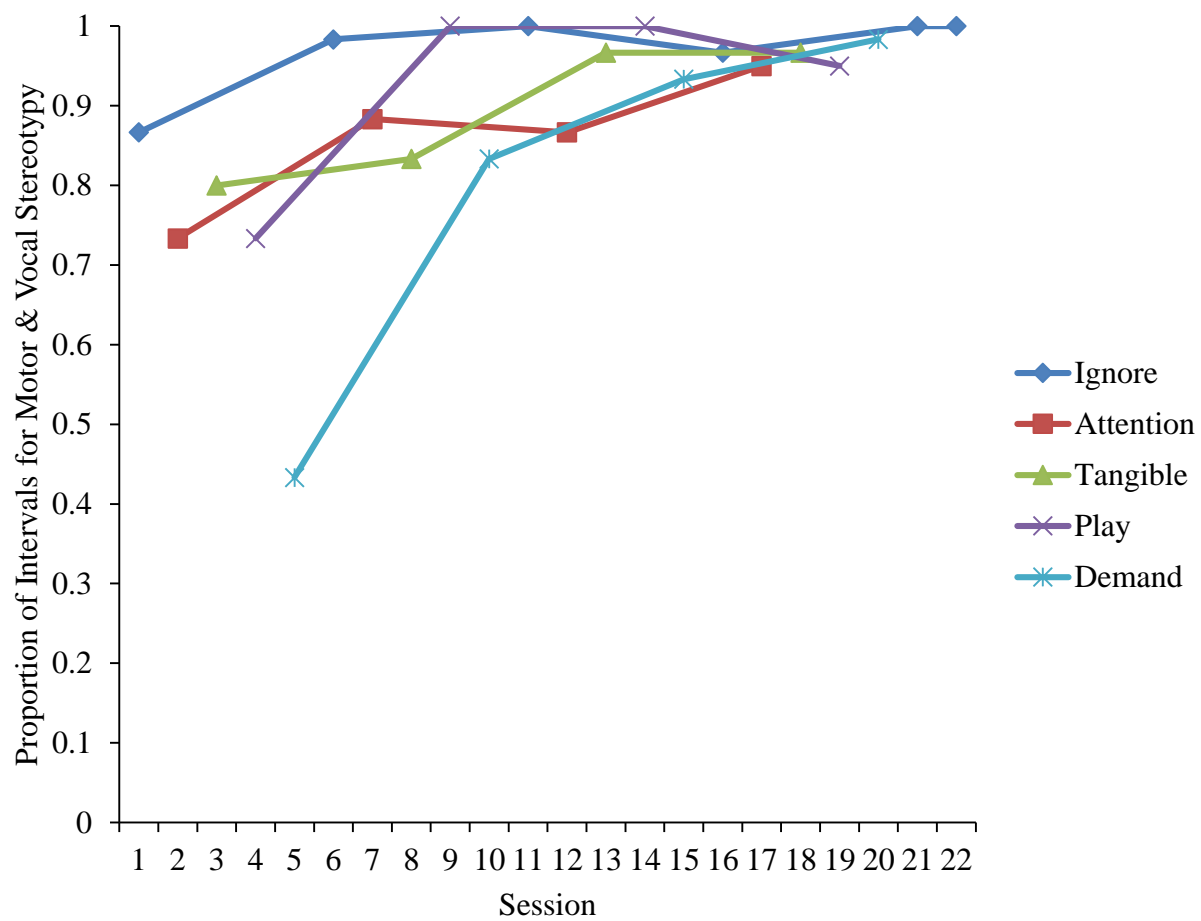


Figure 8. Results of the Functional Analysis for Participant 7a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

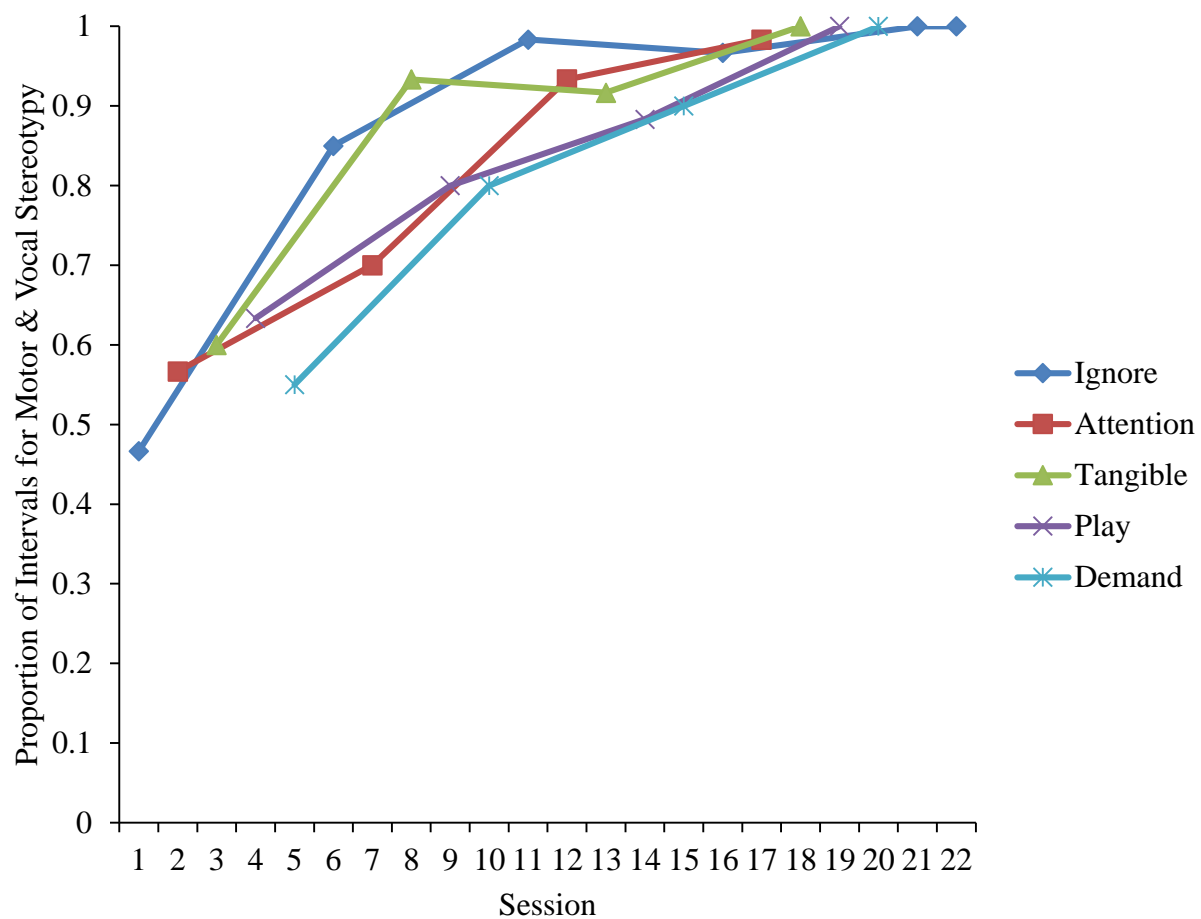


Figure 9. Results of the Functional Analysis for Participant 7b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

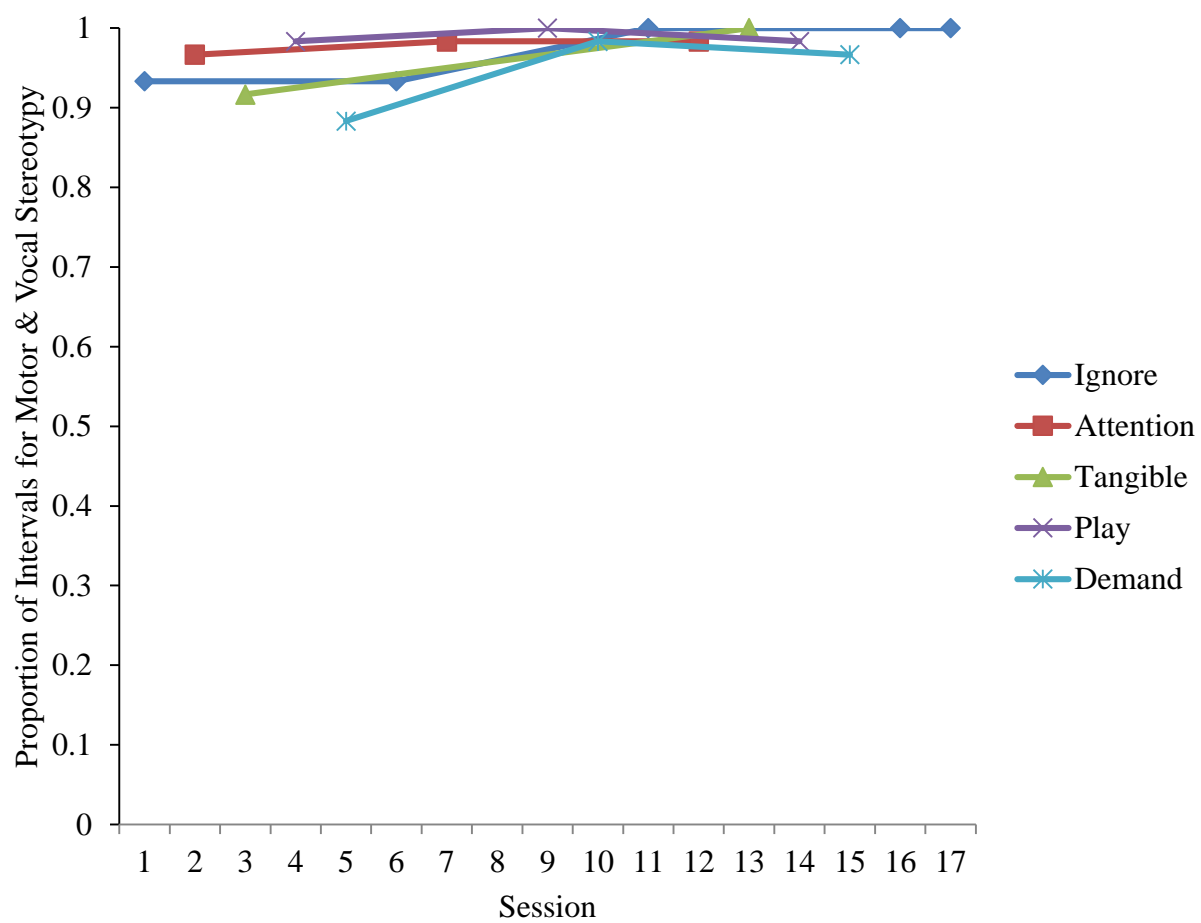


Figure 10. Results of the Demand Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

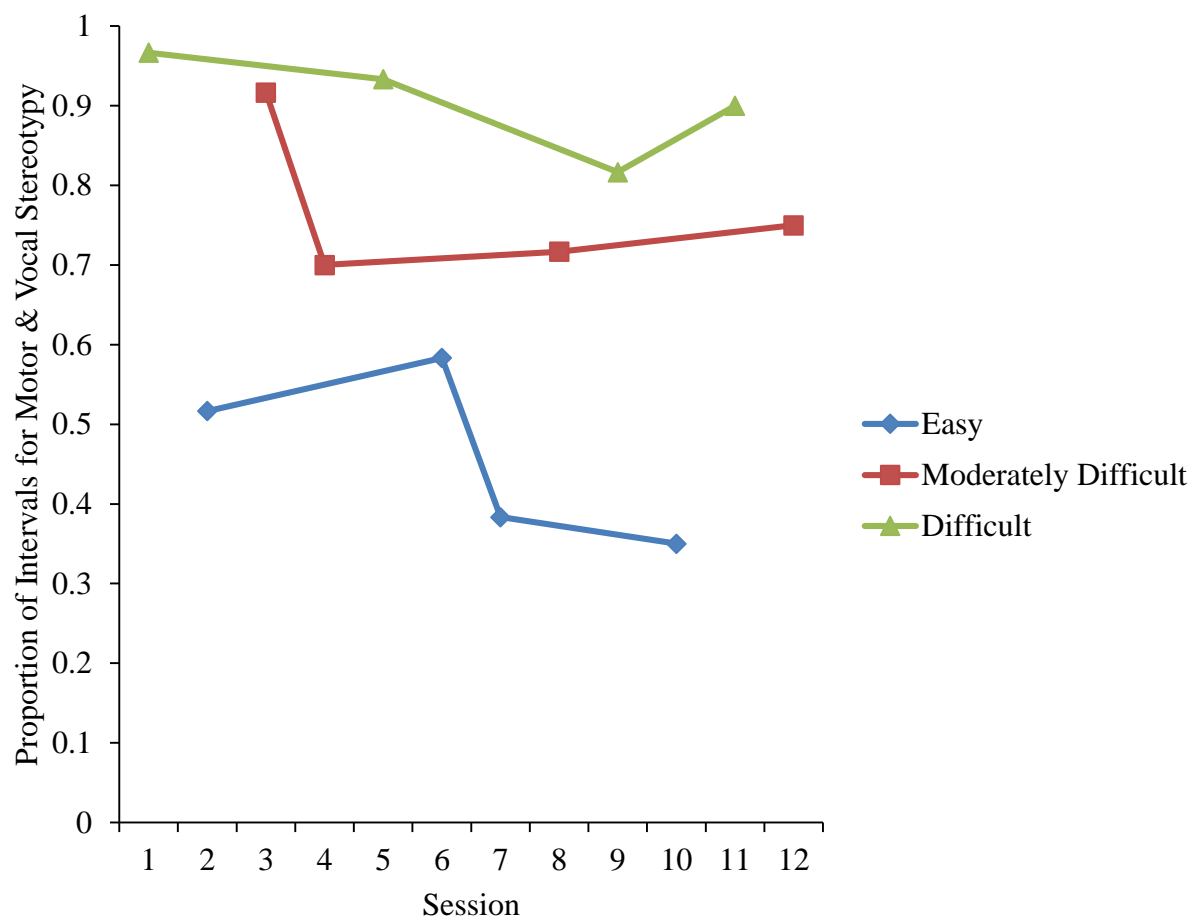


Figure 11. Results of the Demand Analysis for Participant 2. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

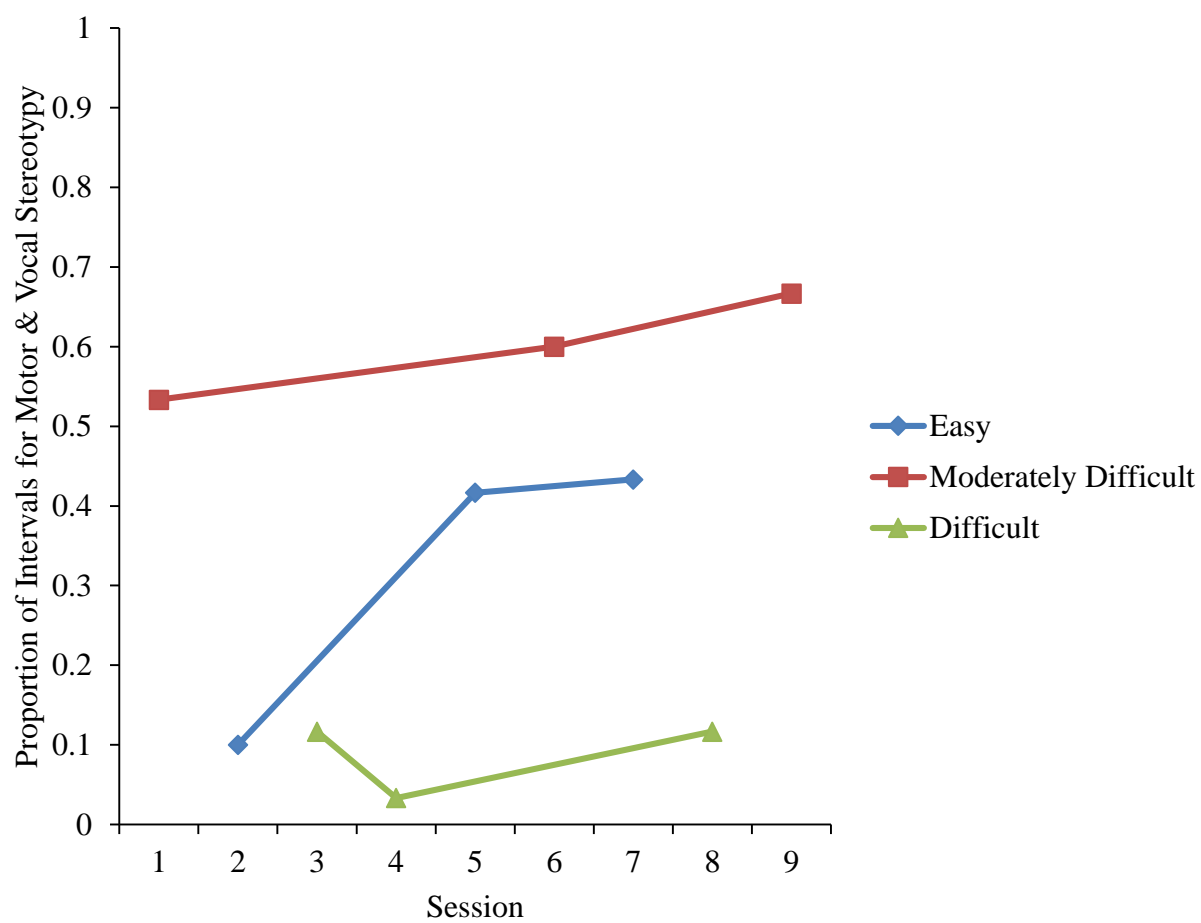


Figure 12. Results of the Demand Analysis for Participant 3. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

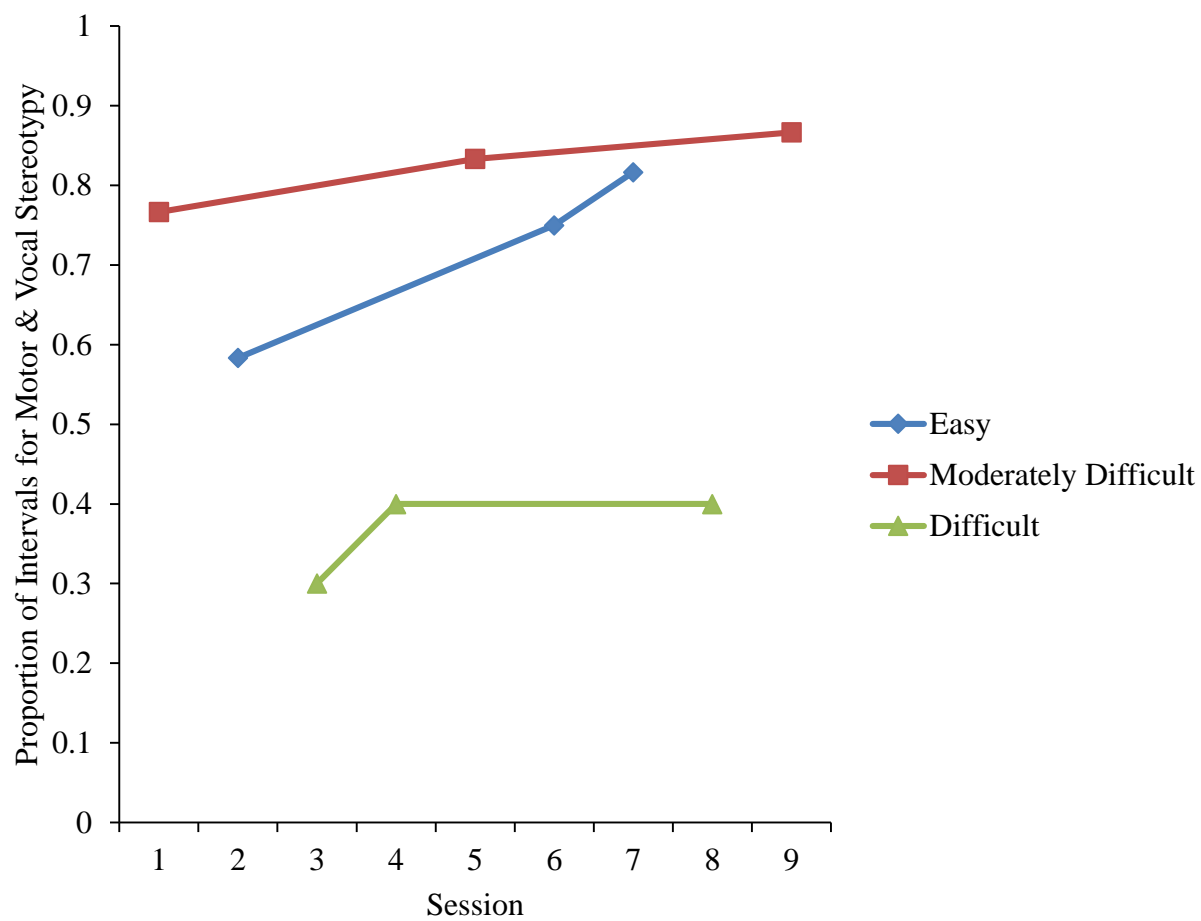


Figure 13. Results of the Demand Analysis for Participant 4. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

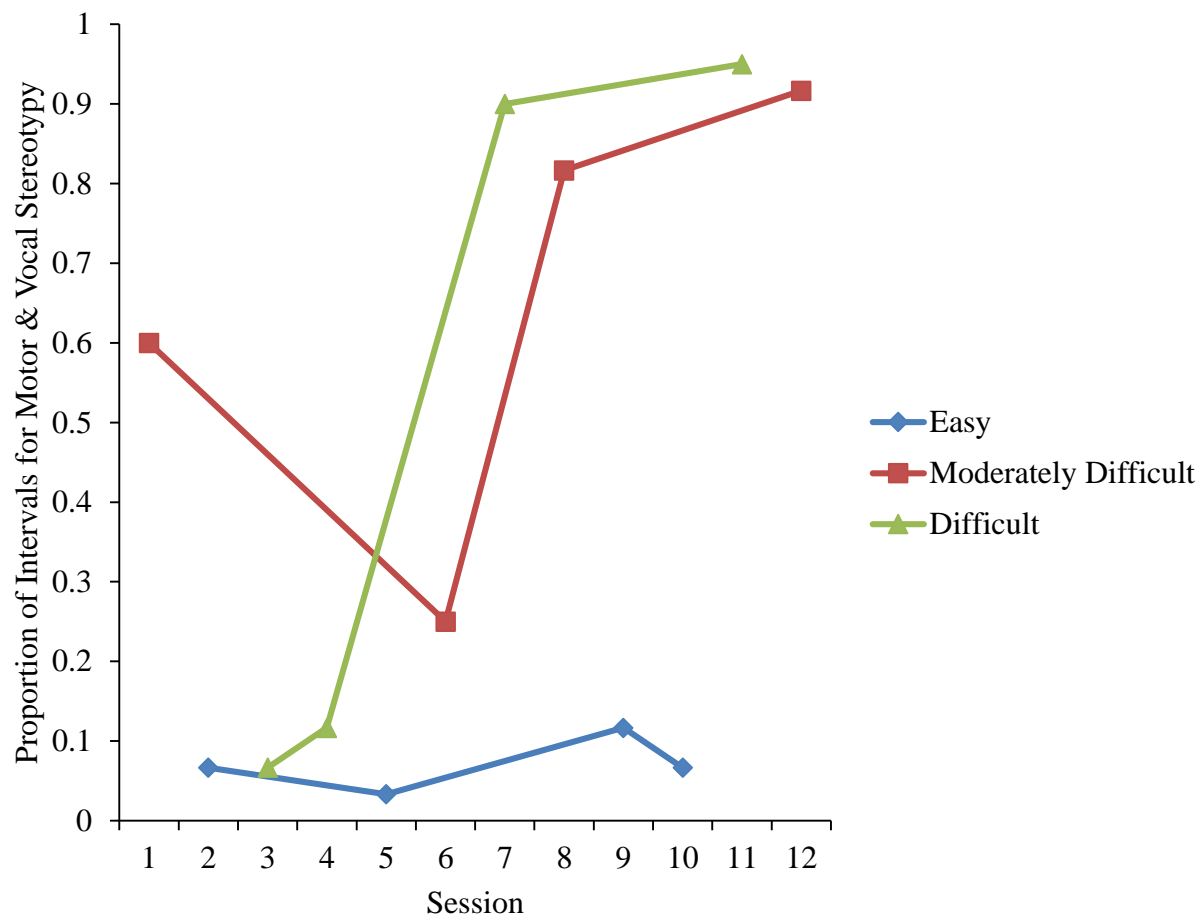


Figure 14. Results of the Demand Analysis for Participant 5. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

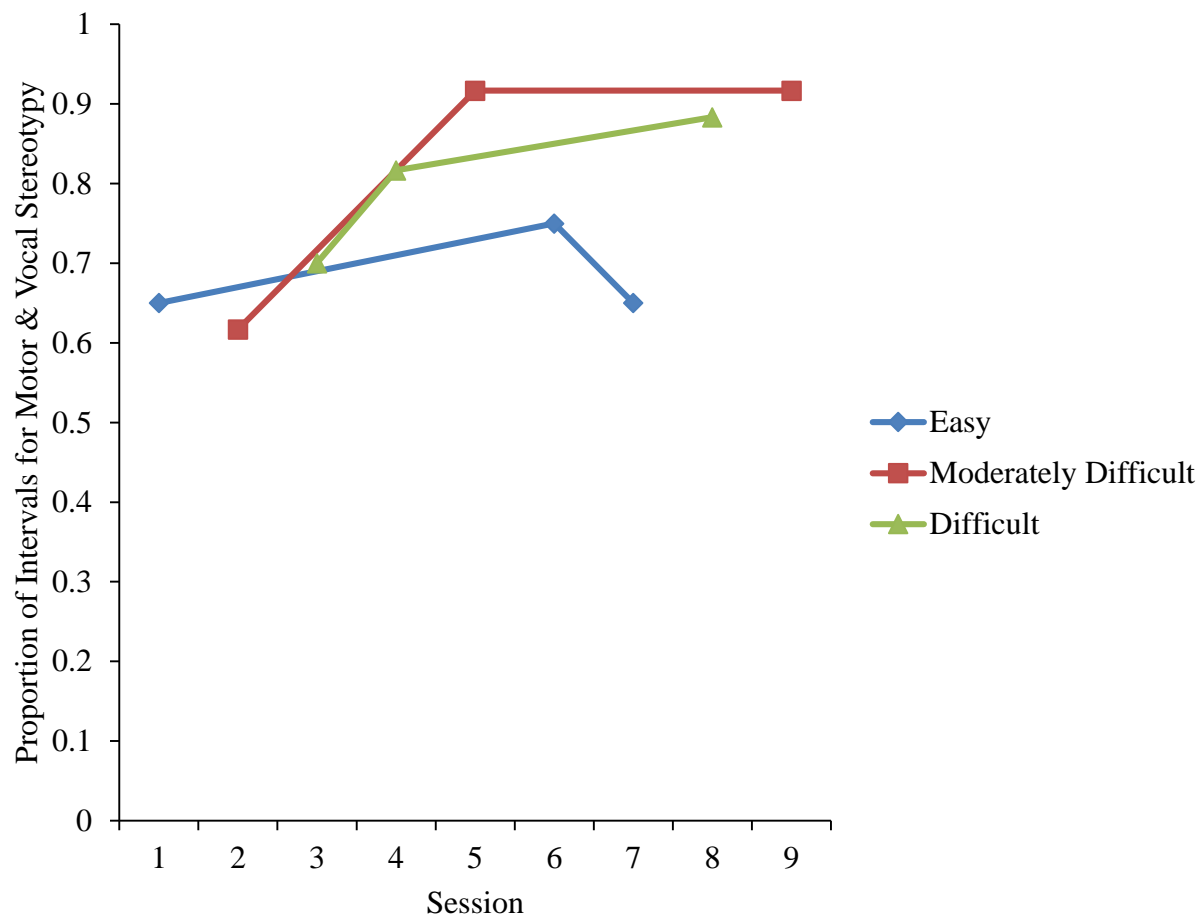


Figure 15. Results of the Demand Analysis for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

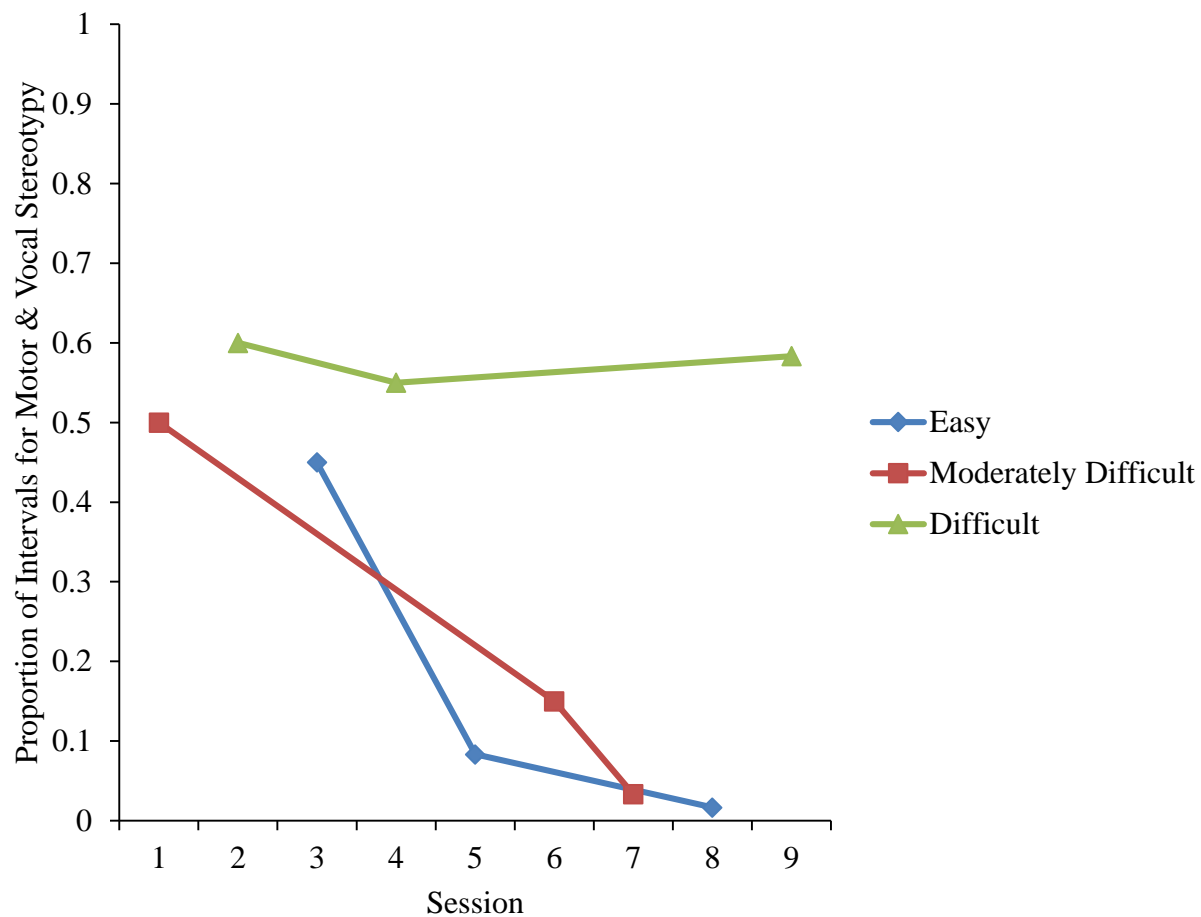


Figure 16. Results of the Demand Analysis for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

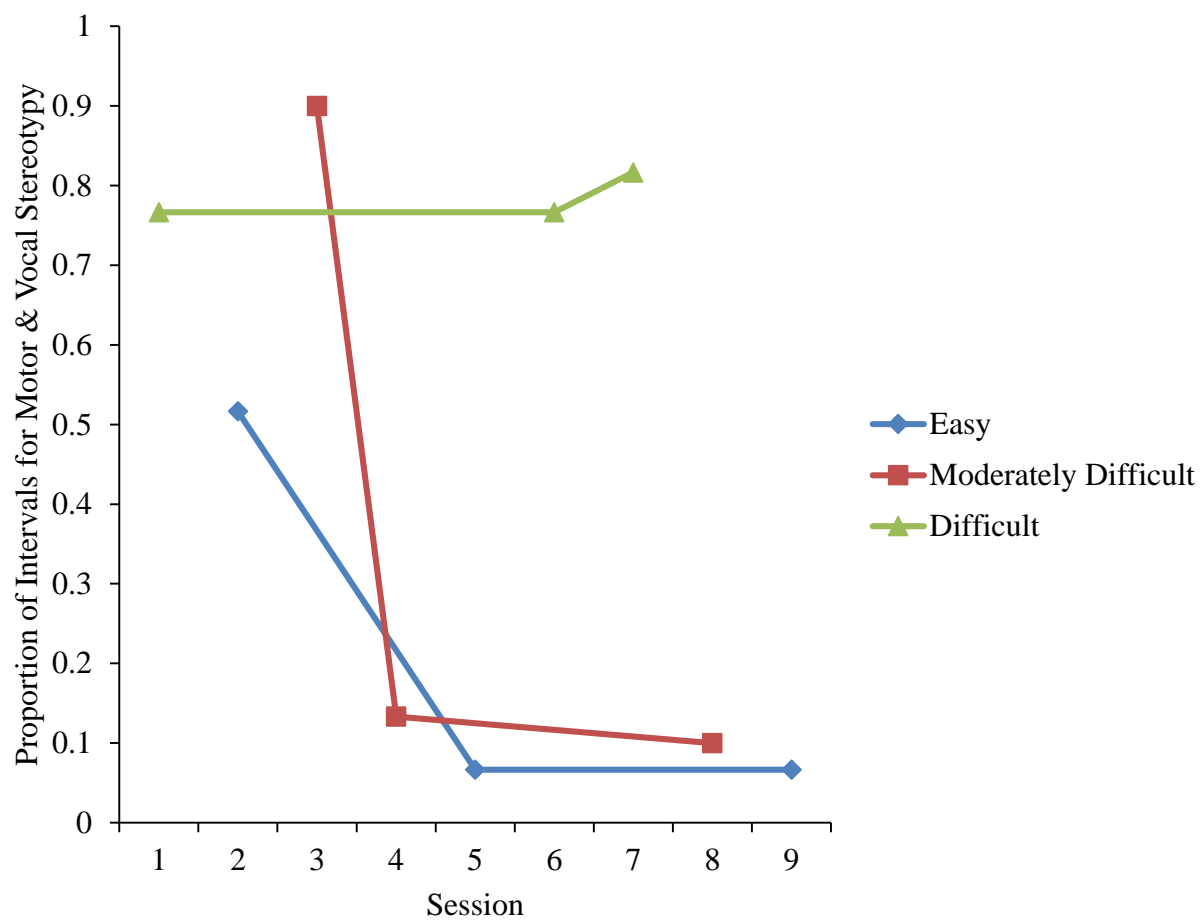


Figure 17. Results of the Demand Analysis for Participant 7a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

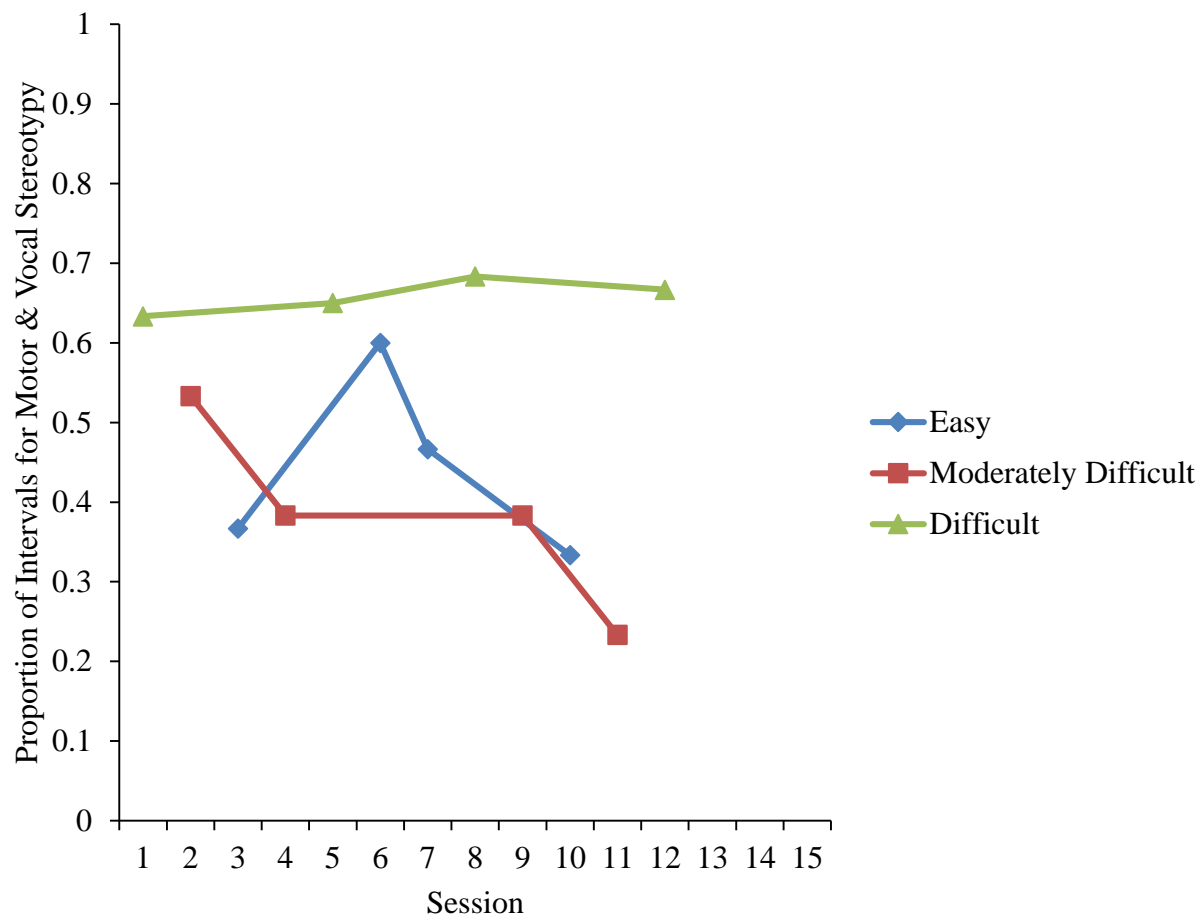


Figure 18. Results of the Demand Analysis for Participant 7b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

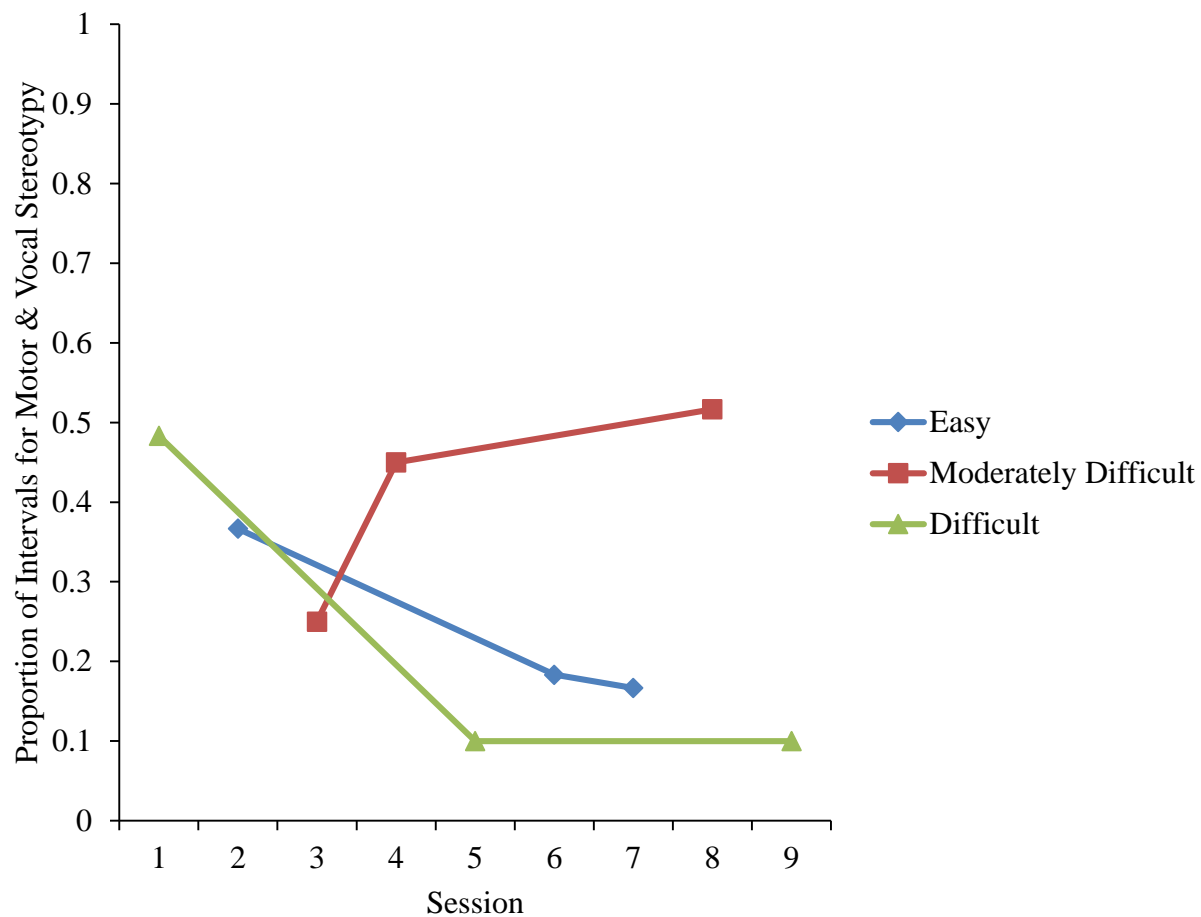


Figure 19. Results of the Demand Analysis treatment for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred throughout demand fading.

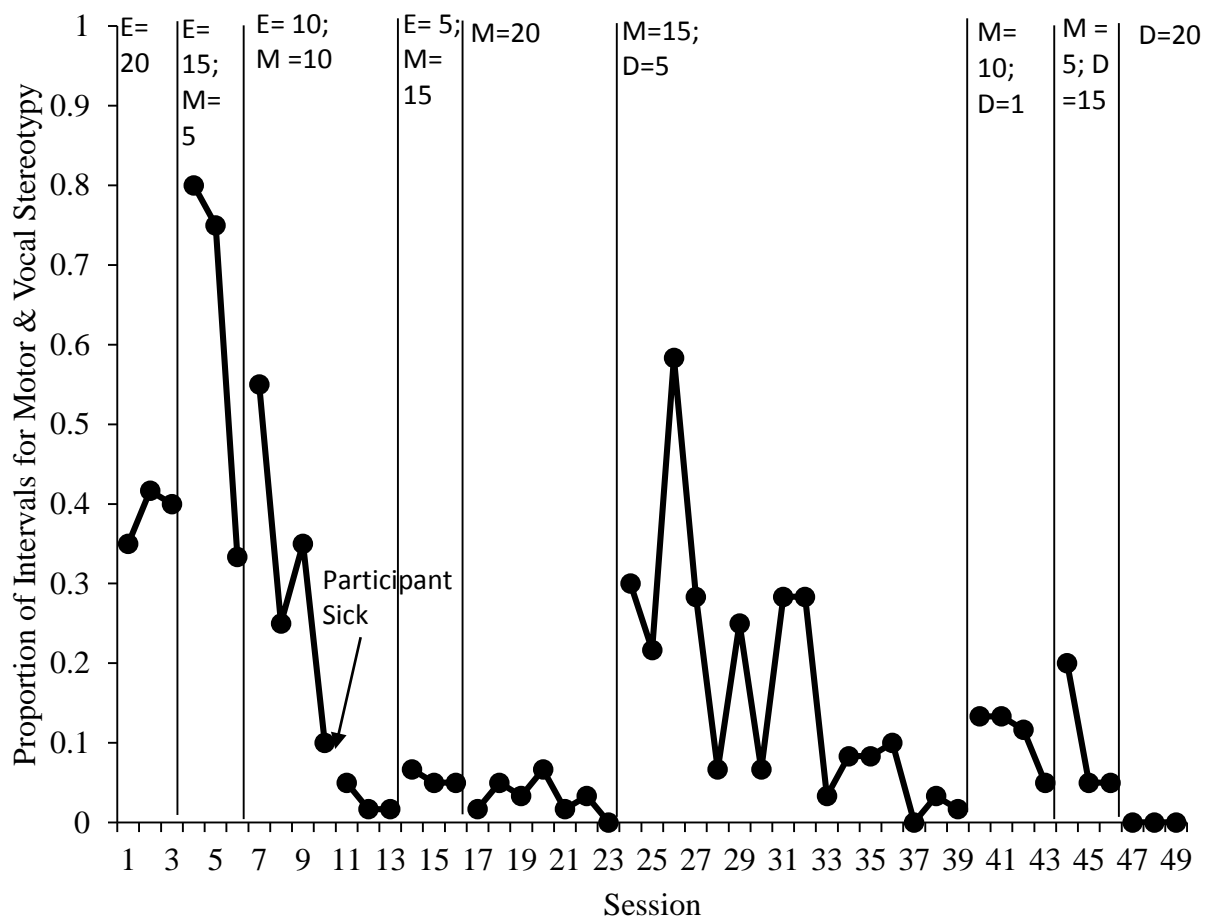


Figure 20. Results of the mid-treatment Demand Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

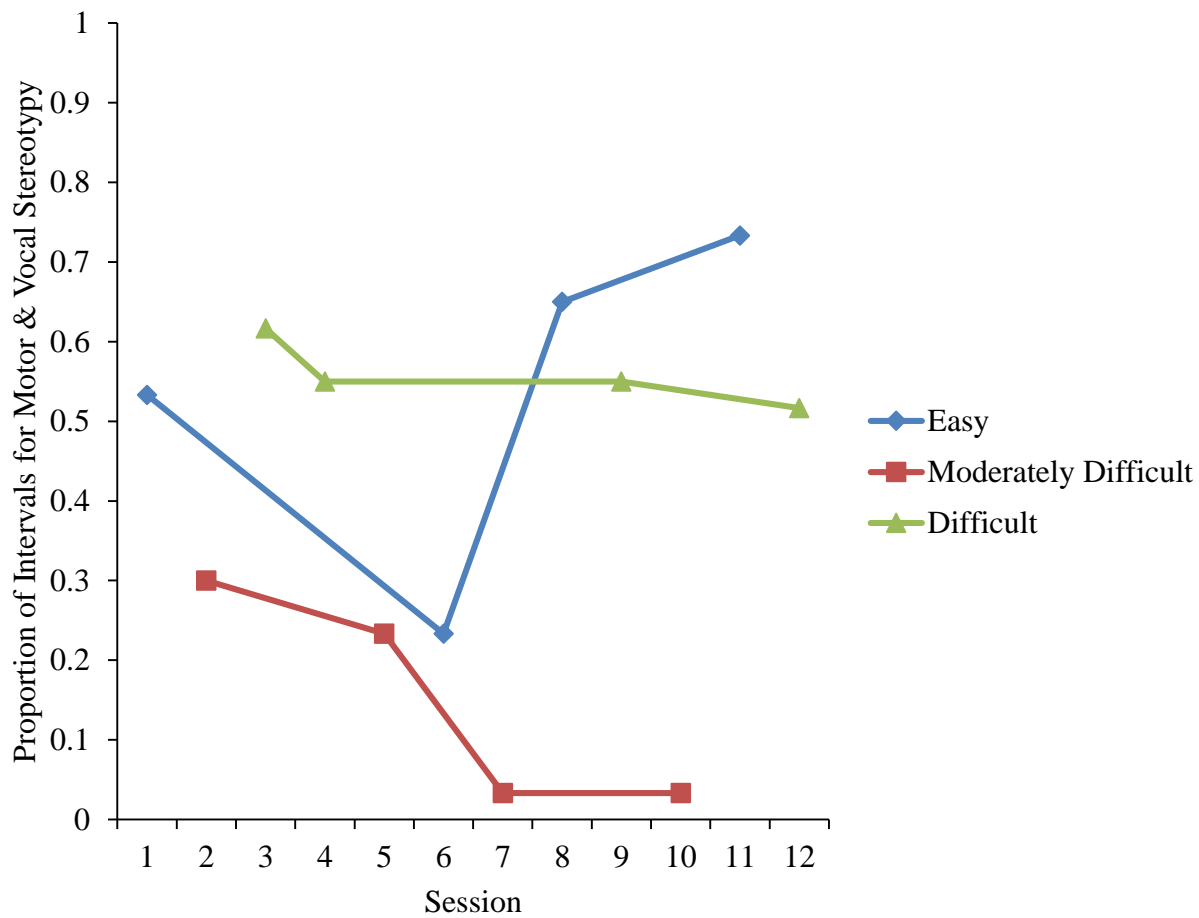


Figure 21. Results of the post-treatment Demand Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

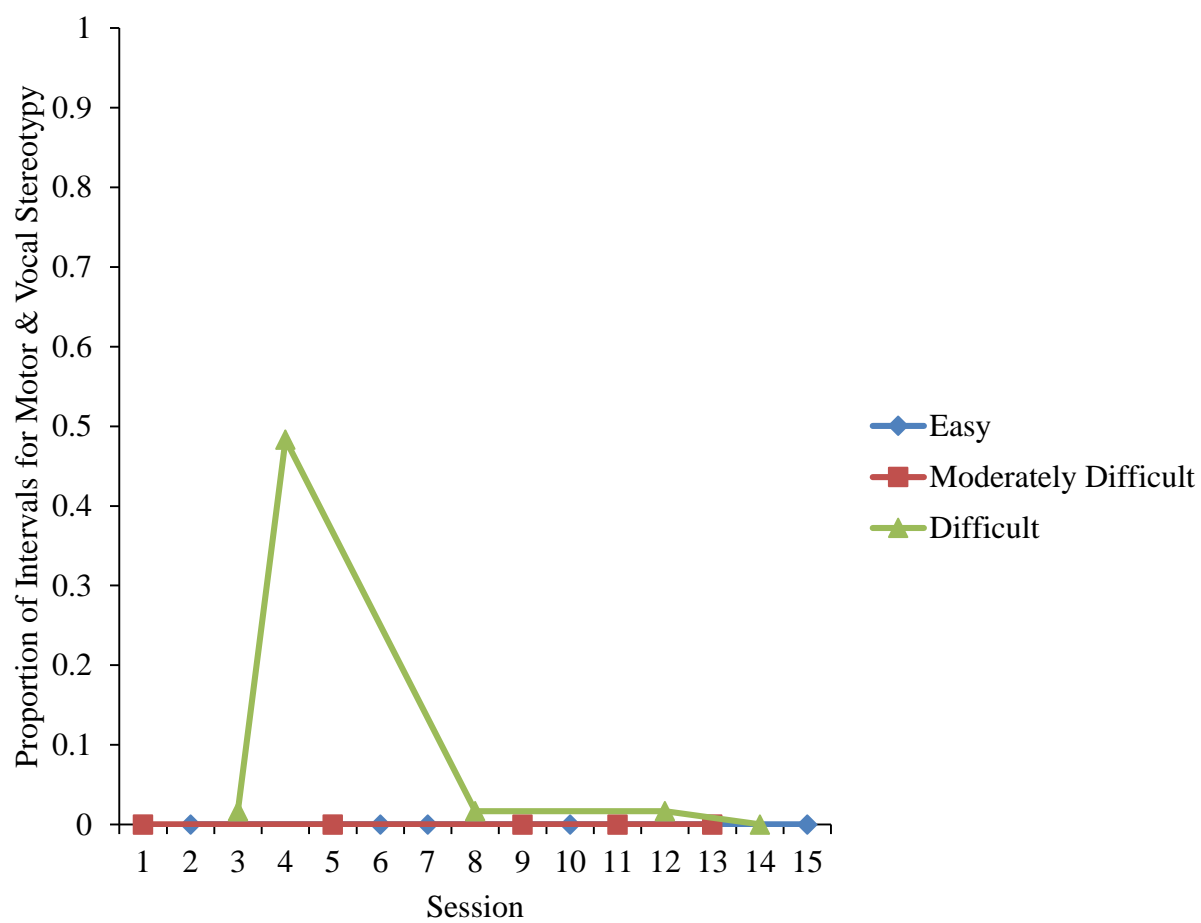


Figure 22. Results of the preference assessment for Participant 1. Data reflect the percentage of times each item was selected.

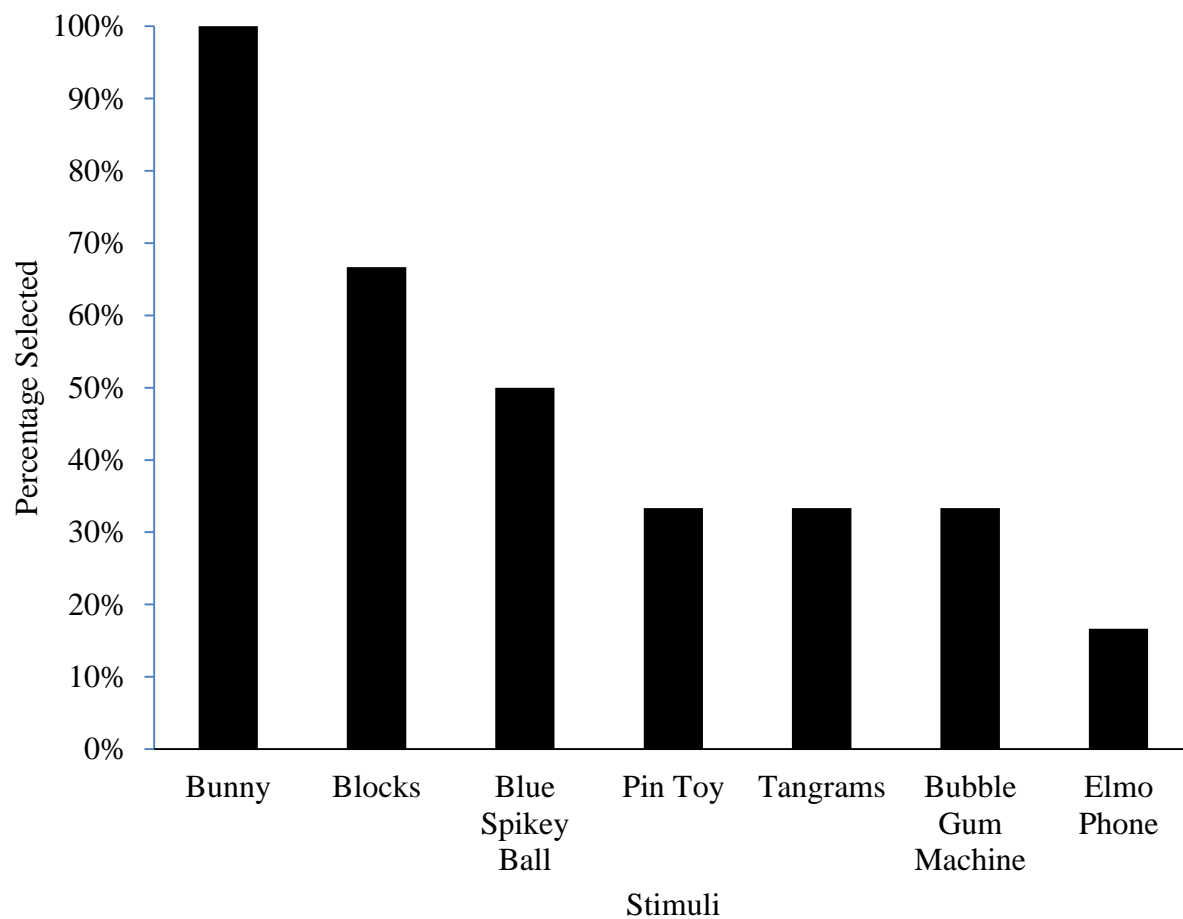


Figure 23. Results of the preference assessment for Participant 2. Data reflect the percentage of times each item was selected.

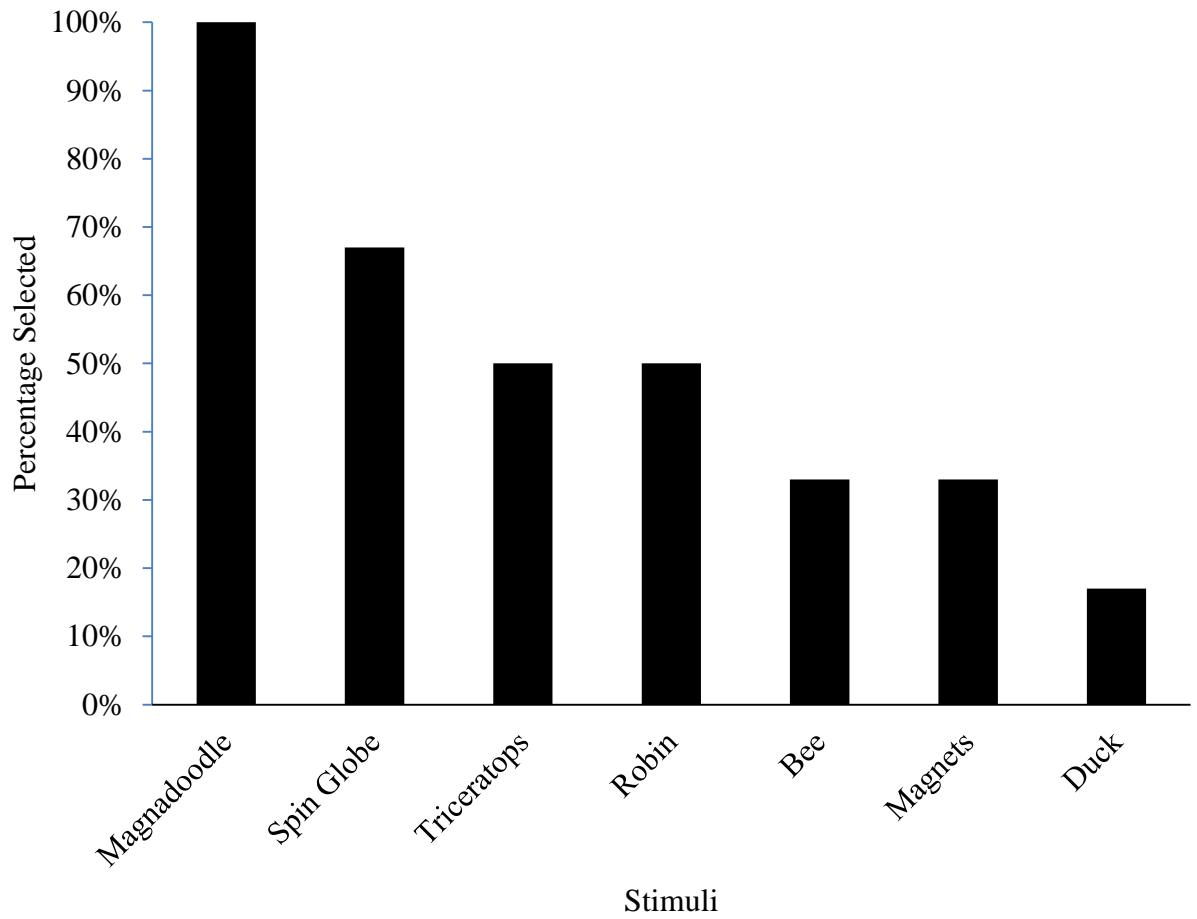


Figure 24. Results of the preference assessment for Participant 3. Data reflect the percentage of times each item was selected.

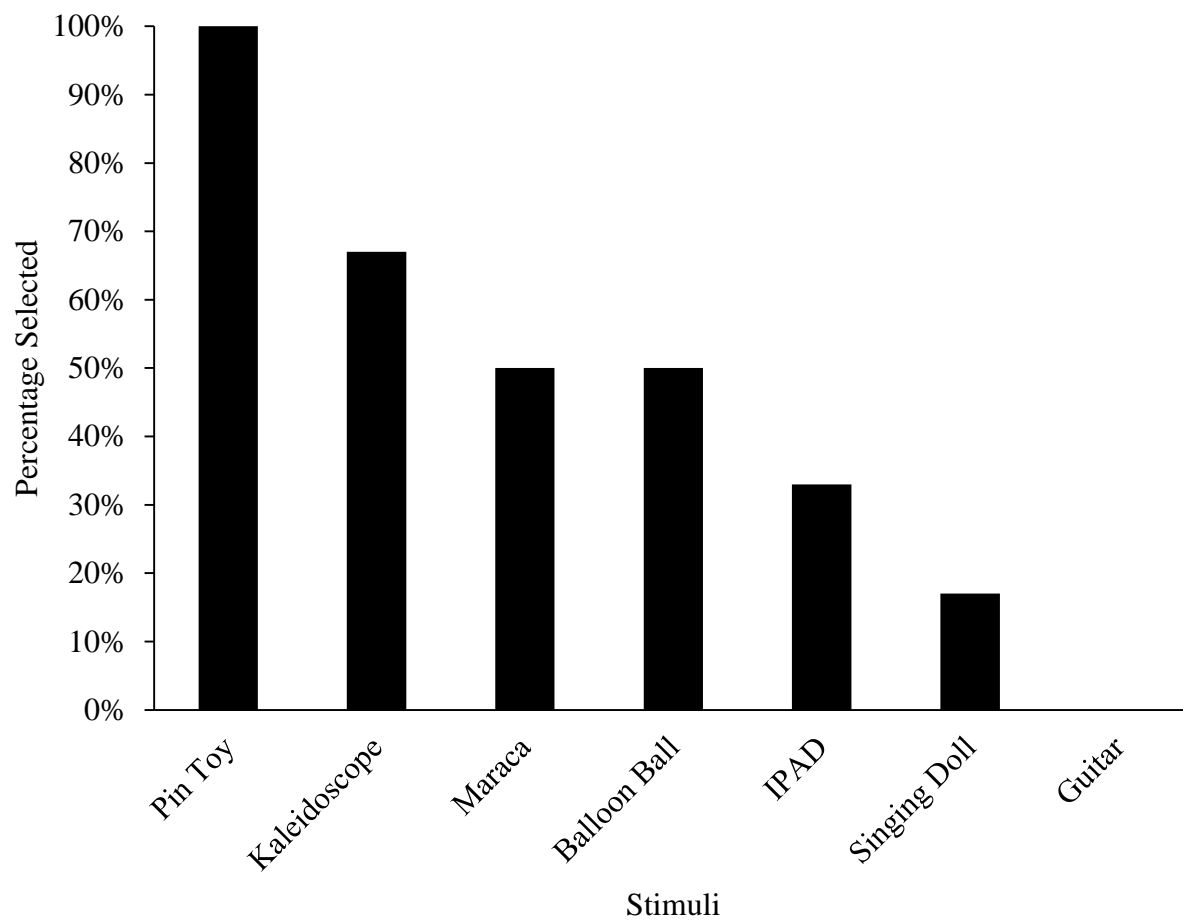


Figure 25. Results of the preference assessment for Participant 4. Data reflect the percentage of times each item was selected.

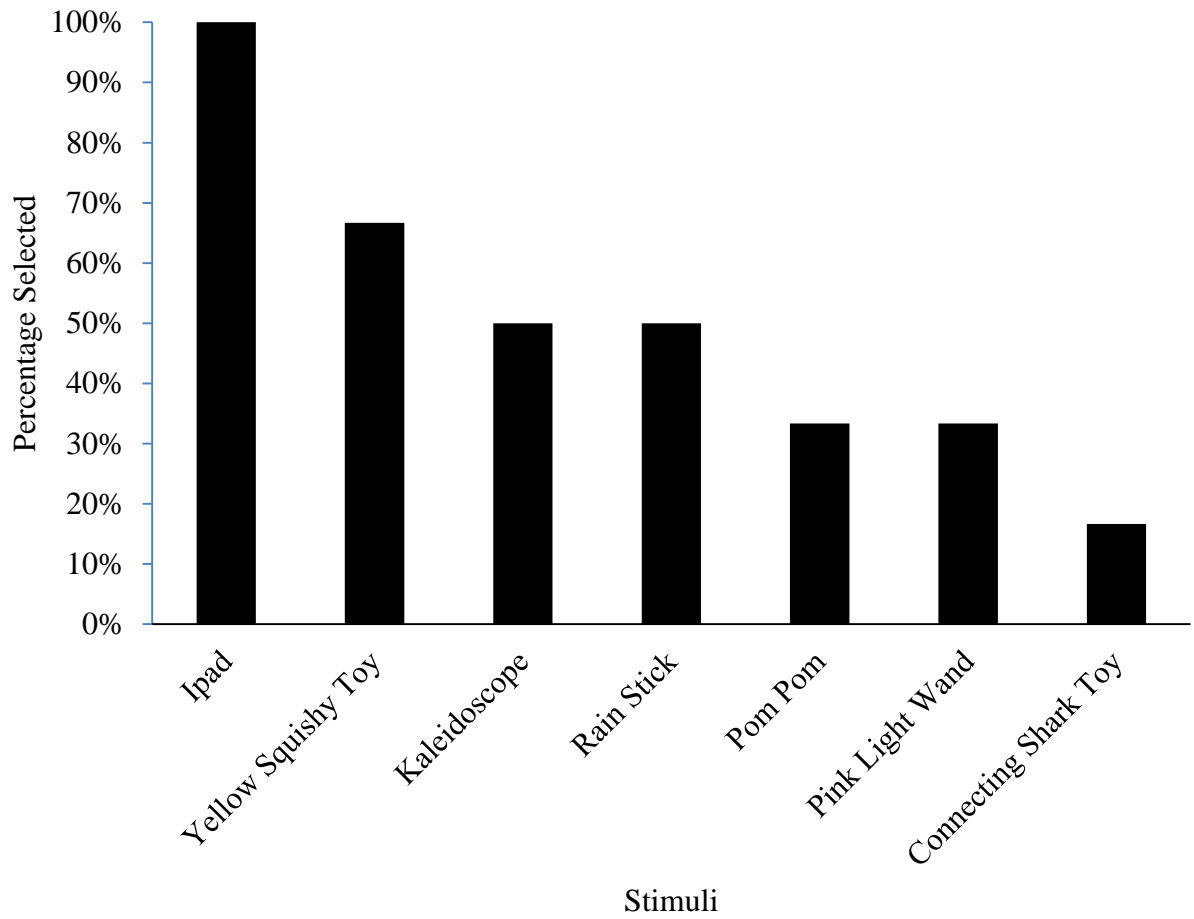


Figure 26. Results of the preference assessment for Participant 5. Data reflect the percentage of times each item was selected.

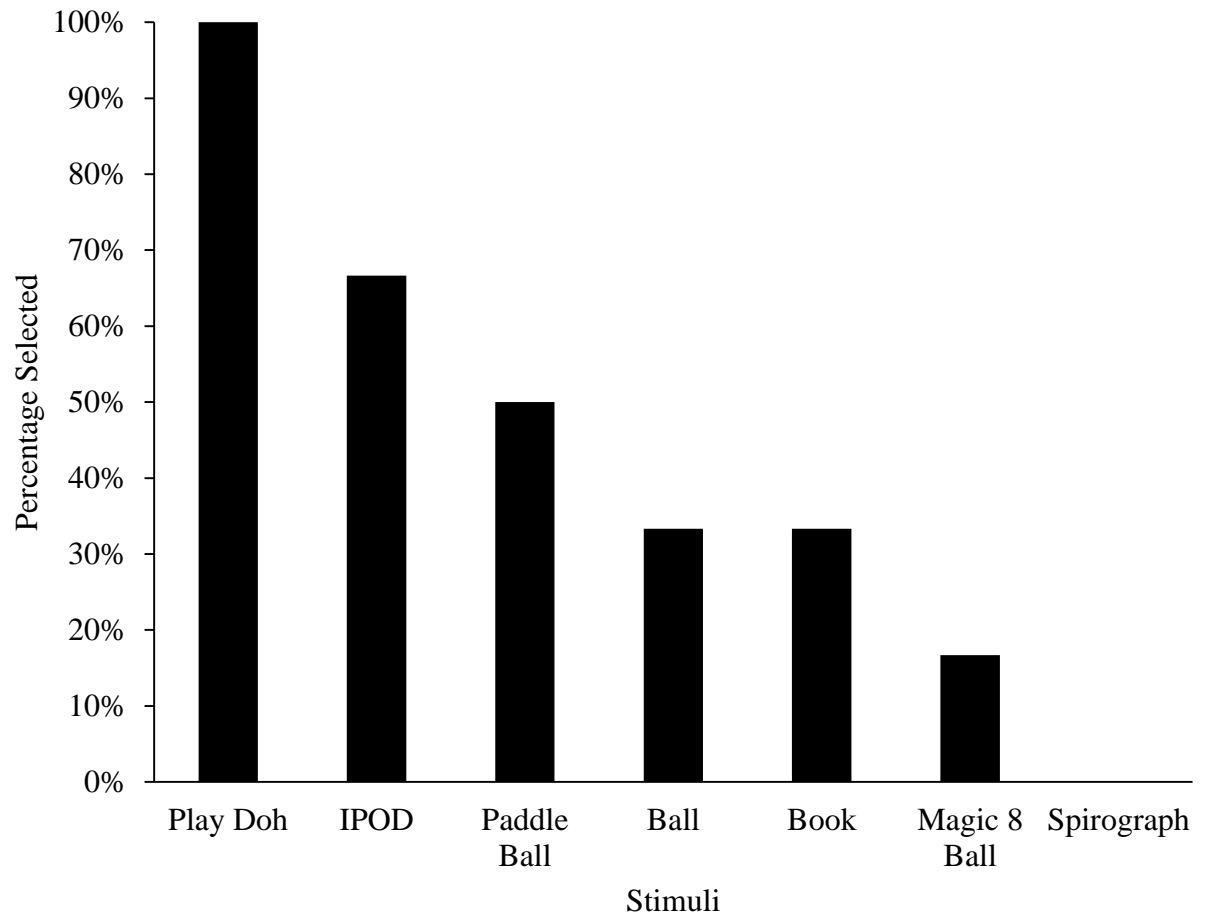


Figure 27. Results of the preference assessment for Participant 6a. Data reflect the percentage of times each item was selected.

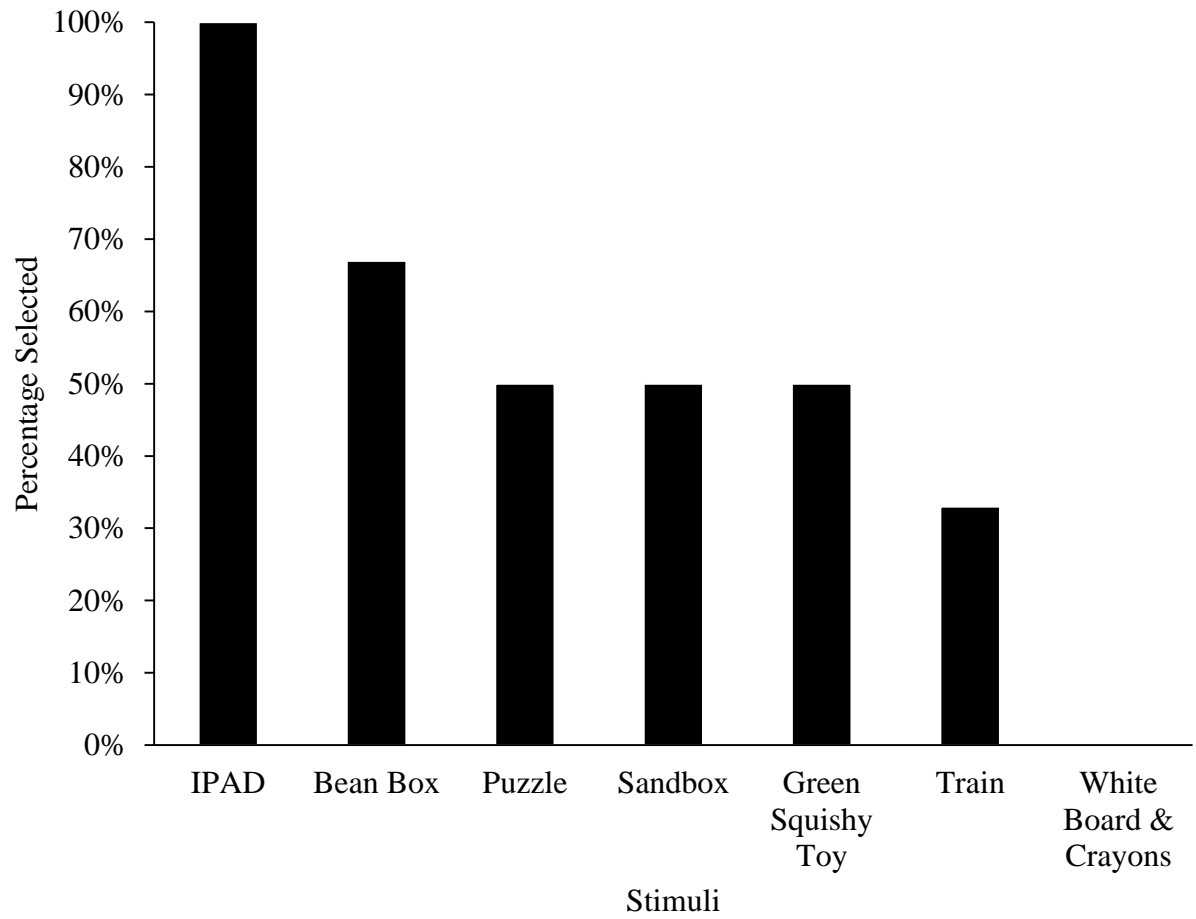


Figure 28. Results of the preference assessment for Participant 6b. Data reflect the percentage of times each item was selected.

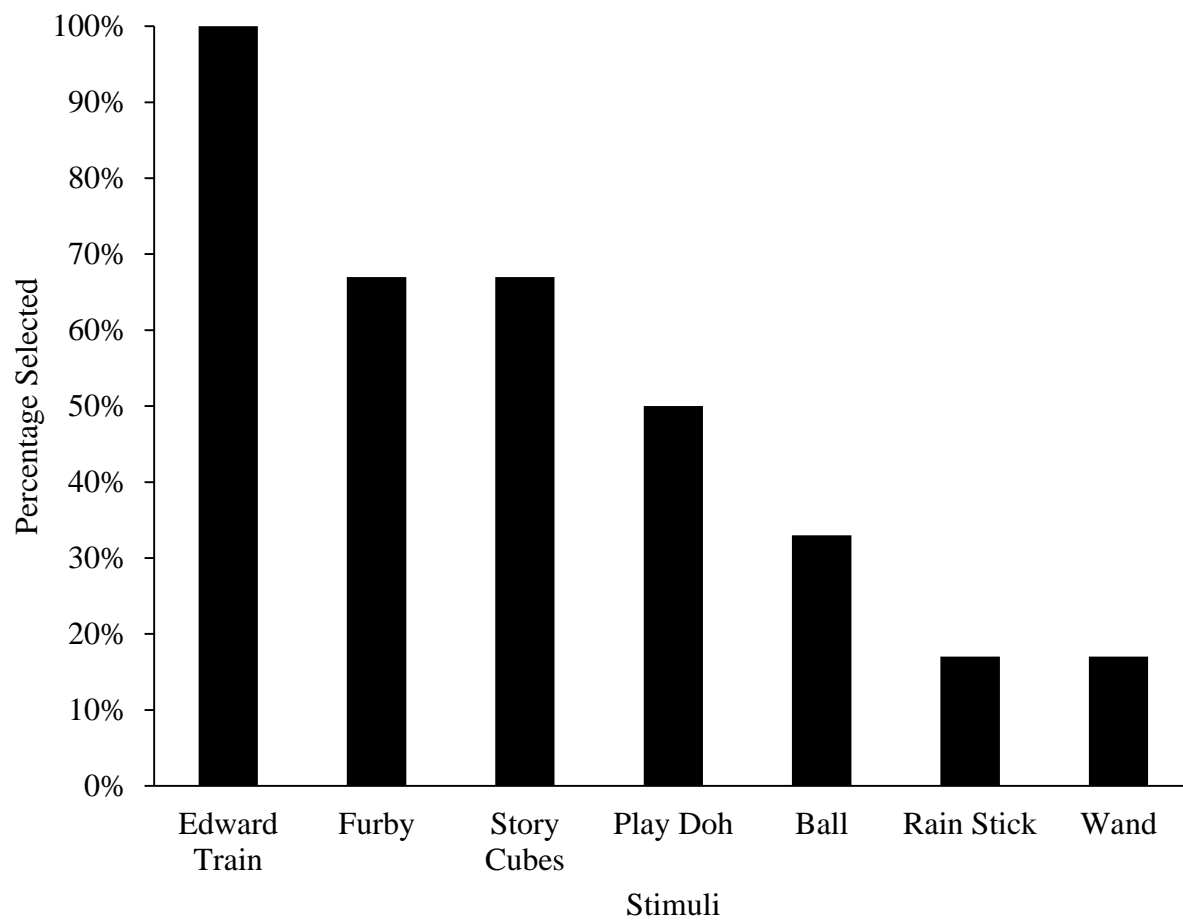


Figure 29. Results of the preference assessment for Participant 7a. Data reflect the percentage of times each item was selected.

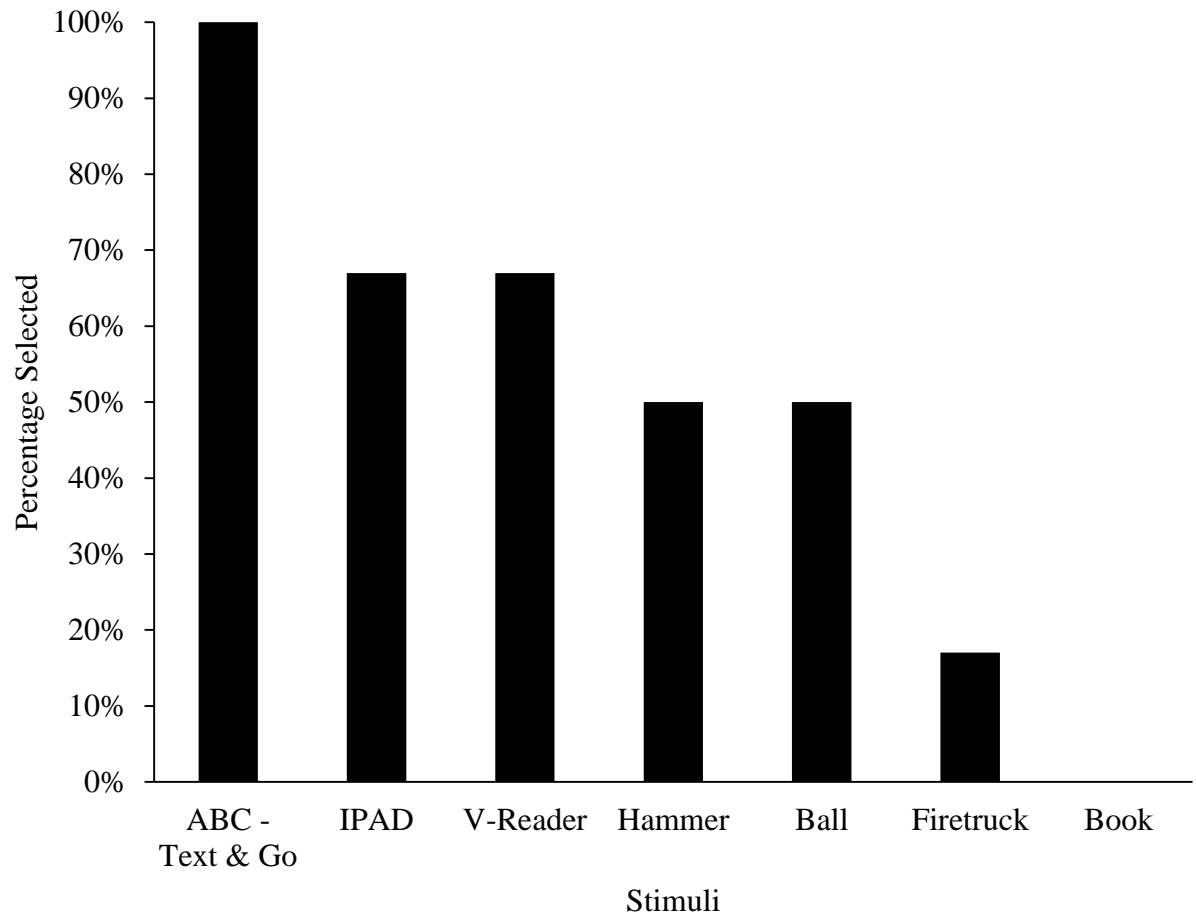


Figure 30. Results of the preference assessment for Participant 7b. Data reflect the percentage of times each item was selected.

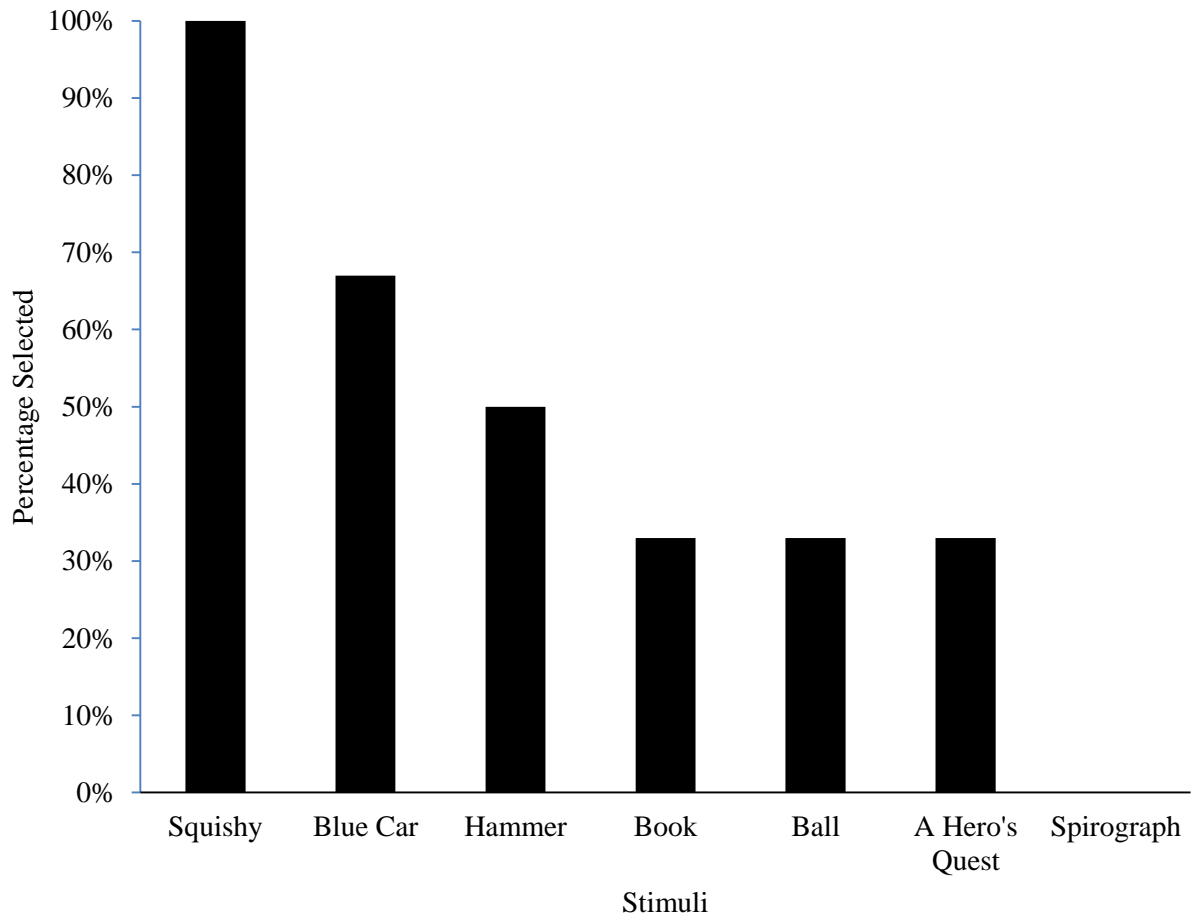


Figure 31. Results of the Tangible Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

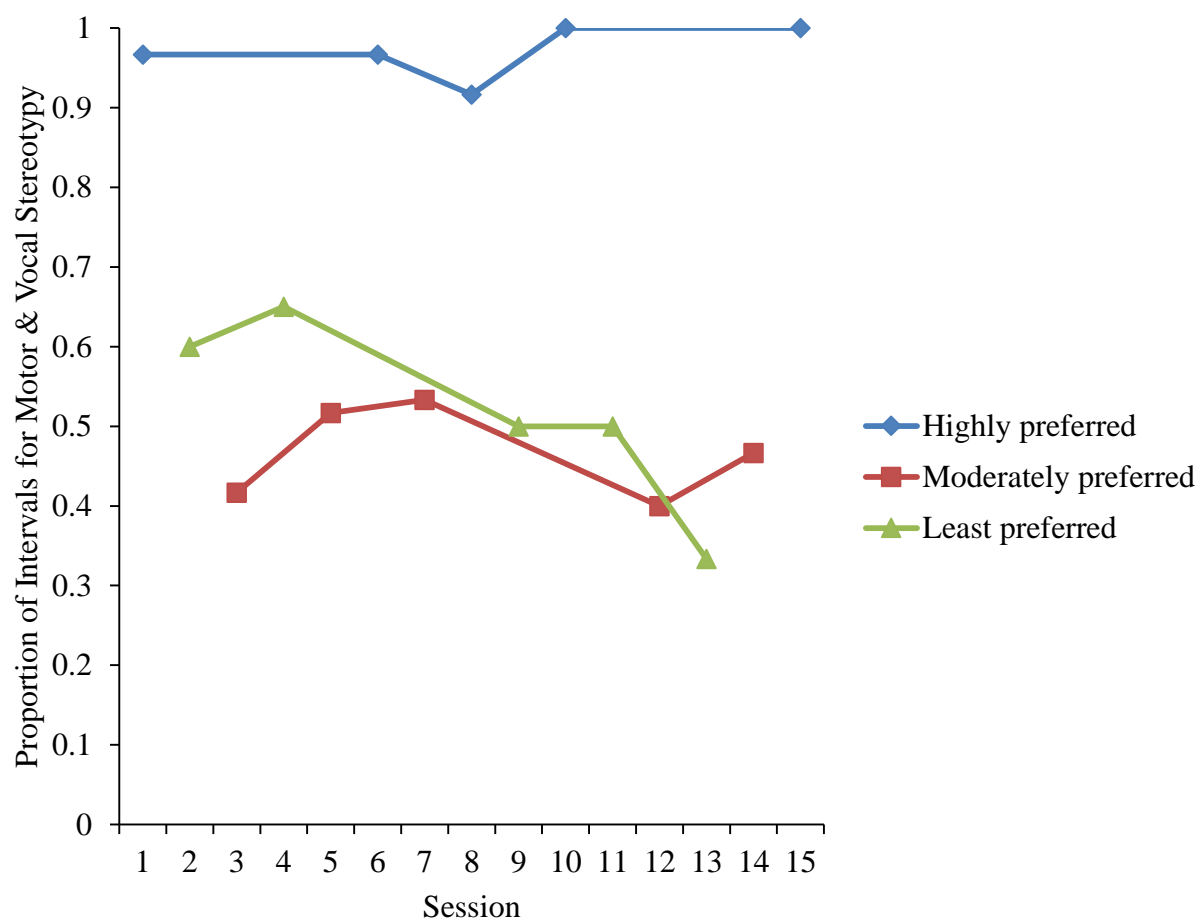


Figure 32. Results of the Tangible Analysis for Participant 2. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

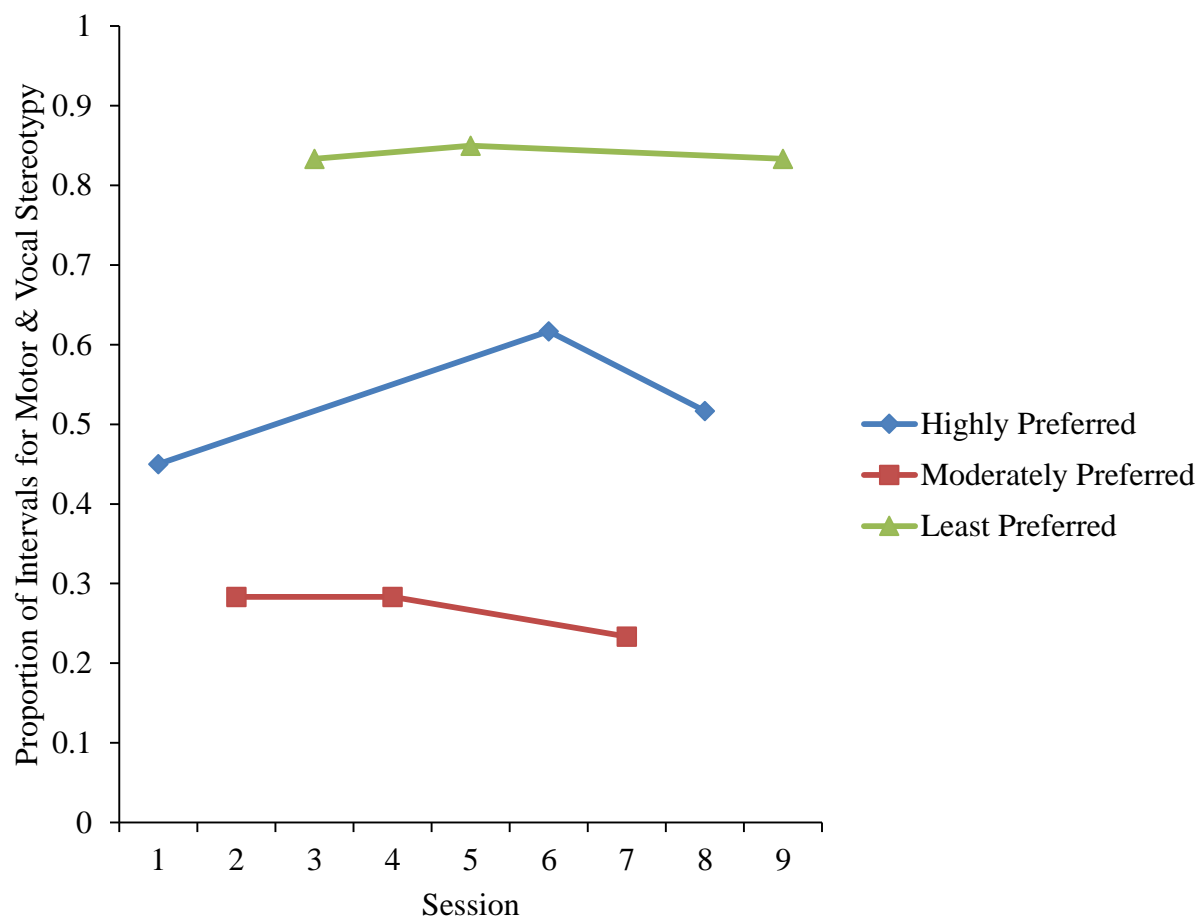


Figure 33. Results of the Tangible Analysis for Participant 3. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

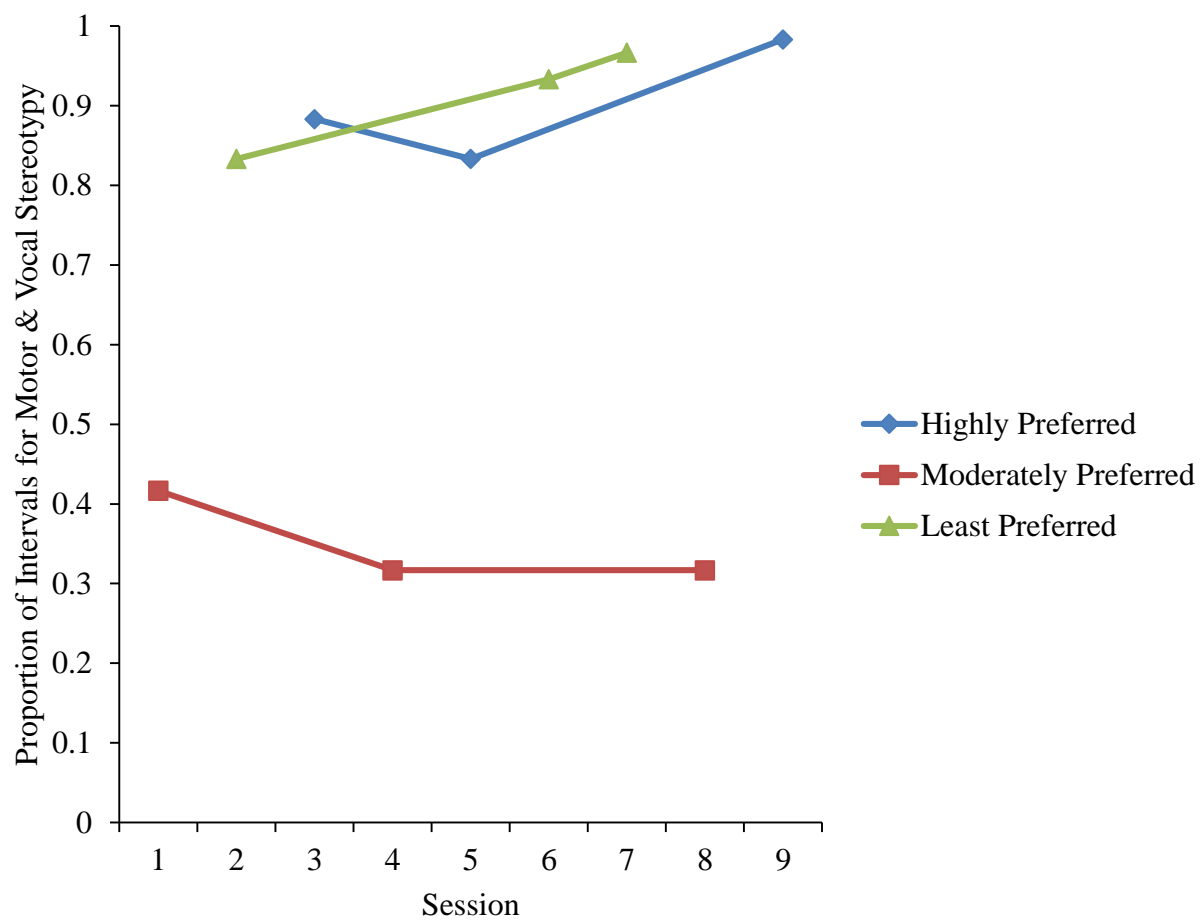


Figure 34. Results of the Tangible Analysis for Participant 4. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

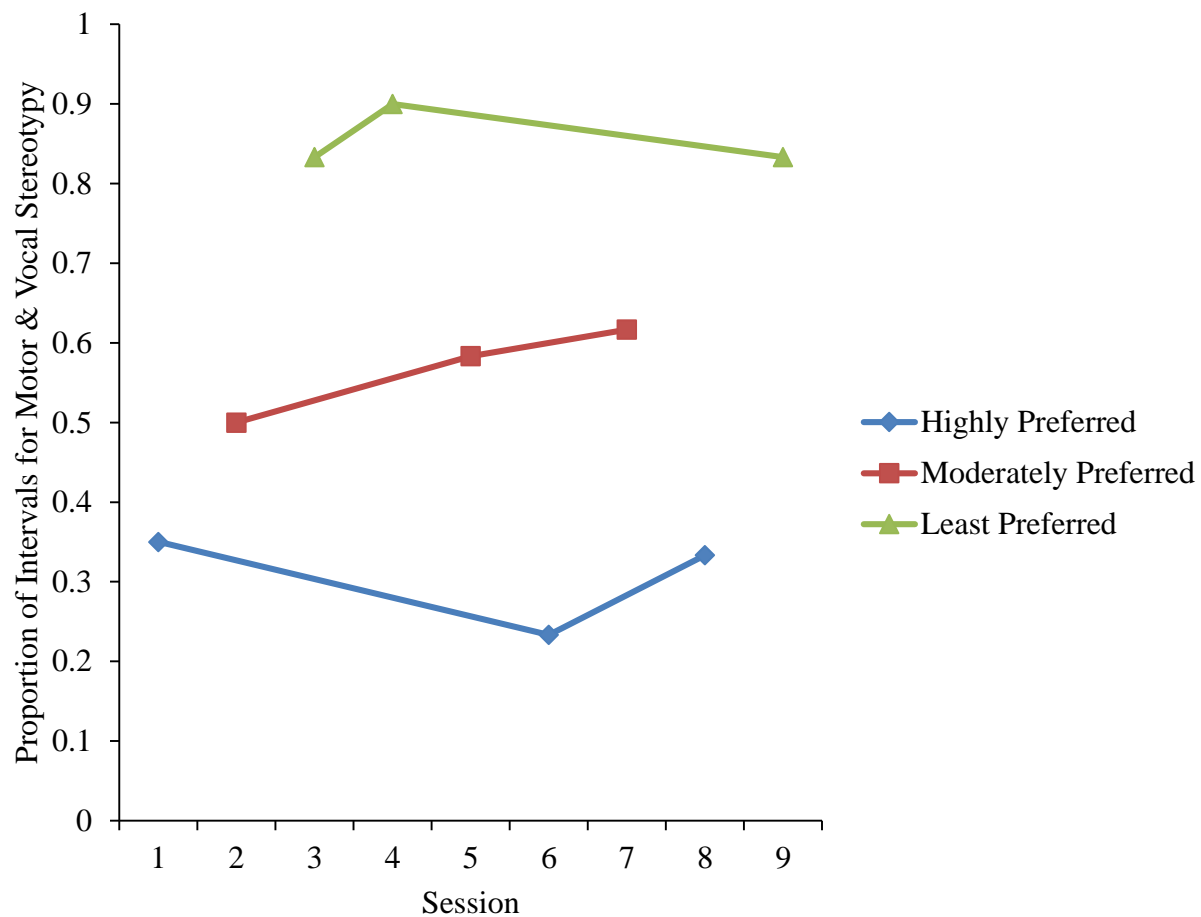


Figure 35. Results of the Tangible Analysis for Participant 5. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

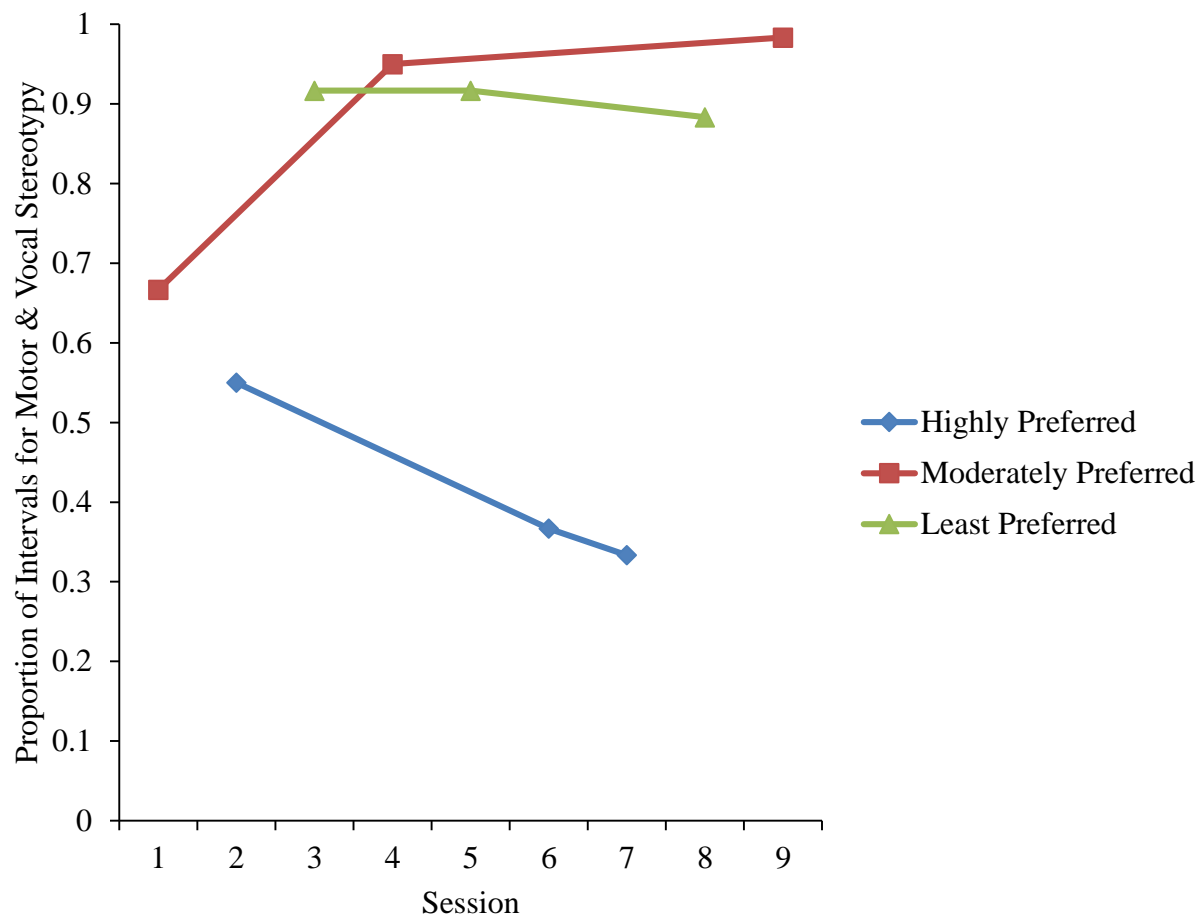


Figure 36. Results of the Tangible Analysis for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

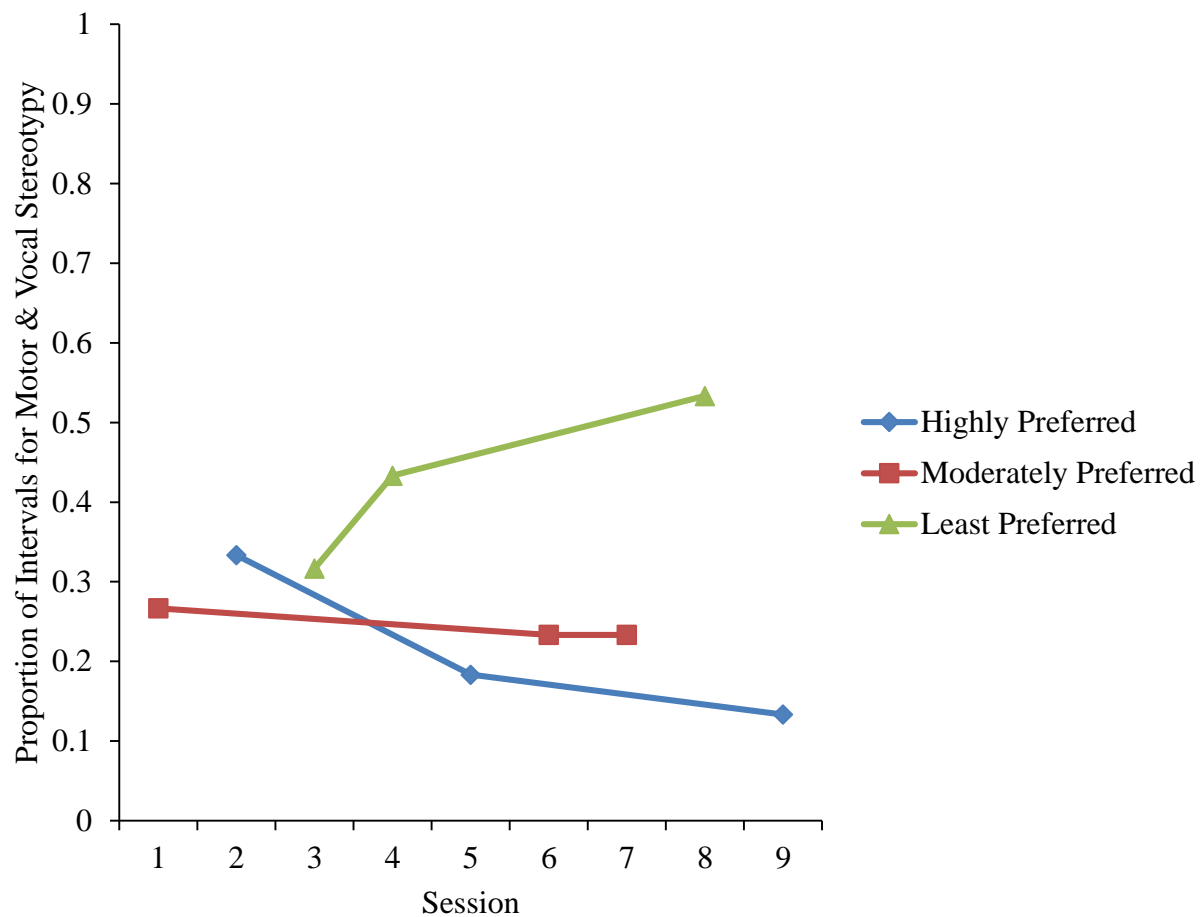


Figure 37. Results of the Tangible Analysis for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

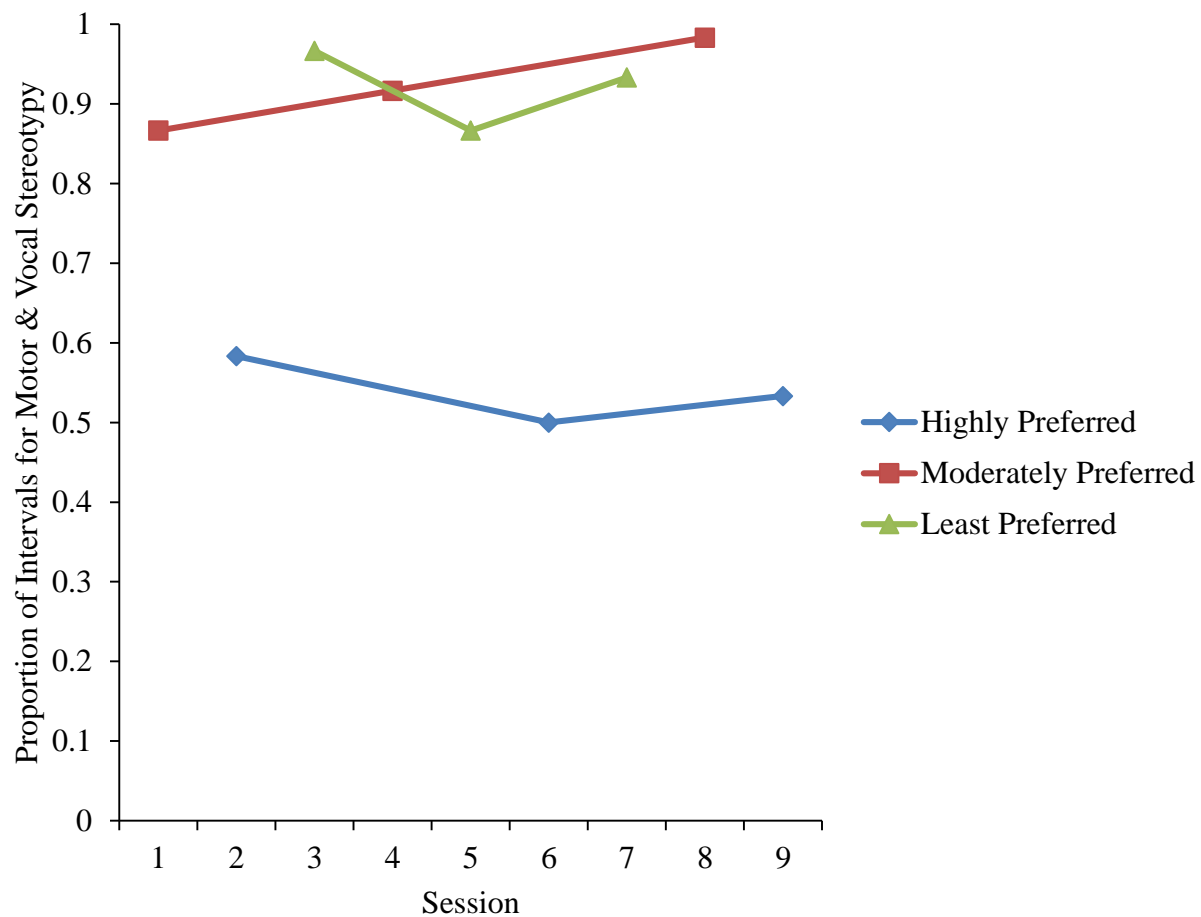


Figure 38. Results of the Tangible Analysis for Participant 7a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

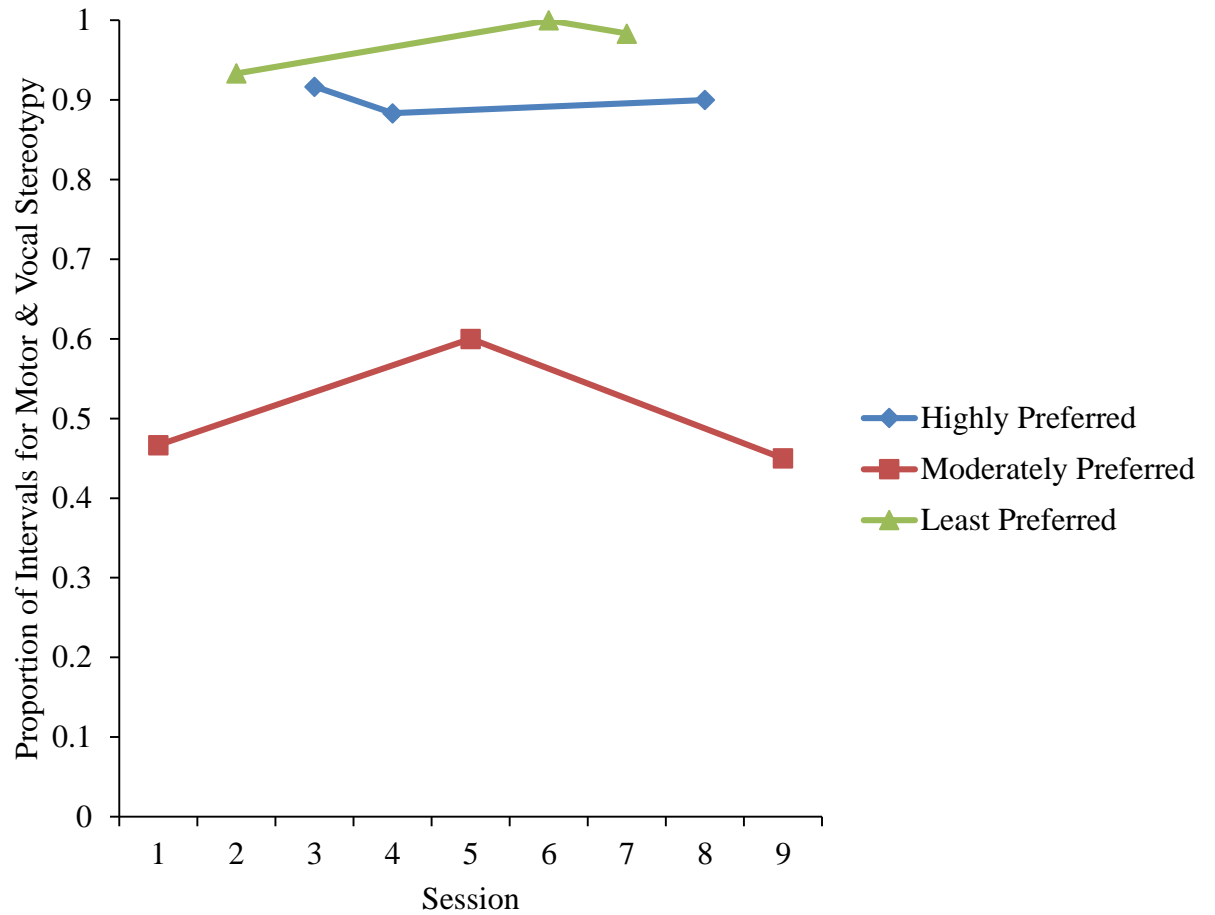


Figure 39. Results of the Tangible Analysis for Participant 7b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

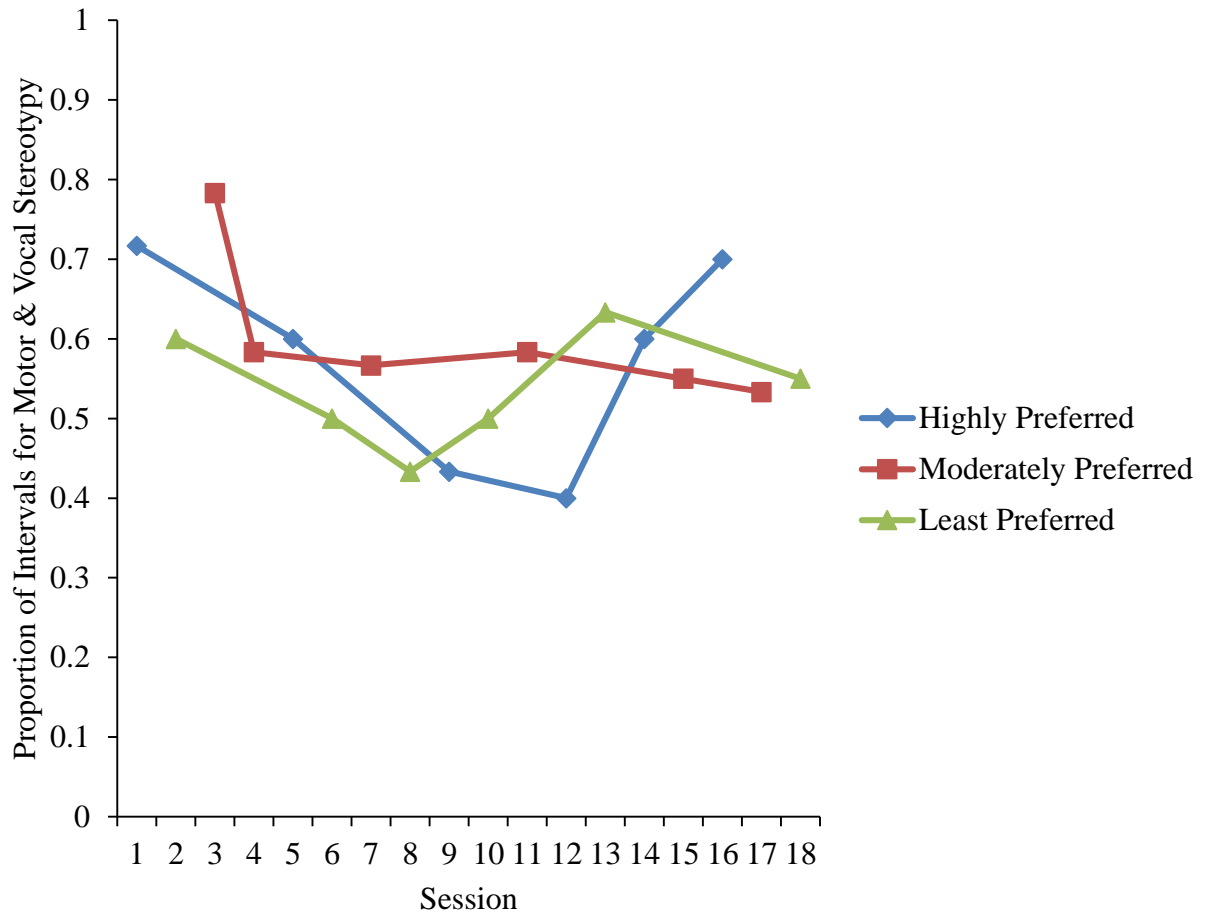


Figure 40. Results of the Tangible Analysis treatment for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred throughout phases.

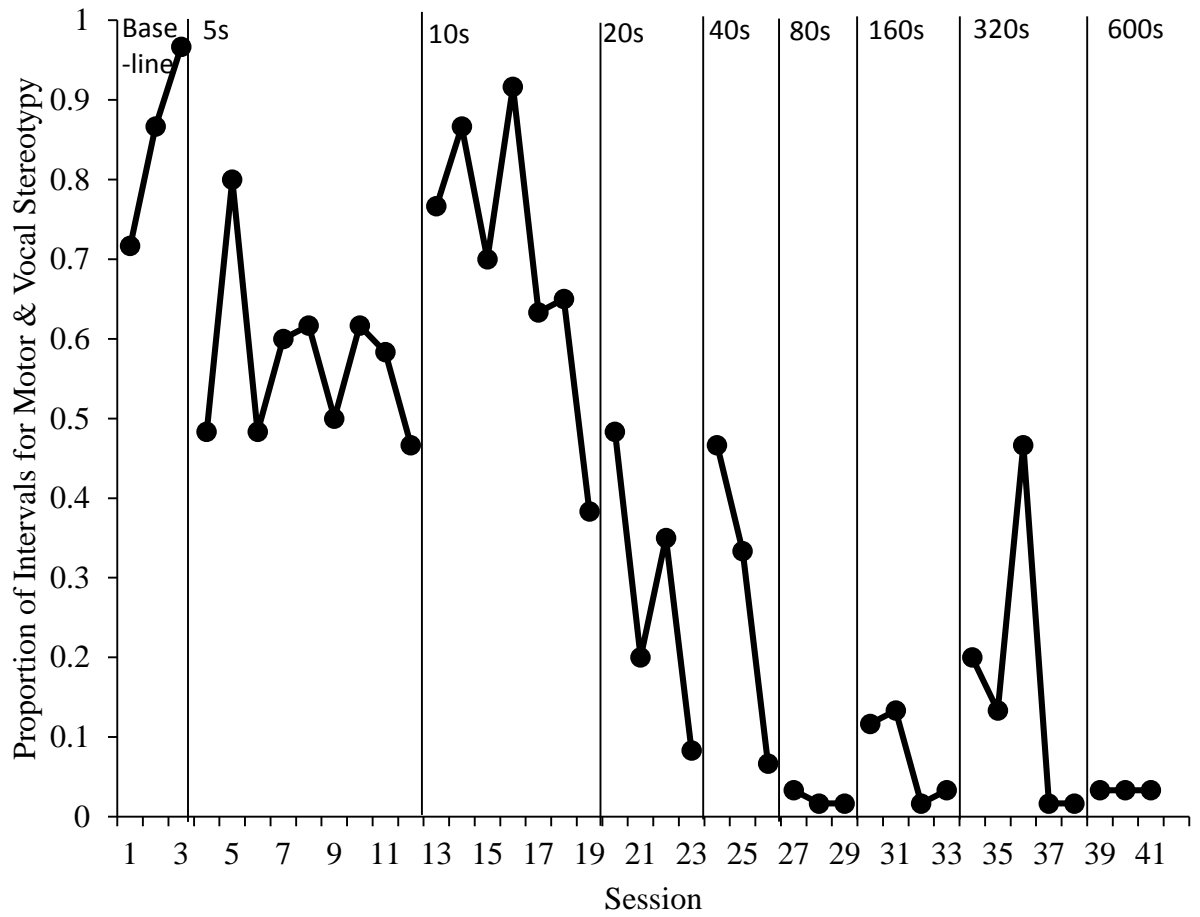


Figure 41. Results of the post-treatment Tangible Analysis for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

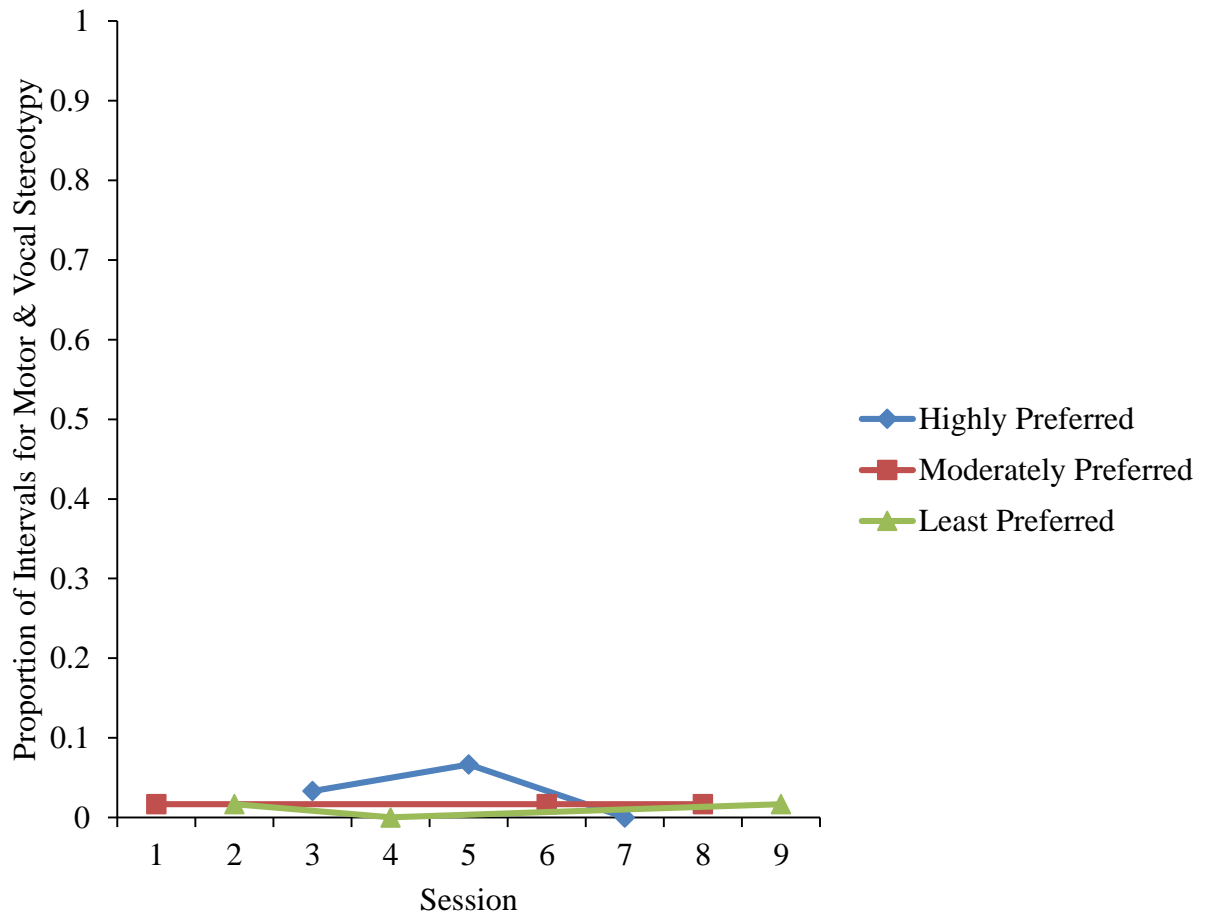


Figure 42. Results of the Attention Analysis for Participant 1. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

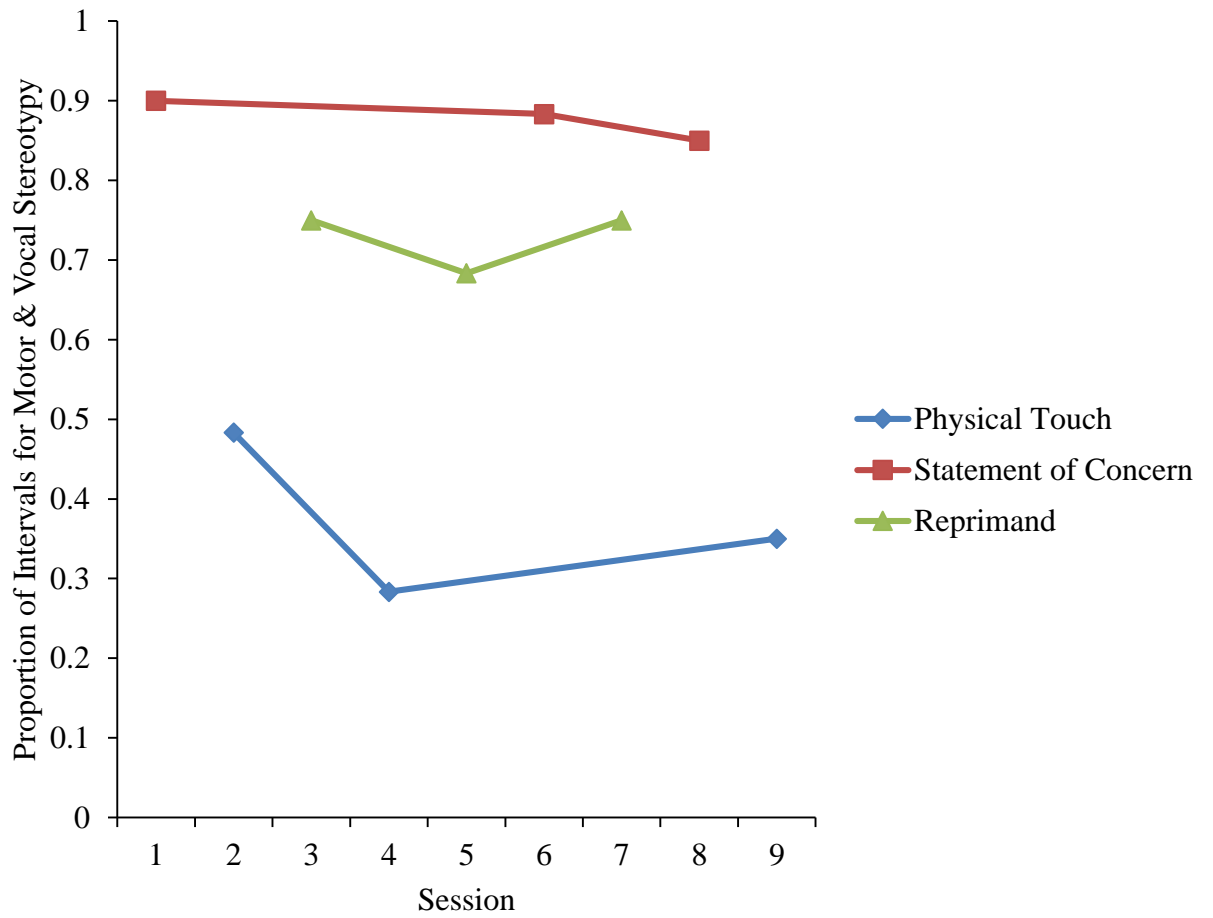


Figure 43. Results of the Attention Analysis for Participant 2. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

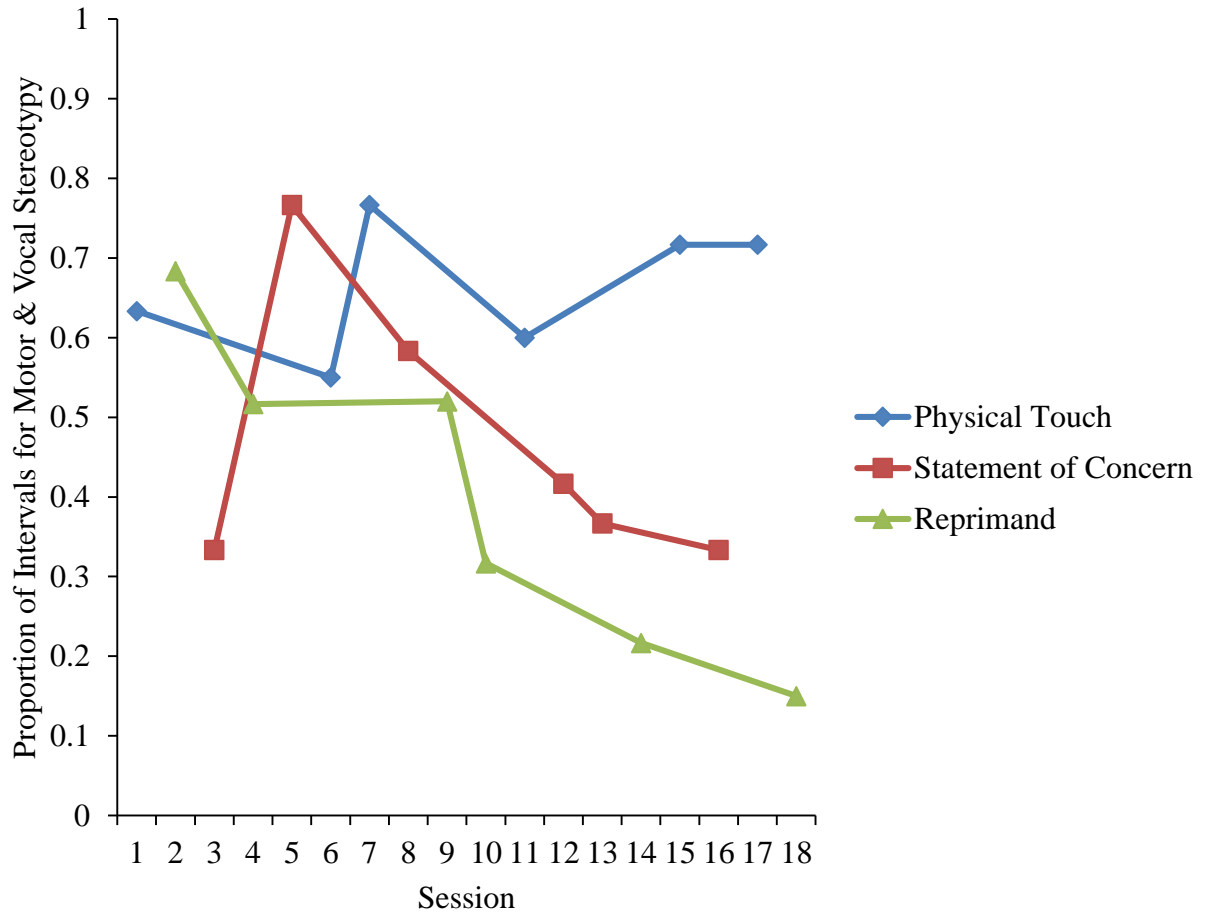


Figure 44. Results of the Attention Analysis for Participant 3. Data reflect the proportion of intervals containing motor and vocal stereotypy that occurred in the experimental conditions.

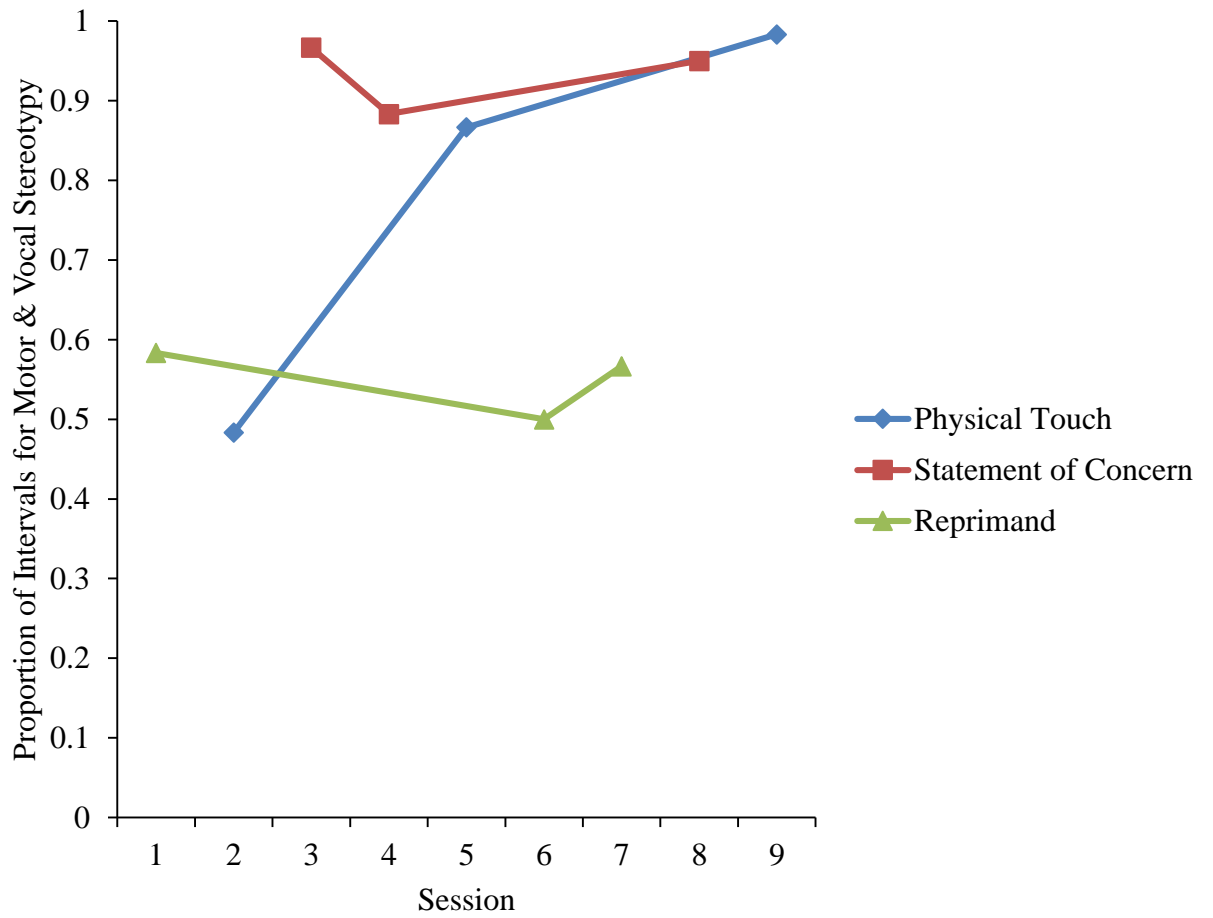


Figure 45. Results of the Attention Analysis for Participant 4. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

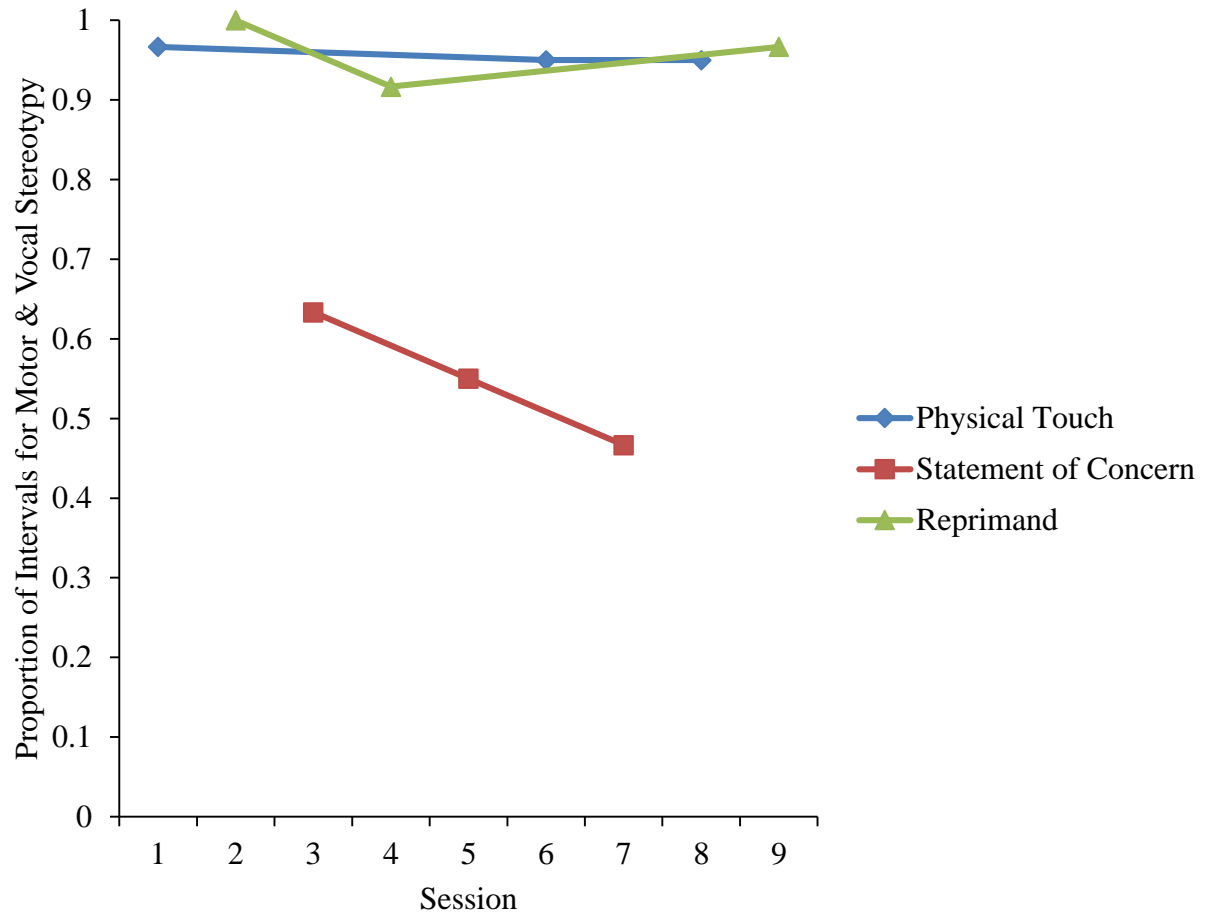


Figure 46. Results of the Attention Analysis for Participant 5. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

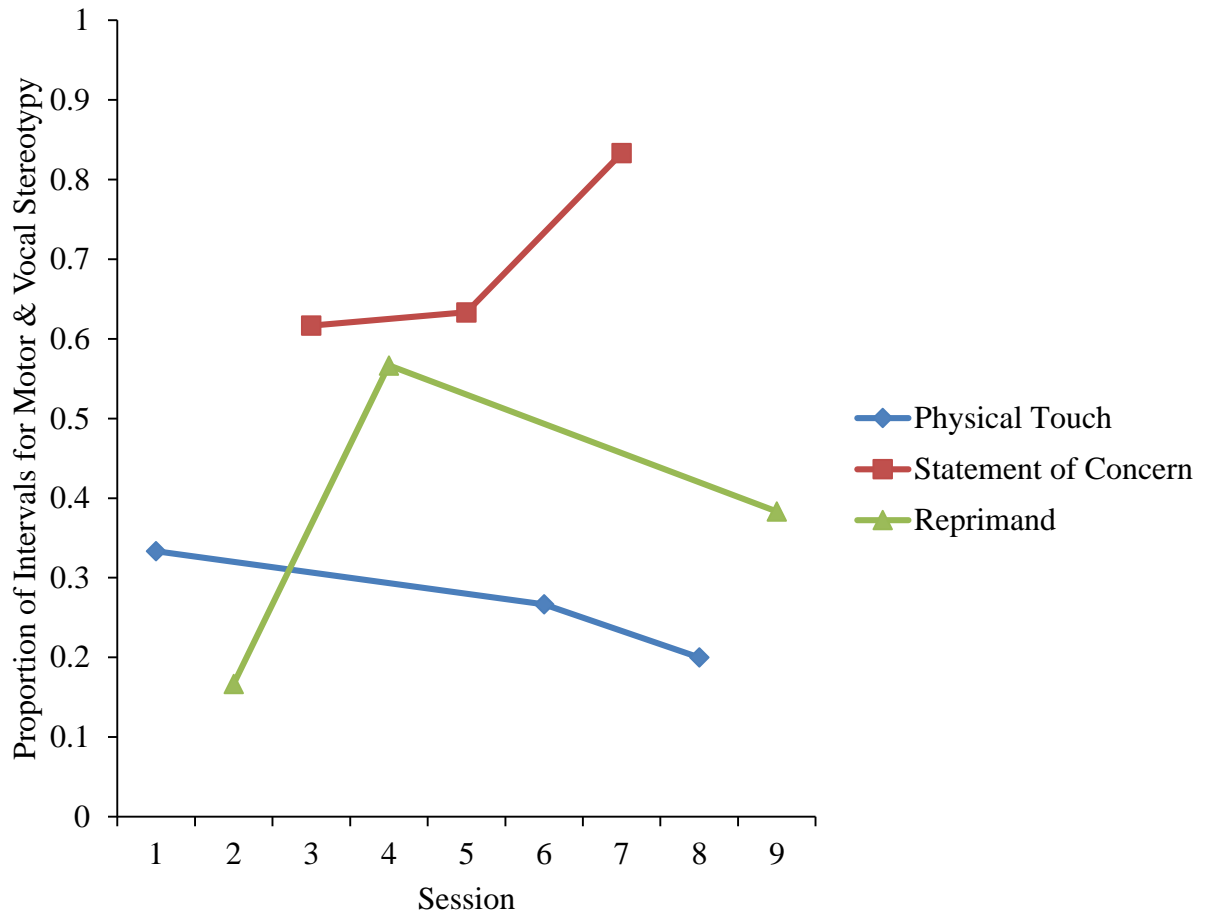


Figure 47. Results of the Attention Analysis for Participant 6a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

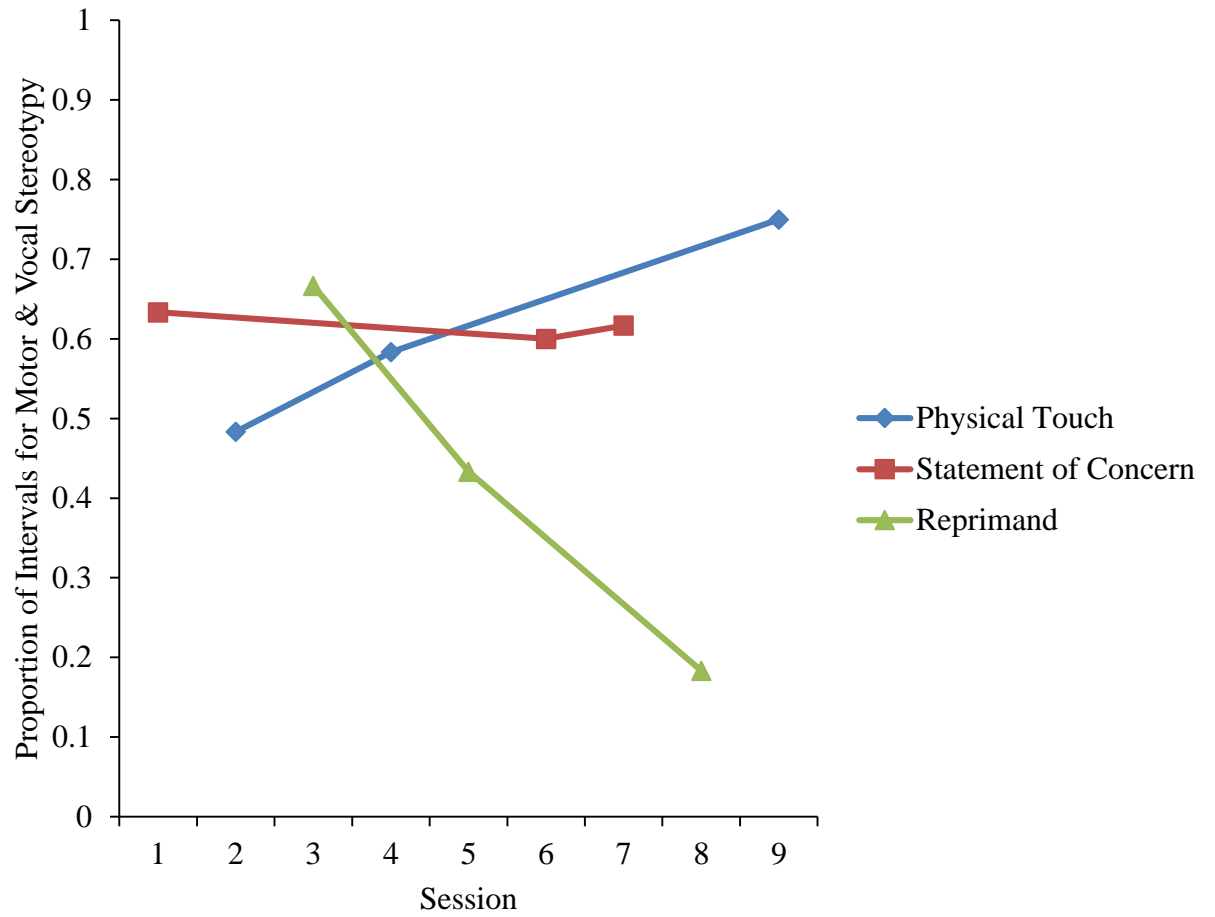


Figure 48. Results of the Attention Analysis for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

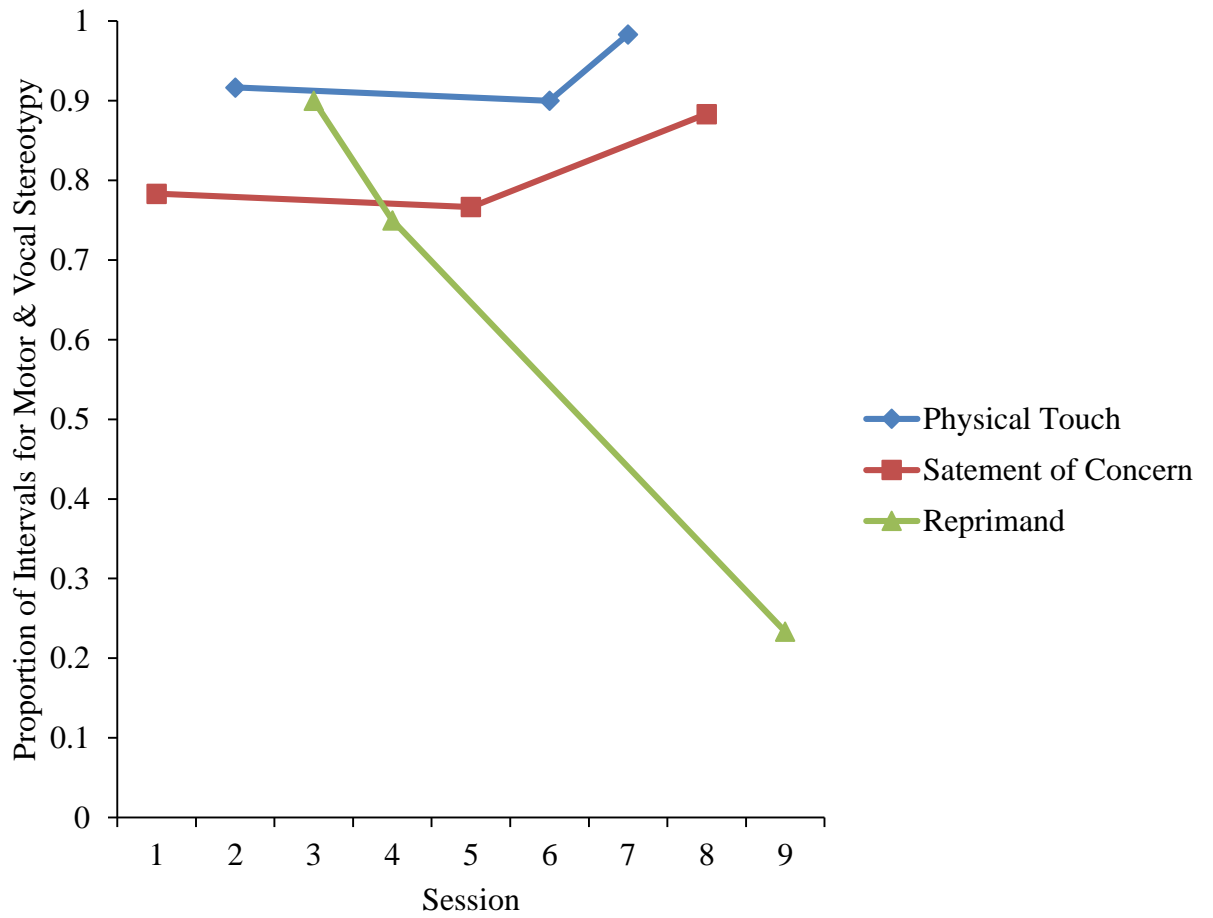


Figure 49. Results of the Attention Analysis for Participant 7a. Data reflect the proportion of intervals containing motor stereotypy that occurred in the experimental conditions.

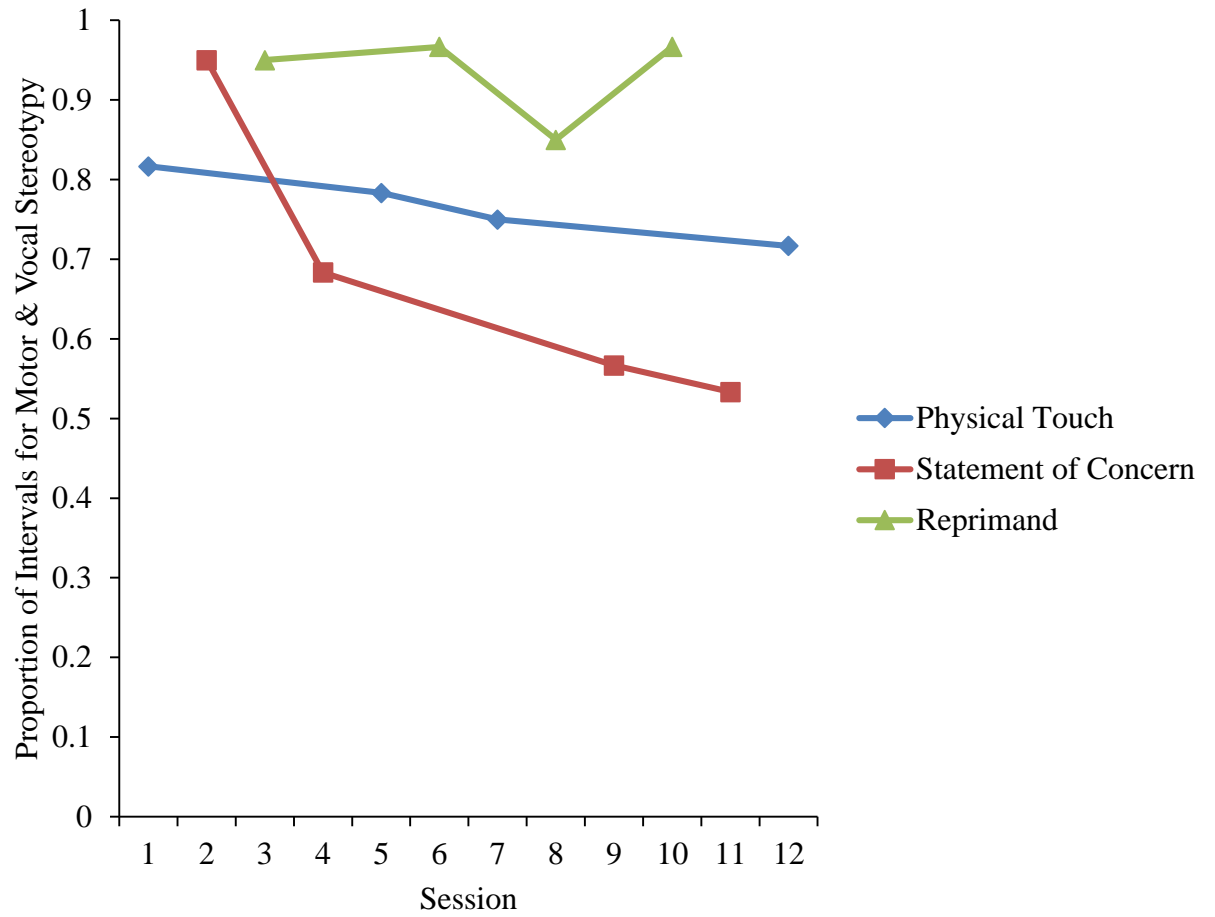


Figure 50. Results of the Attention Analysis for Participant 7b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.

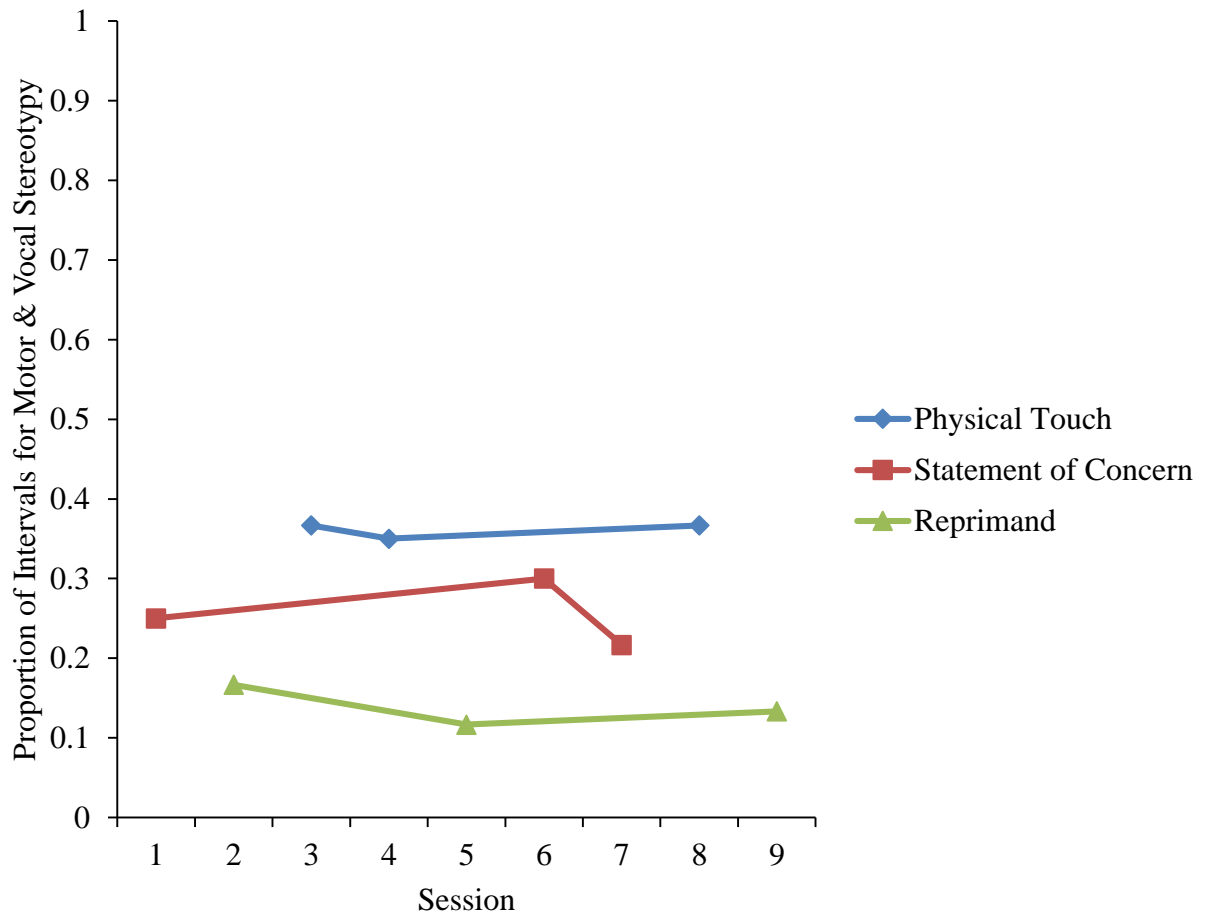


Figure 51. Results of the Attention Analysis treatment for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred during phases.

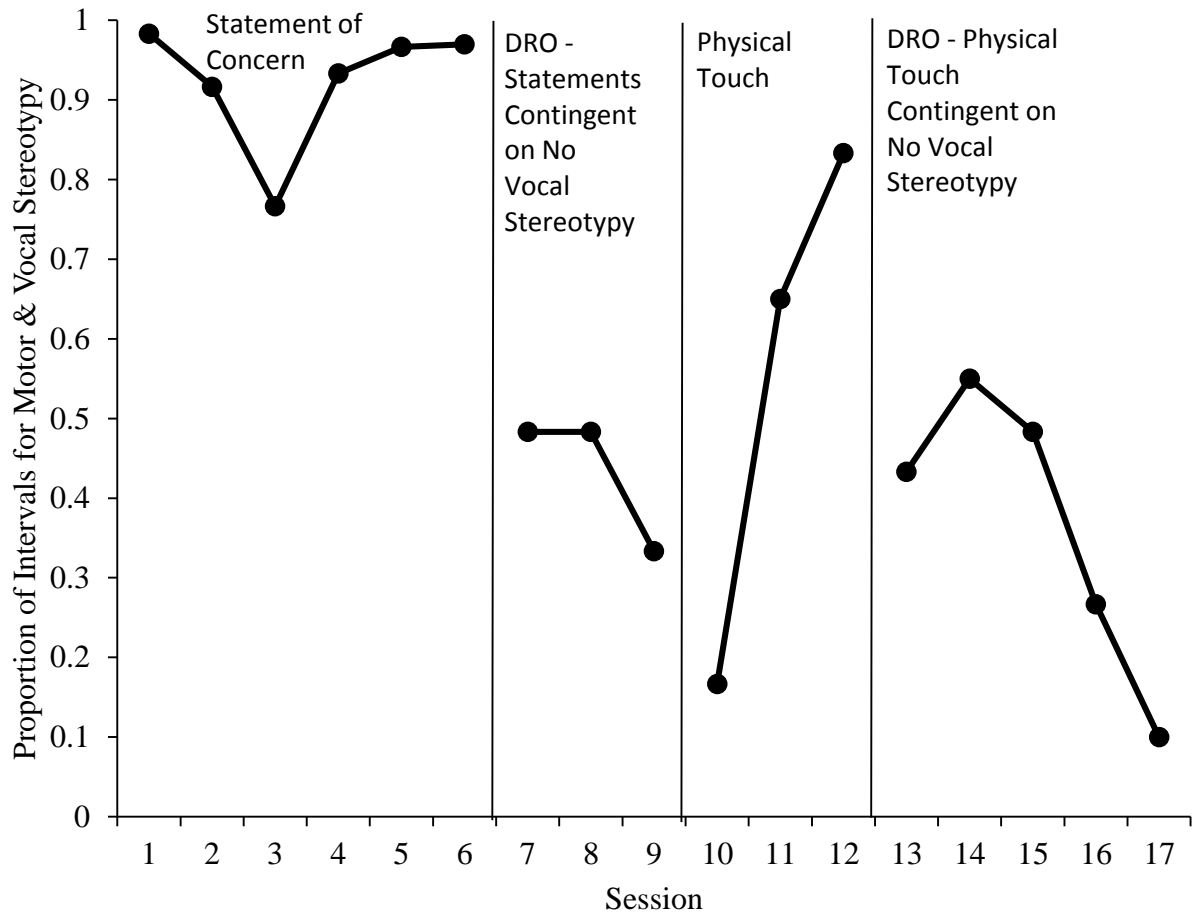
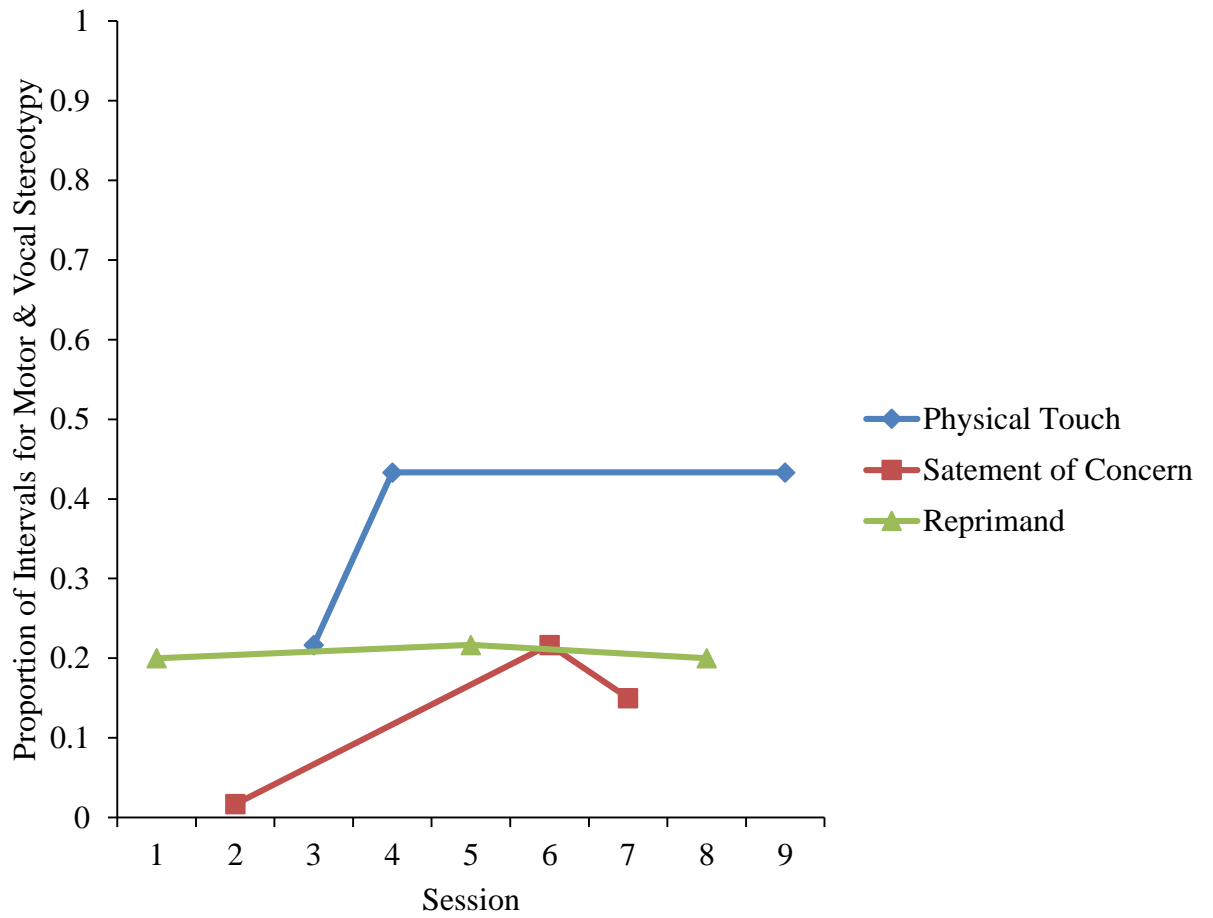


Figure 52. Results of the post-treatment Attention Analysis for Participant 6b. Data reflect the proportion of intervals containing vocal stereotypy that occurred in the experimental conditions.



Appendix A. Example of Functional Analysis Screening Tool - Revised.

FAST
Functional Analysis Screening Tool

Client: _____ Date: _____
Informant: _____ Interviewer: _____

To the Interviewer: The FAST identifies factors that may influence problem behaviors. Use it only for screening as part of a comprehensive functional analysis of the behavior. Administer the FAST to several individuals who interact with the client frequently. Then use the results to guide direct observation in several different situations to verify suspected behavioral functions and to identify other factors that may influence the problem behavior.

To the Informant: Complete the sections below. Then read each question carefully and answer it by circling "Yes" or "No." If you are uncertain about an answer, circle "N/A."

Informant-Client Relationship

1. Indicate your relationship to the person: Parent Instructor
 Therapist/Residential Staff (Other)
2. How long have you known the person? _____ Years _____ Months
3. Do you interact with the person daily? Yes No
4. In what situations do you usually interact with the person?
 Meals Academic training
 Leisure Work or vocational training
 Self-care (Other)

Problem Behavior Information

1. Problem behavior (check and describe):
 Aggression _____
 Self-injury _____
 Stereotypy _____
 Property destruction _____
 Other _____
2. Frequency: Hourly Daily Weekly Less often
3. Severity: Mild: Disruptive but little risk to property or health
 Moderate: Property damage or minor injury
 Severe: Significant threat to health or safety
4. Situations in which the problem behavior is most likely to occur:
Days/Times _____
Settings/Activities _____
Persons present _____
5. Situations in which the problem behavior is least likely to occur:
Days/Times _____
Settings/Activities _____
Persons present _____
6. What is usually happening to the person right before the problem behavior occurs?

7. What usually happens to the person right after the problem behavior occurs?

8. Current treatments _____

- | | | | |
|--|-----|----|-----|
| 1. Does the problem behavior occur when the person is not receiving attention or when caregivers are paying attention to someone else? | Yes | No | N/A |
| 2. Does the problem behavior occur when the person's requests for preferred items or activities are denied or when these are taken away? | Yes | No | N/A |
| 3. When the problem behavior occurs, do caregivers usually try to calm the person down or involve the person in preferred activities? | Yes | No | N/A |
| 4. Is the person usually well behaved when (s)he is getting lots of attention or when preferred activities are freely available? | Yes | No | N/A |
| 5. Does the person usually fuss or resist when (s)he is asked to perform a task or to participate in activities? | Yes | No | N/A |
| 6. Does the problem behavior occur when the person is asked to perform a task or to participate in activities? | Yes | No | N/A |
| 7. If the problem behavior occurs while tasks are being presented, is the person usually given a "break" from tasks? | Yes | No | N/A |
| 8. Is the person usually well behaved when (s)he is not required to do anything? | Yes | No | N/A |
| 9. Does the problem behavior occur even when no one is nearby or watching? | Yes | No | N/A |
| 10. Does the person engage in the problem behavior even when leisure activities are available? | Yes | No | N/A |
| 11. Does the problem behavior appear to be a form of "self-stimulation"? | Yes | No | N/A |
| 12. Is the problem behavior <u>less</u> likely to occur when sensory stimulating activities are presented? | Yes | No | N/A |
| 13. Is the problem behavior cyclical, occurring for several days and then stopping? | Yes | No | N/A |
| 14. Does the person have recurring painful conditions such as ear infections or allergies? If so, list: _____ | Yes | No | N/A |
| 15. Is the problem behavior <u>more</u> likely to occur when the person is ill? | Yes | No | N/A |
| 16. If the person is experiencing physical problems, and these are treated, does the problem behavior usually go away? | Yes | No | N/A |

Scoring Summary

Circle the number of each question that was answered "Yes" and enter the number of items that were circled in the "Total" column.

Items Circled "Yes"	Total	Potential Source of Reinforcement
1 2 3 4	_____	Social (attention/preferred items)
5 6 7 8	_____	Social (escape from tasks/activities)
9 10 11 12	_____	Automatic (sensory stimulation)
13 14 15 16	_____	Automatic (pain attenuation)

