LATENCY-BASED AUTOMATIC REINFORCEMENT SCREENER

LATENCY-BASED FUNCTIONAL ANALYSIS SCREENER FOR PROBLEM BEHAVIOR MAINTAINED BY AUTOMATIC REINFORCEMENT IN ADULTS WITH AUTISM SPECTRUM DISORDER

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LATENCY-BASED AUTOMATIC REINFORCEMENT SCREENER

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Abstract

Individuals with autism spectrum disorder are more likely to engage in problem behavior than those diagnosed with other psychiatric conditions (American Psychiatric Association, 2013). These behaviors – which include, but are not limited to, aggression, disruptions, rituals, self-injury, and noncontextual motor movements and vocalizations – have profoundly negative impacts on the physical and emotional wellbeing of these individuals and their caregivers, as well as society as a whole. While the traditional multielement functional analysis (Iwata et al., 1982/1994) is an effective method of assessing problem behavior and informing treatment interventions, the standard functional analysis and its subsequent iterations pose implementation challenges in adult programs where time and expertise are often lacking, and safety-concerns are heightened. The present study sought to address these barriers by posing modifications to the Querim et al. (2013) automatic reinforcement screener, in which latency to problem behavior served as the dependent variable and sessions terminated after the first instance of target behavior. Three participants with varying problem behavior topographies completed a latency screener, automatic reinforcement screener, and traditional multielement functional analysis. The latency screener accurately predicted the function class of target behavior (i.e., socially or automatically-maintained) in two out of three cases. Moreover, it did so in less time and with fewer instances of target behavior than the standard functional analysis and automatic reinforcement screener. Though more research is necessary, these results suggest that the latency screener may be a viable method of assessing the function of challenging behavior in adults, while overcoming the many practical obstacles inherent to identifying behavior function in this population.
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Introduction

A foundational assumption of applied behavior analysis (ABA) is that behavior – both adaptive and maladaptive – occurs as the result of environmental events. Behavior is not random nor does it exist in isolation; it is purposeful and transpires in a universal context that is meaningful and lawful (Cooper et al., 2014). For behavior to persist, it must contact reinforcing contingencies. In the study of human behavior, these types of reinforcement are broken down into positive or negative, and social or automatic. Put simply, social-positive reinforcement consists of accessing preferred activities, attention, or items contingent on behavior, whereas social-negative reinforcement indicates reprieve from unpleasant environmental stimuli as the result of engagement in a behavior. Automatic reinforcement suggests an internal experience that is either avoided (negatively reinforced) or accessed (positively reinforced) contingent on a particular behavior.

These fundamental principles have meaningful clinical implications and have been applied to the acquisition of adaptive behavior and the reduction of problem behavior. Problem behavior is a term used in the intellectual and developmental disabilities community that refers to culturally abnormal behavior(s) of such intensity, frequency, or duration that the physical safety of the person or others is likely to be placed in serious jeopardy, or behavior which is likely to seriously limit use of, or result in the person being denied access to, ordinary community facilities (Emerson, 2001, p. 3)

Decades of research and thousands of studies have been dedicated to the refinement of effective assessment procedures and data-informed treatment interventions for the purposes of reducing problem behavior. However, while extensive research has been conducted on these procedures as they relate to children and adolescents with autism spectrum disorder, very little research exists
Functional Assessment

Functional assessments are a set of procedures used to identify how environmental properties and characteristics of an individual interact to maintain problem behavior (Steege et al., 2019). They are grounded in the understandings that behavior serves a purpose, behavior often occurs within a particular context, and these factors are unique to the individual. In other words, topographically similar behaviors can serve different purposes. Therefore, when clinicians can detect the function of the behavior (i.e., why it is happening) and the contexts in which the behavior occurs, they can better tailor interventions to reduce or eliminate these identified variables (Carr, 1977). The purpose of functional behavioral assessments (FBAs) is to ascertain this information by creating a clear description of the problem behavior, isolating the events and situations that predict when the behavior will and will not occur (antecedents), identifying the consequences that may reinforce the behavior, and obtaining data that support the hypothesized function (Cooper et al., 2014). There are three main assessment tools used in functional behavioral assessments: Indirect assessments, descriptive assessments, and functional analyses.

Indirect assessments, such as behavioral interviews or rating scales, rely on third-party reports of the behavior and the circumstances in which it most often occurs. Several instruments have been developed that use caregiver report to aide in the identification of behavior function. Examples of these tools include the Motivation Assessment Scale (Durand & Crimmins, 1988),
the Questions About Behavioral Function (Matson & Vollmer, 1995), and the Contingency Analysis Questionnaire (Wieseler et al., 1985). However, the reliability of these instruments is low, meaning that the answers provided by two separate reporters often yield different functional outcomes (e.g., Zarcone et al., 1991). Additionally, studies have shown that agreement between the results of these instruments and more rigorous experimental methods (i.e., functional analyses) is poor (e.g., Alter et al., 2008), and these tools often fail to identify the presence of multiple functions (Matson & Boisjoli, 2007). Caregiver report, when approached with open-ended questions for the purpose of informing subsequent direct-methods of function identification, are considered a more useful application of indirect assessments (Hanley, 2012). These efforts should focus on identifying the topography of the problem behavior, the degree to which the behavior is impeding the individual’s functioning, the variables that influence the behavior, and prior intervention attempts. Indirect methods should never be used in isolation when assessing the function of problem behavior.

While indirect methods rely on third-party report, descriptive analyses (Bijou et al., 1968) involve the direct observation and coding of behavior. By eliminating reporter bias inherent in indirect assessment measures, direct observations can yield more accurate behavior definitions, information about the rate and duration of target behavior, and contexts in which the behavior occurs most and least frequently. They can also provide insight into the function of the behavior through the careful observation of the events that proceed and immediately follow the behavior. This process, called descriptive analysis, requires multiple observations across several settings. Information about antecedents and consequences are collected until patterns emerge that suggest the problem behavior is maintained by positive reinforcement (i.e., attention, access to tangibles), negative reinforcement (i.e., escape), or automatic reinforcement (i.e., sensory
stimulation, pain reduction). Though considered more accurate than indirect methods, the results of descriptive assessments can be misleading as a causal relationship between environmental variables and problem behavior cannot be assumed (Hagopian et al., 2013). In other words, the temporal proximity of environmental events and problem behavior is not always indicative of a functional relationship (e.g., simply because a caregiver emits a scream when they witness their child throw an item does not necessarily mean that caregiver attention is serving as a reinforcer for the disruptive behavior).

**Functional Analysis**

Functional analyses (FAs) are the most precise form of functional assessment. Developed by Iwata et al. (1982/1994) for the assessment of self-injury, functional analyses identify maintaining variables by manipulating antecedents and consequences, instead of simply observing them. These environmental manipulations allow for a detailed evaluation of the function of target behavior from which causal conclusions can be surmised. In the seminal article, Iwata et al. (1982/1994) sought to determine if the self-injurious behaviors of nine individuals with developmental delays were maintained by positive reinforcement, negative reinforcement, or automatic reinforcement.

Individuals with self-injury participated in a series of experimental conditions that mimicked commonly encountered contingencies: social disapproval, academic demands, unstructured play, and alone. During these 15-min long sessions, the researchers manipulated the antecedents in an attempt to alter the participants’ motivating operations to engage in the behavior, and they reinforced every subsequent occurrence of the behavior in question. For example, in the academic demands condition, participants were prompted to complete educational tasks, thereby increasing the motivation to escape. Contingent on the target behavior,
demands were removed for 30 s. Similarly, during the social disapproval condition, researchers turned away from the participant and only provided attention when the participant engaged in self-injurious behavior. In the alone and unstructured play conditions, no consequences were provided contingent on target behavior. The unstructured play condition mimicked an enriched environment in which the participant had noncontingent access to attention and toys, and, theoretically, little motivation to engage in self-injury; this condition served as the control. Conversely, no items or attention were provided during the alone condition either prior to, or after, engagement in target behavior.

The researchers found that results varied across subjects, indicating topographically similar behaviors were not functionally equivalent for every participant. They also identified relatively consistent results on individual bases; patterns across conditions persisted across trials, suggesting that the experimental design was capable of identifying the maintaining variables of behavior. These concrete results supported theoretical speculation that behaviors serve different functions, and presented a means of identifying these functions to the clinical community.

Since its publication, hundreds of studies have replicated these results, effectively highlighting how functional analysis methodology yields accurate function identification. In a large-scale review of functional analyses, 94.6% of the 152 analyses reviewed successfully identified the function of self-injurious behavior (Iwata, Pace, et al., 1994), and across 277 studies with 536 FAs, function identification occurred 95.5% of the time (Hanley et al., 2003). Further, the last several decades of research have demonstrated the effective application of FA procedures with varying behavior topographies, populations, and settings (Beavers et al., 2013; Hanley et al., 2003). For example, FA procedures have been used to assess pica (e.g., Piazza et al., 1996), noncompliance (e.g., Reimers et al., 1993), stereotypy (e.g., Mace et al., 1987),
elopement (e.g., Piazza et al., 1997), and tantrums (e.g., Vollmer et al., 1996), to name a few, and have proven to be effective in classroom, inpatient, outpatient, vocational, and community settings (as cited in Beavers et al., 2013; Hanley et al., 2003).

Ultimately, however, the utility of the functional analysis technology is only significant if its outcomes, and the treatments they inform, result in the reduction of problem behavior. A large body of research exists that demonstrates the successful application of treatments designed to target the specific environmental contingencies/functions that maintain challenging behavior. Moreover, several studies have directly compared the outcomes of function-based treatments and the arbitrary application of treatment strategies. For example, using a multiple baseline design across participants, Newcomer and Lewis (2004) applied nonfunction-based and function-based interventions to the treatment of problem behavior in three young people, and found that function-based interventions yielded superior reductions in target behaviors.

Pelios et al. (1999) noted that prior to the development of functional analyses, punishment-based procedures prevailed as the intervention approach of choice. Punishment based procedures were chosen most often because of their ability to override the variables maintaining problem behavior. In other words, the treatment did not have to identify or change the reinforcement contingencies in existence, it simply had to be stronger than them (Azrin & Holz, 1966). However, reliance on punishment procedures as a first-line intervention is neither ethically nor legally acceptable. Pelios et al. discovered that the field-wide application of functional analysis procedures corresponded with a decrease in punishment-based procedures and a shift to reinforcement-based strategies as the preferred intervention for the treatment of self-injurious behavior and aggression.
Challenges of using FAs in applied settings. Despite the efficacy and utility of the functional analysis, a number of procedural challenges have been highlighted. Notably, functional analyses are often labor intensive, time consuming, and dependent on a level of clinical expertise not accessible in many treatment settings (Sturmey, 1995). Several alternative assessments have been proposed that attempt to capture the function and integral features of Iwata et al.’s (1982/1994) original instrument, while addressing these logistical constraints. Modifications have included shorter conditions (e.g., Northup et al., 1991), trial-based models (Sigafoos & Saggers, 1995), automatic reinforcement screening analyses (Querim et al., 2013) and latency-based functional analysis models (e.g., Thomason-Sassi et al., 2011).

Response Latency as an Indicator of Behavioral Strength

Response latency—or the length of time from the onset of a stimulus to the engagement of target behavior—has most commonly been utilized to measure the acquisition and maintenance of desired skills such as responding to a request or demand (Thomason-Sassi, et al., 2011). Traditionally, research on problem behavior has employed measures of rate, duration, and percent of intervals (i.e., repeated occurrence measures) to capture response strength (Skinner, 1938; Thomason-Sassi et al., 2011). However, harmful challenging behavior cannot always be safely or ethically captured in assessments that utilize repeated occurrence measures. Several studies have explored the single occurrence measure of response latency as an alternative form of response strength in the assessment and treatment of maladaptive behavior.

Thomason-Sassi et al. (2011) sought to empirically assess the assumption made by previous studies that shorter latency to target behavior was predictive of high rates of behavior. In the first phase of the study, Thomason-Sassi et al. taught four men with developmental disabilities to engage in a vocational response such as hole punching or dialing telephone
numbers. During baseline sessions, the target behavior was modeled once prior to the start of the session without verbal directions or prompts. Latency to first response and frequency (converted to rate) of target behavior were recorded. No reinforcement was provided. The same procedure was followed during the acquisition phase with the exception of the delivery of a small preferred edible item following each occurrence of target behavior. The maintenance phase did not incorporate a pre-session model and the session was terminated after the first target behavior was emitted and reinforcement provided. Results indicated an inverse relationship between rate of target behavior and latency to first response.

In the second phase of their study, Thomason-Sassi et al. (2011) conducted a retrospective analysis of 38 functional analyses in which latency to first response of problem behavior could be ascertained. Function was determined when one condition had consistently shorter latencies to problem behavior relative to the control. Sessions with short latencies in the test conditions and longer control condition latencies were considered predictive of automatically-maintained behavior. The function of target behavior was determined by a group of individuals trained in behavior analysis after reviewing rate and latency graphs individually. Correspondence between results from the latency and standard FAs occurred in 33 of the 38 pairs of graphs.

To more effectively assess the utility of a latency-based functional analysis in which sessions conclude after the first instance of target behavior—and may therefore hinder the acquisition of stimulus control given the reduced exposure to contingencies—Thomason-Sassi et al. (2011) conducted two separate functional analyses in the final phase of their study. While both assessments had identical conditions, the standard FA measured response strength using rate, whereas latency was utilized as the dependent variable in the experimental FA. To address
the constraints of phase two, the researchers concluded the latency sessions following the first instance of target behavior. Ten individuals with problem behavior underwent both forms of functional analysis. Data from the FAs produced identical functions for nine out of the ten participants. The researchers concluded that while the latency-based FAs required a substantial number of trials to distinguish contingencies and may be more likely to produce false positives than overall rate measures, latency may serve as an appropriate replacement dependent variable for assessments and treatment analyses in circumstances when repeated occurrence measures are not feasible or appropriate.

Caruthers et al. (2015) utilized latency-based functional analysis data as a baseline for subsequent treatment analysis, effectively demonstrating the utility of the FA results in the design and implementation of successful treatments. The researchers alternated escape and ignore conditions using a measure of latency to target behavior. Consistent with Thomason-Sassi et al. (2011), sessions were terminated after the first instance of target behavior. After an escape function of the 5-year-old participant’s aggression was identified, Caruthers et al. tracked latency to mand (i.e., request a break using the functional communication response of “break please”) and target behavior across functional communication training and discrimination training. To allow for comparison of more traditional measures, treatment phases were not terminated after the first instance of target behavior, and rate and percent of opportunities were tracked. Results indicated that graphs depicting latency to dependent measures yielded similar conclusions regarding treatment efficacy as the analysis of visual representations of rate of dependent measures.
Assessment of Automatically Reinforced Behavior

**Automatic function in traditional multielement FA.** As previously described, functional analysis results are interpreted using visual inspection. However, given the subjective nature of this process, Hagopian et al. (1997) generated a set of guidelines to aid in the standardization of FA data analysis. The researchers determined that behavior should be interpreted as automatically-maintained if higher rates are observed in the alone condition compared to the control (play); if lower rates are seen in the conditions with high external stimulation (demand and play) and higher rates are observed in the conditions with low external stimulation (alone, attention, tangible); or if behavior is high and stable in all conditions.

**Automatic reinforcement screener.** Given these standards, Querim et al. (2013) proposed a screening procedure to identify automatically-maintained behavior using the guideline that high rates of behavior in the alone condition is indicative of an automatic function. The purpose of the screening instrument was to identify automatically-maintained behavior without a lengthy standard functional analysis. Querim et al. sought to determine if high rates of target behavior during repeated brief exposure to alone/ignore conditions were predictive of automatically-maintained functions determined by the standard multielement functional analysis.

The researchers included 30 cases of problem behavior - the specific definitions of which varied on an individual basis - and included behavior such as aggression, motor and vocal stereotypy, property destruction, and self-injury. Each participant completed at least three, 5-min alone or no-interaction conditions. Target behavior was measured using frequency (converted to rate) or duration (converted to percent of 10-s intervals) measures; the measurements were determined based on the topography of the behavior. Once a clear and stable pattern of responding was established, a traditional multielement functional analysis was conducted that
included alone/no interaction, attention, play, and demand conditions. Each condition lasted for 10 min and series were run at least three times or until a clear pattern emerged.

The researchers predicted that if high rates of problem behavior were found in all three screening sessions, the function was automatic. If low rates of target behavior occurred, or if there was a downward trend ending at or near zero, the function was predicted to be maintained by social reinforcement. Alternatively, if behavior was highest in either the attention or demand condition of the FA, it was determined to be maintained by social reinforcement. High rates in the FA alone condition were indicative of automatically-maintained behavior. Three to eight Board Certified Behavior Analysts (BCBAs) analyzed graphical representations of the screening data and FA data separately, and determined the function of the behavior based on each assessment.

Querim et al. (2013) identified four possible correspondence outcomes: both the screener and FA predicted automatic functions (hit), both assessments predicted social reinforcement functions (hit), the screener predicted a social function while the FA indicated an automatic function (miss), or the screener identified an automatic function while the FA predicted a social function (false alarm). Results of outcome comparison found that the screener was successful at predicting the function of problem behavior in 28 of the 30 cases (93% correspondence).

Assessment duration averages were calculated for the 21 participants with automatically-maintained behavior. The screening procedure took an average of 21.5 min while the mean duration of the FA was 170 min. Additionally, when the amount of problem behavior was compared across the two assessments, problem behavior occurred 70.8% less in the screening procedure than in the traditional FA. Querim et al. (2013) concluded that screening may be a
useful means of determining the function of stereotypy, self-injury, and property destruction suspected to be maintained by automatic reinforcement.

**Adults with Autism Spectrum Disorder**

**Traditional FAs and adults.** As previously described, there is a rich and profound body of literature dedicated to the development and refinement of functional analysis-related best practices. Indeed, between 1961 and 2013, 981 studies on the topic were published (Beavers et al., 2013), highlighting the field’s long held belief in the importance of function-based treatment of problem behavior. However, of these studies, only 142 (32.9%) included adult participants (Beavers et al., 2013; Hanley et al., 2003). Moreover, only 39 studies on functional analyses with adults were published from 2001 to 2012 (Beavers et al., 2013; Hanley et al., 2003). The underrepresentation of adults in autism research is not just confined to the study of functional analysis. For example, in a review of approximately 11,000 research articles on autism published between the years 2000 and 2010, only 23 concerned adult services (Shattuck et al., 2012). Further, Howlin (2013) noted that of the sparse outcome literature pertaining to adults on the spectrum, the vast majority focuses on young adulthood, with no emphasis placed on how outcomes may change as individuals age into later stages of life.

**Adults and challenging behavior.** The dearth of research on functional analyses with adults is surprising given the significant impact problem behavior has on this population. Challenging behavior in adults on the autism spectrum can take many topographical forms and may include aggression (e.g., hitting, kicking), self-injury (e.g., head banging, skin picking), disruptive vocalizations (e.g., vocal stereotypy), pica (i.e., consuming nonedible items), and noncontextual movements (e.g., motor stereotypy), to name a few. Functionally, these behaviors interfere with individuals’ ability to learn, work, socialize, gain independence, and/or remain
safe. Though not a diagnostic feature of ASD, challenging behavior occurs at high rates in adults with autism. In a study of 686 adults with intellectual disability, those with comorbid autism spectrum disorder were four times more likely to engage in challenging behavior than those without the diagnosis (McCarthy et al., 2010). Estimates of challenging behavior exhibited by individuals with ASD range from 64-94% (as cited in Turygin et al., 2013) and the frequency of these behaviors in adulthood is found to be positively correlated with autism symptom severity (Matson & Rivet, 2008).

Unsurprisingly, challenging behavior can have a significantly negative impact on individuals’ ability to function in the world. Research has shown that problem behavior interferes with work performance (Hendricks, 2010; Lancioni et al., 2009) and is positively correlated with social impairment (Mansell et al., 2002). A study by Matson et al. (2006) found that these impairments compounded when more than one problem behavior was present (e.g., comorbid stereotypy and self-injury). Further, the presence of vocal and/or motor stereotypy (i.e., repetitive, noncontextual vocalizations or movements) has been found to lead to the unfavorable treatment of adults with autism (Noll & Barrett, 2004) and the presence of challenging behavior in adults with ASD is correlated with higher levels of depressive symptoms (Turygin et al., 2013).

Despite the literature that suggests employment is an integral component of independence and wellbeing, the vast majority of adults with ASD are jobless. In fact, estimates indicate that 50 to 75% of adults with ASD do not have employment (Howlin et al., 2004; Hurlbutt & Chalmers, 2002; Mawhood et al., 2000; as cited in Hendricks, 2010). In a longitudinal study conducted from 2001 to 2008, researchers followed 922 transition-age individuals with ASD. At the time of study completion, only 6% of participants had acquired competitive employment,
80% lived with their parents, 40% indicated they had no friends, and 21% reported no job or post-secondary education experience (Newman et al., 2009). These results indicate that socially normative levels of independence are not being achieved by young adults with autism (Schall et al., 2014).

The impact of challenging behavior on an individual’s employment status, caliber of social interaction, and degree of independence is profound for a number of reasons including the link between these variables and a person’s quality of life. Quality of life is a multidimensional concept that encapsulates an individual’s perception of his or her physical, functional, psychological/emotional, and social/occupational wellbeing (Burckhardt & Anderson, 2003). While widely studied in populations with acute or chronic illness, its focus has recently been applied to individuals on the autism spectrum as a means of isolating treatment targets. Research has found that adults with autism spectrum disorder report significantly lower quality of life than members of the general population (Burgess & Gutstein, 2007). In a study of 370 adults with ASD in the UK, predictors of higher quality of life included being employed, receiving social support, and being in a relationship; greater symptom severity was a negative predictor (Mason et al., 2018).

Given the detrimental effects challenging behavior can have on an individual’s functioning, happiness, and overall quality of life, it is imperative for clinicians and researchers to implement effective treatment protocols to decrease the frequency and intensity of these behaviors. Unfortunately, however, adult challenging behavior is frequently difficult to treat given the individual’s long learning history with the behavior. Therefore, assessing the behavior’s function to ensure appropriate and targeted treatment is arguably even more essential
with this population than with oft-studied younger participants who have contacted behavior-maintaining contingencies for shorter periods of time.

**Challenges of assessing adults.** There are several factors that interfere with the accurate attainment of behavior function and, by extension, effective treatment of challenging behavior in adults. Among the environmental challenges of assisting adults with special needs is the lack of adequate resources. Under the Individuals with Disabilities Education Act (IDEA), children with ASD are legally entitled to a multitude of services to meet their education needs. However, when the individual graduates (often at age 18 or 21) their educational entitlements end; this has colloquially been referred to as a “services cliff.” Consequently, there is less support and funding streams are not as readily available. One parent of an adult with autism likened the transition process to “exiting nirvana” (Park, 2001). Indeed, research has shown that most students’ transition into adult services is far from seamless (Certo et al., 2003). In a survey of 200 families, 67% were not aware of transition programs, 78% had no knowledge of agencies that may aid in job development, and 83% used family members as the sole source of transition planning assistance (Gerhardt & Lainer, 2011).

The sparse funding channeled to adult services results in fewer high-quality agencies. It also fosters a low level of overall expertise as the inability of existing agencies to provide competitive salaries makes it challenging to recruit and retain qualified staff. The federal Department of Health and Human Services (2004) found that the average annual staff turnover rate in adult focused programs is 50%, and at any given time, 10-11% of direct care staff positions are vacant (Gerhardt & Lainer, 2011). Furthermore, evidence-based staff training and supervision methods are infrequently implemented, resulting in the inadequate provision of services (Gerhardt et al., 2014).
The lack of resources and expertise of adult agencies is especially relevant in the context of challenging behavior where the risk to safety is profound. Given the size and strength of many adults on the autism spectrum, problem behavior can result in devastating injury to the individual, their caregivers, and/or members of the community, particularly when support staff are inadequately prepared. The safety implications of these behaviors also make determining their function more difficult, as repeated occurrences are often required to discern function but cannot occur under ethical guidelines and appropriate best-practices.

**Conclusions/Present Study**

Untreated problem behavior in adults with autism spectrum disorder has devastating effects, including strained social relationships, reduced community involvement, and lower quality of life. It is, therefore, crucial to identify and mitigate variables that contribute to the persistence of these behaviors. While hundreds of publications have focused on the efficacy of FA models, the refinement of functional analysis methodology, and adaptations to address the barriers to its successful implementation, very few have considered how functional analyses can best address the unique needs of older populations. Treating the problem behavior of adults on the autism spectrum is notoriously difficult given their oft-long history of encountering behavior-maintaining reinforcement contingencies. As a result, the need for sound assessment procedures to accurately inform treatment approaches is paramount. However, the lack of funding directed towards adult-focused agencies—and the subsequently subpar expertise, time, and resources available—make this crucial task near impossible. Further, repeated occurrence measures in this population pose an increased risk to the safety of the autistic adults and those assessing them.

The purpose of the present study is to address these barriers by assessing the efficacy of an automatic reinforcement screener that uses latency as a measure of response strength. Like
previous functional analyses that incorporate response latency as the dependent measure, this assessment terminates following the first instance of target behavior. Therefore, the amount of potentially dangerous behavior will be limited. Additionally, the early termination will result in a shortened variation of existing assessments, which may increase the likelihood of its successful implementation by under-resourced facilities.

It is hypothesized that the latency-based screener will accurately differentiate between automatic and socially-maintained behaviors in adults with autism when compared to the traditional functional analysis posed by Iwata et al. (1982/1994), and will do as effectively as the longer, repeated occurrence automatic reinforcement screener created by Querim et al. (2013). Further, the duration of participant involvement in the latency screener is hypothesized to be shorter than both the standard multielement functional analysis and the automatic reinforcement screener, and is suspected to require fewer instances of target behavior to determine the social or automatic function of the problem behavior in question.

Methods

Participants and Setting

Participants were recruited from a university-based day-program serving adults with developmental disabilities using applied behavior analysis. To be included in the study, participants were required to be 18 years of age or older, have a diagnosis of autism spectrum disorder, and engage in some form of challenging behavior (e.g., vocal or motor stereotypy, property destruction, aggression, etc.). Participants were not selected for inclusion in the study if their challenging behavior occurred infrequently (less than one occurrence per week) or included severe self-injury such as forceful head-banging or facial punching. Three participants who met these criteria were identified and surrogate consent was obtained.
Mason was a 32-year-old white male diagnosed with autism. He had attended the adult program for the last 11 years and his verbal/vocal communication consisted of single words and short phrases. Mason was referred to the study by his direct-care staff for the assessment of yelling. The behavior was operationally defined as any instance of contextual or non-contextual vocalization made above conversation volume.

Zane was a 34-year-old white male diagnosed with autism. At the time of participation, he had been a client of the adult program for approximately 13 years. His verbal/vocal communication consisted of single words and short phrases. Zane’s behavior topography included inappropriate touching, defined as any instance or attempt to touch another individual with his hand, without force, including, but not limited to, touching others’ hair, body parts, and/or piece of clothing. Zane had recently been terminated from his part-time job for engaging in this behavior.

Connor was a 23-year-old white male diagnosed with autism. He became a client of the adult program less than one year prior to enrolment in the present study. His verbal/vocal communication consisted of phrases. Connor was referred to the study for the assessment of disruptions. Behavior topography included any instance of arranging, aligning, or closing objects (e.g., drawers, backpacks) more than one time. An instance was considered complete when Connor had removed both of his hands from the item for 5 s.

Materials

Six items identified by direct-care staff were used in the paired-stimulus preference assessment. Two highly preferred items identified via the preference assessment were included in subsequent standard functional analysis conditions. Academic materials (e.g., puzzles, sorting items, math worksheets, etc.) identified by participants’ job coaches were included in the demand
condition of the FA. Data were collected on two laptops equipped with Instant Data software. Study procedures took place in participants’ classrooms. In rooms that did not contain a one-way mirror, an iPad was used to remotely observe the participants during screener and functional analysis sessions. A video camera recorded sessions to facilitate interobserver agreement data collection.

**Dependent Measures**

**Latency screener (LS).** The dependent measure consisted of the time elapsed between the start of the session (i.e., when the participant was left alone in the room or attention was withheld) and the first instance of target behavior. Upon engagement in the behavior, the session was terminated. Data were also taken on the frequency or duration of the target behavior during the minute following session termination when the participant remained alone in the room. Finally, study staff recorded the length of the entire latency screener series.

**Querim et al. (2013) automatic reinforcement screener (ARS).** The occurrence of problem behavior was collected for each participant. Frequency measures, converted to responses per minute (rate), were utilized for both Mason and Zane, whose target behaviors had discrete beginnings and endings. Connor’s behavior had variable durations and was measured using 10-s partial interval data converted to percent of 10-s intervals. The duration of the participants’ involvement in ARS sessions was also collected.

**Multielement functional analysis (FA).** The occurrence of problem behavior was collected using frequency for Mason and Zane, and 10-s partial interval for Connor. Frequency data were converted to rate (responses per minute) and partial interval data was converted to percentage of 10-s intervals. Problem behavior were tracked across conditions. Data acquired during experimental conditions were compared to the results of the control condition (play) to
determine function. Data was also collected on the duration of the functional analysis procedures.

**Procedures**

**Paired-stimulus preference assessment.** Six leisure items and/or edibles were assessed for each participant. Consistent with the procedures described by Fisher and colleagues (1992), the participants had pre-session access to each item for approximately 5 s. During the assessment, the items were presented in pairs in a random order until all possible combinations were offered. Upon presentation of a pair, the participant was instructed to “pick one.” When the participant touched one of the two items, the selection was recorded and the participant had access to the item for 5 s. If the participant did not choose one of the items within 5 s, he was prompted to engage with each item again before being represented with the instruction to make a selection. The two items chosen most often were included in the play and tangible FA conditions.

**Latency screener (LS).** Participants’ target behavior was assessed in a series of alone/no-interaction conditions. In these conditions, participants were brought into their classroom and seated at a table. During Mason and Connor’s assessments, the research staff member told the respective participants that she would “be back in a little while,” and exited the room, closing the door behind her and leaving the participant alone. Zane’s target behavior necessitated the presence of a research staff member who positioned herself away approximately 2 ft from him and ignored all behavior. The participants were given no instructions prior to the start of the session and there were no programmed consequences contingent on target behavior.

As Connor’s target behavior involved the manipulation (e.g., organizing, straightening) of objects, his latency screener sessions occurred at his desk where he had access to academic
materials. Prior to the beginning of each session, materials were opened or displaced (e.g., pen caps removed, papers made askew in folders, etc.). Materials in other areas of the room (e.g., cleaner, notebooks, bins on shelves, etc.) were also shifted slightly from their typical positions to allow for the occurrence of Connor’s problem behavior.

Following the first instance of target behavior, sessions were terminated. Participants—and the research staff member during Zane’s trials—remained in the room until 1 min had passed after session termination to control for potential adventitious reinforcement. If the participant did not engage in the target behavior within 5 min, the session was terminated and an additional minute was not required. At least three screener sessions were conducted and 2-min unstructured breaks occurred between trials (e.g., walks, bathroom breaks, etc.). The latency screener sessions occurred in a single block.

**Automatic reinforcement screener (ARS).** Session settings were identical to those in the latency screener and no programmed consequences occurred contingent on target behavior. Sessions lasted for 5 mins regardless of the occurrence of behavior and were followed by 2-min long unstructured breaks. At least three ARS sessions were conducted and occurred in a single block.

**Functional analysis (FA).** A standard functional analysis (Iwata et al., 1992/1994; Mace & West, 1986) was conducted with each participant to determine the function of target behavior and compare findings to the two screening instruments. Consistent with research conducted by Northup et al. (1991), sessions lasted 5 min and were separated by 2 min of unstructured break time. Participants were exposed to the following conditions: alone/no interaction, attention, tangible, play/control, and demand. Every condition run with Connor included the displaced materials previously described.
**Alone/no interaction.** The procedures in this condition were identical to those followed in the automatic reinforcement screener sessions. Dependent on the participant and his target behavior topography, participants were either left alone in a room or ignored by a research staff member. No programmed consequences were provided contingent on problem behavior.

**Attention.** During the attention condition, a research staff member remained in the room with the participant, regardless of the target behavior topography. The staff member provided 1 min of pre-session attention then informed the participant that they had work to do and turned away. Contingent on the target behavior, the staff member provided 20 s of attention before returning to their solitary activity. This condition sought to determine if the participants’ behavior was maintained by access to attention and, thus, socially maintained.

**Tangible.** Two highly preferred items identified in the paired stimulus preference assessment were included in this condition. Prior to the start of the condition, the participants were provided 1-min access to the items before they were removed and the session commenced. During the session, a research staff member kept the items in their possession and did not provide any attention to the participant; all non-target behaviors were ignored. Contingent on target behavior, the participants were given 20 s of access to the items. The purpose of this condition was to determine if the target behavior had a social function in the form of access to preferred items.

**Demand.** The demands condition determined if negative social reinforcement in the form of escape from demands maintained the identified problem behavior. During this condition, a staff member issued continuous academic demands to the participants (e.g., match pictures, sort objects, etc.). Contingent on target behavior, the demands were removed for 20 s and no attention was provided.
**Play.** This condition served as the control by mimicking an enriched environment. Each participant had free access to two highly preferred leisure items and a staff member. The staff member gave brief attention every 30 s and no consequences were provided following the occurrence of target behavior.

**Sequence of assessments.** Both screeners and the preference assessment proceeded the typical functional analysis in all cases. The order of screener assessments was randomly assigned. As previously described, at least three screener sessions for each assessment and at least three series of functional analysis conditions were run. Additional series/sessions could take place until a clear functional pattern had been established, though the extension did not occur in any of the multielement functional analyses run in this study.

**Interoobserver Agreement**

A second research staff member took live, independent data on occurrence of problem behavior for 38.46% of sessions. Interoobserver agreement was calculated by dividing the number of 10-s intervals agreed upon by the two observers by the total number of intervals. For data that was collected using duration, agreement intervals were those for which both observers indicated occurrence or nonoccurrence of behavior. For data that was collected using frequency, agreement intervals were those in which the same number of behavior was recorded. The mean reliability was 98.9%, with a range between 93.33% and 100%.

**Data Analysis**

Data were interpreted by three board certified behavior analysts. Results of the latency screeners, the automatic reinforcement screeners, and traditional functional analyses were deidentified and independently reviewed with the following guidelines:
Latency screener. If the target behavior did not occur during the three sessions, the behavior was considered to be maintained by social contingencies. It was also considered socially maintained if the target behavior occurred, but the latency to first occurrence increased across the sessions, nearing 300 s. If short latency to target behavior was maintained during three or more latency screener trials, the behavior was deemed automatically maintained.

Automatic reinforcement screener. Target behavior was considered to be maintained by social contingencies if it did not occur during the three sessions. It was also considered socially maintained if the target behavior occurred, but the rate of behavior decreased across the sessions, reaching or nearing zero. If moderate to high rates of target behavior were maintained during three or more automatic reinforcement screener trials, the behavior was predicted to be automatically reinforced.

Functional Analysis. If higher rates of target behavior were observed in the alone condition compared to the control (play); if lower rates were seen in the conditions with high external stimulation (demand and play) and higher rates were observed in the conditions with low external stimulation (alone, attention, tangible), or if behavior was high and stable in all conditions, the behavior was deemed automatically-maintained (Hagopian et al., 1997). If the target behavior occurred at high and stable rates in the attention, demand, and/or tangible condition as compared to the control, it was considered socially maintained.

Assessment Comparison. Functions determined by the latency screener and FA were compared, as were outcomes from the automatic reinforcement screener and FA. Consistent with Querim et al. (2013), the following outcomes were possible:
• Hit: The screener(s) and functional analysis both indicated behavior was maintained by automatic reinforcement. Conversely, both assessments found behavior to be maintained by social reinforcement.

• Miss: The screener(s) predicted a socially maintained function while functional analysis results indicated an automatic function.

• False Alarm: The screener(s) predicted an automatic function while the functional analysis results indicated a socially-maintained function.

Results

The results of the paired-stimulus preference assessment are depicted in Figure 1. Mason chose cookies and chips most frequently; goldfish, Twizzlers, and M&Ms were identified as Connor’s most preferred items; and Zane chose nachos, fruit snacks, and Hershey’s Kiss most often when paired with alternative options. These items were included in each participants’ respective tangible and play conditions during the multielement functional analysis.
Figure 1. Paired Stimulus Preference Assessment

Figure 2 shows the results of the participants’ latency-based functional analysis screener. Mason did not engage in yelling during any of the LS sessions. The absence of behavior is illustrated graphically as data points above the 300-s session duration limit and corresponding to N/A on the y-axis. Mason’s data suggest that the behavior was maintained by social contingencies (i.e., not automatic). Both Zane and Connor quickly engaged in their target behaviors after being left alone or ignored during all LS sessions. These latencies were stable across sessions. The results of Zane and Connor’s latency screeners are indicative of automatic functions.
Results from the automatic reinforcement screener are depicted in Figure 3. Mason engaged in target behavior one time during the first 5-min screener and maintained zero rates in the subsequent sessions. These data are predictive of a socially-maintained function as no environmental reinforcement was delivered contingent on yelling. Zane’s target behavior occurred across all three sessions, though a downward trend was observed. The board-certified behavior analysts who reviewed the graph did not agree on the function of this behavior; two of the behavior analysts identified a social function, while one indicated the data was indicative of an automatic function. Connor engaged in disruptive behavior during all four ARS sessions. Data illustrated an increasing trend predictive of an automatic function.
Figure 3. Automatic Reinforcement Screener

Figure 4 displays the multielement functional analysis results. Though Mason engaged in high rates of target behavior during the first attention condition, rates fell to zero in the subsequent series, suggesting that yelling did not have a social-positive function in the form of access to attention. However, when compared to the control conditions, differentiation was achieved during tangible sessions. These results suggest that Mason’s target behavior was maintained by a social contingency in the form of access to preferred items. Zane engaged in high and stable rates of inappropriate touching in the attention conditions and zero rates of target behavior in all but one other session. The results of Zane’s FA are consistent with a socially-maintained function in the form of access to attention. Finally, Connor engaged in consistently
high rates of target behavior in the alone condition, signaling an automatic function to his disruptions.

Figure 4. Functional Analysis
Table 1 provides a summary of the results. Both the latency screener and the automatic reinforcement screener accurately predicted the social function of Mason’s target behavior and the automatic function of Connor’s problem behavior. The latency screener incorrectly predicted that Zane’s behavior was maintained by automatic reinforcement while the multielement functional analysis determined an attention (i.e., social) function. Consistent with Querim et al. (2013) analysis of outcomes, this error was considered a false alarm. As previously described, the interpretation of Zane’s automatic reinforcement screener data did not yield a unanimous conclusion. However, as the majority of the reviewers reported a social function, this data was determined to be a “hit” with the functional analysis.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>FA</th>
<th>LS</th>
<th>ARS</th>
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</thead>
<tbody>
<tr>
<td><strong>Mason</strong></td>
<td>Tangible</td>
<td>Social</td>
<td>Social</td>
</tr>
<tr>
<td>Results</td>
<td></td>
<td>Hit</td>
<td>Hit</td>
</tr>
<tr>
<td><strong>Zane</strong></td>
<td>Attention</td>
<td>Automatic</td>
<td>Social</td>
</tr>
<tr>
<td>Results</td>
<td></td>
<td>False Alarm</td>
<td>Hit</td>
</tr>
<tr>
<td><strong>Connor</strong></td>
<td>Automatic</td>
<td>Automatic</td>
<td>Automatic</td>
</tr>
<tr>
<td>Results</td>
<td></td>
<td>Hit</td>
<td>Hit</td>
</tr>
</tbody>
</table>

Table 2 depicts correspondence between the instruments based on majority interpretation, with 100% agreement between the automatic reinforcement screener and functional analysis, and 66% agreement between the latency screener and the other measures.

Table 2

<table>
<thead>
<tr>
<th></th>
<th>FA</th>
<th>ARS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LS</strong></td>
<td>66%</td>
<td>66%</td>
</tr>
<tr>
<td><strong>ARS</strong></td>
<td>100%</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 3 summarizes the total session duration of each measure. The latency screener durations include the minute-long post session termination period that occurred contingent on the participant’s engagement in the target behavior. Mason did not engage in the target behavior during any of the three latency screener sessions, and thus had the maximum possible duration of involvement in LS trials. This duration was identical to the three ARS sessions. As stated in the protocol, the 1 min session extension was not implemented since he did not engage in the target behavior and adventitious reinforcement was not a concern. Zane’s latency screener had a total duration of 4.24 min which occurred over the course of four trials, whereas Connor’s three-session latency screener took 3.56 min of participation, excluding unstructured breaks between sessions. The average of each measure was calculated with the multielement functional analysis requiring the most participant involvement to complete and the latency screener the least. The FA was 9.87 times longer than the latency screener and the automatic reinforcement screener took 2.2 times more time to complete when compared to the latency screener. When session duration was conceptualized as the period in which behavior data was collected for the purposes of determining function (i.e., the 1 min post-session period of the latency screener was excluded), the differences in assessment duration were even more profound: The FA was 14.25 times longer than the latency screener and the ARS took 3.18 times more time to complete when compared to the latency screener.
The amount of target behavior observed during each assessment is displayed in Table 4. Across all three participants, the highest occurrence of behavior was observed in the functional analysis. In two out of three cases, less problem behavior occurred in the latency screener compared to the automatic reinforcement screener. Overall, there was five times more problem behavior observed in the functional analysis and 1.62 times more problem behavior in the automatic reinforcement screener when compared to the latency screener. When the 1 min of post-session termination period was extracted from the total, significantly less problem behavior occurred in the latency screener than the other two assessment measures.

Table 3

*Total Session Duration*

<table>
<thead>
<tr>
<th></th>
<th>FA</th>
<th>LS (w/ 1 min)</th>
<th>LS (w/out 1 min)</th>
<th>ARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason</td>
<td>75 min (n = 15)</td>
<td>15 min (n = 3)</td>
<td>15 min (n = 3)</td>
<td>15 min (n = 3)</td>
</tr>
<tr>
<td>Zane</td>
<td>75 min (n = 15)</td>
<td>4.24 min (n = 4)</td>
<td>.24 min (14.32 s) (n = 4)</td>
<td>15 min (n = 3)</td>
</tr>
<tr>
<td>Connor</td>
<td>75 min (n = 15)</td>
<td>3.57 min (n = 3)</td>
<td>.57 min (34 s) (n = 3)</td>
<td>20 min (n = 4)</td>
</tr>
<tr>
<td>Average</td>
<td>75 min</td>
<td>7.6 min</td>
<td>5.27 min</td>
<td>16.7 min</td>
</tr>
</tbody>
</table>

Table 4

*Amount of Target Behavior*

<table>
<thead>
<tr>
<th></th>
<th>FA</th>
<th>LS (w/ 1 min)</th>
<th>LS (w/out 1 min)</th>
<th>ARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason</td>
<td>10 instances</td>
<td>0 instances</td>
<td>0 instances</td>
<td>1 instance</td>
</tr>
<tr>
<td>Zane</td>
<td>7 instances</td>
<td>10 instances</td>
<td>1 instance</td>
<td>9 instances</td>
</tr>
<tr>
<td>Connor</td>
<td>103 10-s PI</td>
<td>16 10-s PI</td>
<td>1 10-s PI</td>
<td>32 10-s PI</td>
</tr>
</tbody>
</table>
**Discussion**

The present study sought to contribute to the sparse body of research on adults with ASD by determining if a screening tool could accurately identify the social or automatic functions of problem behavior in adults with autism spectrum disorder through a series of alone/ignore conditions that terminated after the first instance of target behavior. The latency-based screener expanded on Querim et al.’s (2013) screener by proposing modifications meant to address the commonly encountered challenges of assessing problem behavior in adults; namely, the lack of time, resources, expertise, and safety precautions available in adult programs. It was hypothesized that the latency screener would identify the function category of problem behavior with the same accuracy as the automatic reinforcement screener (Querim et al., 2013) when compared to the standard, multielement functional analysis (Iwata et al., 1982/1994). It was also hypothesized that it would do so in less time and with fewer instances of target behavior than the alternative measures.

**Function Identification**

The latency-based functional analysis posed in this study combined previously researched assertions that latency to target behavior is an accurate measure of response strength when multiple-occurrence measures are not feasible (Thomason-Sassi et al., 2011), and repeated alone/ignore conditions provide sufficient data to discern between social and automatic functions of challenging behavior (Querim et al., 2013). The current study found that, when compared to the traditional multielement functional analysis (Iwata et al., 1982/1994), the latency-based screener correctly predicted the function of target behavior in two out of three participants.

The results of the present study yielded 100% correspondence between the FA and ARS with two independent reviewers, and 66% correspondence with the third. In their study on the
efficacy of the ARS instrument, Querim and colleagues (2013) found that the function identified by the screener corresponded to the results of the standard FA in 28 out of 30 cases. In these comparisons, the dependent variable was identical across assessments (e.g., both the FA and ARS measured target behavior using rate), albeit the condition durations were inconsistent. Of note, the false alarm identified by the latency screener (and by the ARS according to one reviewer) in the present study was identical to one of the incorrect predictions made in Querim (2013) in which the screening instrument predicted an automatic function, while the multielement functional analysis identified a social contingency in the form of access to attention.

The task of differentiating between an attention function and an automatic one for behavior that necessitates an ignore condition (as opposed to an alone condition) poses a unique and potentially problematic challenge for the latency-based assessment. In traditional functional analyses that utilize repeated occurrence measures, behavior can encounter the various contingencies multiple times per trial. As a result, the participant can, theoretically, discriminate between conditions and true differentiation across contingencies can be effectively gleaned. Assessments that use latency to engagement as the dependent variable and terminate after the first instance of behavior inherently allow fewer opportunities for the participant to grasp and, thus, anticipate the consequence of each condition. In other words, if the participant does not identify the contingency, latency to engagement may not be predictive of response strength. Multielement latency-based functional analyses have attempted to overcome this barrier by incorporating several salient stimulus cues to aid in the discrimination of contingencies (Connors et al., 2000; Thomason-Sassi et al., 2011).
It is not necessary for participants to discriminate across different social-reinforcement contingencies in the latency-based screener; the lack of socially-mediated consequences is the foundational rationale for this type of instrument. However, a similar discernment challenge may exist between attention vs. ignore contingencies. This is because the presence of a staff member in an ignore condition may serve as a discriminative stimulus for attention and, if the participant does not have sufficient opportunities to encounter the consequence of ignoring, the true contingency may not be appreciated. As such, the latency-based screener may not be sensitive enough to capture an attention function when the behavior topography requires the presence of an additional person. Further, if the behavior is maintained by access to attention, ignoring may evoke an extinction burst in which the behavior occurs quickly in the session. Such an event would be interpreted by the latency screener as indicative of an automatic function, thereby resulting in a false alarm prediction.

There are several possibilities for rectifying the proposed challenge. Firstly, increasing the minimum number of trials recommended when assessing problem behavior in which an ignore condition is required would allow for greater interaction with the ignore consequence and may better depict the function through either stable rates of short latency (automatic function) or an increasing trend (social function). An alternative solution is consistent with one posed by Querim et al. (2013) in which a pairwise functional analysis (Iwata & Dozier, 2008) that alternates between the control and attention condition is run when a downward trend is observed during the screener. In this event, the screening instrument would not be sufficient on its own, but would likely still serve the purpose of contributing to a shorter functional analysis through the elimination of redundant conditions in a multielement design.
Despite the potential shortcomings of the attention false alarm, the latency screener was able to accurately identify the function of both an automatically-reinforced behavior and a socially-maintained one. Further, the behaviors varied across topographies, pointing to the instrument’s utility of assessing function for a range of problem behaviors. Of note, neither aggressive nor self-injurious behaviors were assessed in this study. Clinicians are, therefore, cautioned against generalizing the construct validity of this instrument to self-injury and aggression before further research can confirm its accuracy in identifying the function of these behavior classes.

**Implications for Assessing Adults**

While the benefits of functional analyses are well documented, the practical challenges of successful implementation are also widely acknowledged. Specifically, functional analyses are time consuming, require multiple staff members to conduct, and necessitate oversight and interpretation by highly trained professionals. Agencies that serve adults on the spectrum rarely have the luxury of these resources. Consequently, adults – whose problem behavior is often deeply engrained through years-long reinforcement – do not receive effective function-based interventions. This reality has detrimental impacts on these adults, their caregivers, and society as a whole.

Several researchers have investigated ways to improve the efficiency of functional analysis procedures. Examples include the brief functional analysis (Northup et al., 1991), the trial-based functional analysis (TBFA) (LaRue et al., 2010), and the automatic reinforcement screener (Querim et al., 2013). To date, the latency-based screener is the shortest known functional analysis tool in existence. The proposed screener took 89.9% less session time than the standard functional analysis to complete. Importantly, this figure is reflective of a shortened
multielement functional analysis session duration consistent with the brief FA (5-min session length as compared to 10-min durations in Querim et al. (2013)); naturally, commonly employed 10-min long session durations would yield more staggering assessment duration comparisons. Further, when compared to reported assessment durations of the trial-based functional analysis, the latency screener took 76% less session time to complete (LaRue et al., 2010). However, this comparison should be interpreted with caution as a TBFA was not included in the present study.

Though the traditional functional analysis yields more information than the latency-based screener (i.e., it can identify the specific socially-maintained contingencies while the screener simply captures the category), as Querim et al. (2013) argued, screening tools can be effective and efficient replacements when automatic-reinforcement is suspected, and can quickly inform subsequent stream-lined functional analysis procedures. That being said, the durations of the latency screener and the automatic reinforcement screener may elicit a more meaningful and arguably fairer comparison. Results from the present investigation indicated that the latency-based screener took 54.5% less session time to determine function than the automatic reinforcement screener.

Another important consideration in the effective implementation of functional analysis procedures is safety. The traditional functional analysis and automatic reinforcement screener necessitate multiple occurrences of target behavior to determine function or function category. In adult populations, repeated engagement in certain problem behaviors is unsafe and ill-advised due to the increased size and strength of the individuals. Further, adult-serving agencies often lack the training necessary to ensure the safe management of aggressive or self-injurious behavior regardless of the clients’ stature. Previous research has shown that latency to responding is an effective means of capturing response strength when safety and feasibility is in
question (Thomason-Sassi et al., 2011). The present study applied Thomason-Sassi et al.’s (2011) protocol by utilizing latency to capture response strength and incorporating a 1-min post-session period following data-collection termination. As a result, 78.33% and 38.1% less target behavior was observed in the latency screener as compared to the standard functional analysis and automatic reinforcement screener, respectively.

Finally, the concern of staff availability and expertise to carry out complicated functional analysis procedures was mitigated through the use of alone conditions – which only necessitate one staff member to collect data – and ignore conditions – for which a single additional staff member was necessary but was not required to carry out complex contingencies. Further, expensive and sophisticated data collection software commonly used in multielement and repeated occurrence functional analyses was not required in the latency-based screener, as the dependent variable could be captured using just a stopwatch. As a result, the resources identified as necessary in most FA protocols but commonly unavailable in adult agencies do not serve as barriers to the successful implementation of the latency-based functional analysis screener.

Limitations and Future Directions

The primary limitation of the present study was the number of data sets; the data collected in this study, though promising, is not sufficient to draw generalizable conclusions about the construct validity of the latency screener. This study attempted to replicate and extend Querim et al.’s (2013) investigation of the automatic reinforcement screener in which 30 behaviors were assessed. The present study was unable to achieve similar enrollment targets due to the unforeseen site closures mandated in response to the COVID-19 pandemic. Future research should incorporate more adult participants and varying behavior topographies to confirm the efficacy of the instrument in identifying the function category of all commonly
encountered forms of problem behavior. Similarly, several assessments could have benefitted from additional trials/series to confirm and clarify function conclusions. For example, Zane’s automatic reinforcement screener data displayed a downward trend after three sessions, though the extent to which the behavior approached zero was inconsistently interpreted. Had additional trials been conducted, the function outcome may have been clarified. Similarly, the variability in Mason’s functional analysis warranted an additional series to confirm function. However, due to limitations on participants’ on-site participation and a second mandated termination of in-person adult services, further assessment could not be carried out.

As previously discussed, additional considerations should be made when ignore conditions are conducted and attention functions are suspected. Potential solutions to the false alarm obstacle include increasing the number of sessions to allow for additional exposures to the contingency, extending the period following initial engagement to allow for greater distinction between ignore and attention conditions, and conducting a subsequent pairwise functional analysis in which attention and control conditions are alternated (Querim et al., 2013). Future research should examine the utility of these modifications and determine if their inclusion would negate the practical benefits of the instrument. Finally, the latency screener may not be an appropriate assessment when the target behavior occurs at low frequencies. In these circumstances, the 5-min long sessions may not be sufficient to capture the behavior and could, therefore, incorrectly indicate that the behavior is socially maintained. Future research could examine the sensitivity of the latency screener to determine a minimum frequency requirement for effective implementation. Clinicians are encouraged to use other proven methods such as longer session durations and/or trial-based functional analyses to assess the function of these low-occurrence behaviors.
Conclusion

This study is the first to examine a single occurrence latency-based automatic reinforcement screener for problem behavior exhibited by adults with autism spectrum disorder. The latency screener presented a means of assessing the function of challenging behavior in adults while overcoming the many practical obstacles inherent to identifying behavior function in this population. It accurately identified the social and automatic functions in two out of three participants and did so with fewer staff members, in a shorter amount of time, and with fewer instances of target behavior than the automatic reinforcement screener (Querim et al., 2013) and the standard, multielement functional analysis (Iwata et al., 1982/1994; Mace & West, 1986). Though future research is required to clarify the utility and validity of the instrument, initial results are promising and suggest that the latency screener may be a viable tool when other functional analysis instruments are not available or appropriate.
References


Association.


Behavior Analysis, 27, 131–144.


Appendix A

(SURROGATE) CONSENT TO TAKE PART IN A RESEARCH STUDY

TITLE OF STUDY: Latency-Based Functional Analysis Screener for Problem Behavior Maintained by Automatic Reinforcement in Adults with Autism Spectrum Disorder
Principal Investigator: Jacqueline Smith, Psy.M.

SECTION I. SUBJECT CONSENT
A person who takes part in a research study is called a research or study subject. In this section, “you” always refers to the individual who will be the research subject.

STUDY SUMMARY: This consent form is part of an informed consent process for a research study and it will provide information that will help you decide whether you want to take part in this study. It is your choice to take part or not.

The purpose of the research is to learn if a new assessment tool can help clinicians determine the function of problem behavior for adults with autism spectrum disorder. If you take part in the research, you will be asked to participate in three separate types of functional analyses.

Your time in the study will take approximately four hours. Participation may occur across several days if necessary, and will take place at the Douglass Developmental Disabilities Center (DDDC) or the Rutgers Center for Adult Autism Services (RCAAS).

Possible harms or burdens of taking part in the study will depend on the type of your problem behavior and may include physical injury and anxiety.

An alternative to taking part in the research study is not to take part in it.

The information in this consent form will provide more details about the research study and what will be asked of you if you choose to take part in it. If you have any questions now or during the study, if you choose to take part, you should feel free to ask them and should expect to be given answers you completely understand. After your questions have been answered and you wish to take part in the research study, you will be asked to sign this consent form. You are not giving up any of your legal rights by agreeing to take part in this research or by signing this consent form.

Who is conducting this research study?
Jacqueline Smith is the Principal Investigator of this research study. A Principal Investigator has the overall responsibility for the conduct of the research. However, there are often other individuals who are part of the research team.

The Principal investigator or another member of the study team will also be asked to sign this informed consent. You will be given a copy of the signed consent form to keep.

Why is this study being done?
When a person has challenging behavior, it is important to understand the function—or why the behavior is happening—so that treatments can be more successful. Researchers and clinicians use assessments called functional analyses to gather that information. This study seeks to determine if a new type of functional analysis—one that is shorter and requires less challenging behavior than other assessments like it—can accurately identify the function of problem behavior in adults on the autism spectrum.

Who may take part in this study and who may not?
Adult clients (ages 18 and older) at the DDDC and RCAAS with autism spectrum disorder who exhibit frequent problem behavior may be asked to participate in this study. Individuals who engage in frequent and severe self-injury will not be part of this study.

Why have I been asked to take part in this study?
You are being asked to take part in this study because you are an adult at the DDDC or RCAAS with autism spectrum disorder and have been identified by staff members as engaging in problem behavior that requires a functional assessment.

How long will the study take and how many subjects will take part?
Five to ten individuals will participate in this study. The length of each individual’s participation will vary slightly, but will likely occur over the course of approximately four hours. Data collection is expected to occur over three months.

What will I be asked to do if I take part in this study?
If you choose to take part in this study, you will be asked to participate in three different forms of functional analysis. Two of the functional analyses are commonly used at DDDC and RCAAS, and have been shown to accurately predict the function of challenging behavior. They are a traditional functional analysis (Iwata et al., 1982/1994) and an automatic reinforcement screener functional analysis (Querim et al., 2013). The third functional analysis is a shortened version proposed by this study. It will require you to stay alone in a room for a maximum of five minutes at a time while researchers monitor your behavior.

What are the risks of harm or discomforts I might experience if I take part in this study?
Risk of physical harm will vary depending on the type of problem behavior. For most subjects, the risk will be minimal, as the target behaviors are not unsafe. Sessions will be stopped if the researcher determines that the behavior is too dangerous (i.e. repeated and forceful self-injury). These parameters are consistent with other studies of the assessment of severe problem behavior.

Are there any benefits to me if I choose to take part in this study?
The results of the assessments will be shared with clinical staff members to aid in the development of treatment. However, it is possible that you may not receive any direct benefit from taking part in this study.

What are my alternatives if I do not want to take part in this study?
Your alternative is not to take part in this study.

How will I know if new information is learned that may affect whether I am willing to stay in the study?
During the course of the study, you will be updated about any new information that may affect whether you are willing to continue taking part in the study. If new information is learned that may affect you after the study or your follow-up is completed, you will be contacted.

Will I receive the results of the research?
In general, we will not give you any individual results from the study. We will, however, provide the results of the assessment measures to your clinical team.

Will there be any cost to me to take part in this study?
There is no cost to participate in this study.

Will I be paid to take part in this study?
You will not be paid to take part in this study.

How will information about me be kept private or confidential?
All efforts will be made to keep your personal information in your research record confidential, but total confidentiality cannot be guaranteed. Confidential means that the research records will include some information about you, and this information will be stored in such a manner that some linkage between
LATENCY-BASED AUTOMATIC REINFORCEMENT SCREENER

your identity and the response in the research exists. No personal identifiers or personal health
information will be collected. Please note that we will keep information confidential by limiting individuals’
access to the research data and keeping it in a secure location. Consent forms with identifying
information will be stored in locked file cabinet separate from data collected for the study. Upon consent,
participants will be provided a numerical code which will be used in place of identifying information on all
subsequent data collection forms and data analysis.

The research team and the Institutional Review Board at Rutgers University are the only parties that will
be allowed to see the data, except as may be required by law. If a report of this study is published, or the
results are presented at a professional conference, no identifying information will be included. All study
data will be kept until 5 years after completion of study procedures.

What will happen to my information collected for this research after the study is over?
The information collected about you for this research will not be used by or distributed to investigators for
other research. All study data will be kept until 5 years after completion of study procedures.

What will happen if I do not wish to take part in the study or if I later decide not to stay in the
study?
It is your choice whether to take part in the research. You may choose to take part, not to take part or you
may change your mind and withdraw from the study at any time.

If you do not want to enter the study or decide to stop taking part, your relationship with the study staff will
not change, and you may do so without penalty and without loss of benefits to which you are otherwise
entitled.

You may also withdraw your consent for the use of data already collected about you, but you must do this
in writing to:

Jacqueline Smith

If you decide to withdraw from the study for any reason, you may be asked to return for at least one
additional visit for safety reasons.

Who can I call if I have questions?
If you have questions about taking part in this study or if you feel you may have suffered a research
related injury, you can contact: Jacqueline Smith at [redacted].

If you have questions about your rights as a research subject, you can contact the Rutgers IRB Director at:
335 George St., Liberty Plaza Ste. 3200, New Brunswick, NJ 08901 (732) 235-2866 or the Rutgers Human
Subjects Protection Program at (973) 972-1149, e-mail us at humansubjects@ored.rutgers.edu or write us
at 65 Bergen Street, Suite 507, Newark, NJ 07107.

___________________________________________________________________________

AGREEMENT TO PARTICIPATE

Subject Consent
I have read this entire consent form, or it has been read to me, and I believe that I understand what has
been discussed. All of my questions about this form and this study have been answered. I agree to
take part in this study.

Subject Name (Print):__________________________________________________________

Subject Signature:________________________________________ Date:________________
Signature of Investigator/Individual Obtaining Consent

To the best of my ability, I have explained and discussed all the important details about the study including all of the information contained in this consent form.

Investigator/Person Obtaining Consent Name (Print): ________________________________

Signature: ________________________________ Date: ________________________________

II. SURROGATE CONSENT

Under certain circumstances, an individual can give consent for another person to take part as a Subject in this Research Study (hereinafter “Study”) because the Subject is unable to consent to this Study and the Subject has not expressed opposition either to this Study or to the determination of incapacity. This individual is called the Legally Authorized Representative, or Surrogate, and is providing Surrogate consent.

You are being asked to serve as the Surrogate for ________________________________, who is called the Subject in this document. You are being asked to give permission for the Subject to participate in this Study. Your decision should be based on the Subject’s individual health care instructions and other wishes, if known, or on your best estimation of what you believe are the Subject’s personal values and what the Subject would choose for himself/herself.

Would the person for whom you are signing consent want to take part in this Study?

This form tells you about this Study. After reading this entire form and having this Study explained to you by someone conducting this Study, you can decide if you think the person for whom you are authorizing consent would want to take part in this Study. It is important to note that the person for whom you are signing consent does not have to take part in this Study in order to receive medical care outside this Study.

What will happen if you, as the Surrogate, do not enroll the Subject in this Study, or if the Subject, or you as the Surrogate, later does not want the Subject to participate in this Study?

The Surrogate can decide not to enroll the Subject. The Subject or the Surrogate can decide to discontinue at any time, the Subject’s participation in this Study. Any decision by the Surrogate not to enroll the Subject or by the Subject or the Surrogate to discontinue the Subject’s participation shall not affect the Subject including the Subject’s receipt of medical care outside the Study. The Subject may withdraw without penalty and without loss of any benefits to which s/he are entitled.

Regardless of the Surrogate’s consent, the Investigator can take the Subject out of this Study at any time because it would not be in the Subject’s best interest to stay in it.

AGREEMENT TO PARTICIPATE

Surrogate Consent

The purpose and procedures for this Study have been described to me verbally and in writing. My questions about this Study have been answered and I have been provided with information about who to contact with additional questions.

As Surrogate, I freely give my consent to allow ________________________________ (printed name of subject) to take part in this Study and authorize that his/her health information as described above, be collected/disclosed in this Study. I understand that by signing this form I am agreeing for the individual named above to take part in research. I understand that I will receive a copy of this form to take with me.
<table>
<thead>
<tr>
<th>Signature of Surrogate</th>
<th>Printed Name of Surrogate</th>
<th>Date</th>
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</thead>
</table>

**Signature of Investigator/Individual Obtaining Consent**

To the best of my ability, I have explained and discussed the full contents of the study including all of the information contained in this consent form. All questions of the research subject and those of his/her parent or legally authorized representative have been accurately answered.

Investigator/Person Obtaining Consent Name (Print): ________________________________

Signature: ________________________________ Date: ____________________

**Signature of Consent Process Witness**

I have observed the consent process which included a description of the purposes and procedures of this Study and an opportunity for questions and answers about this Study. I attest that I am not the subject, his/her guardian or authorized representative, or a researcher on this study and can attest that the requirements for informed consent to the medical research have been satisfied.

Signature of Witness ____________________________ Printed Name of Witness _______________ Date ___________
ADDENDUM: CONSENT TO AUDIO-/VISUALLY RECORD OR PHOTOGRAPH SUBJECTS

You have already agreed to take part in a research study entitled: Latency-Based Functional Analysis Screener for Problem Behavior Maintained by Automatic Reinforcement in Adult with Autism Spectrum Disorder conducted by Jacqueline Smith. We are asking your consent to allow us to videotape you as part of the research. You do not have to consent to be video recorded in order to take part in the main research.

The video recording will be used by my researchers to ensure that data was accurately collected.

The video recording will capture your face, body, and behavior.

The video recording will be stored in a password-protected folder on a password-protected computer at the Douglass Developmental Disabilities Center, with no additional links to your identity. Video recordings will be destroyed 5 years after study procedure completion. The video recordings will not be used by us or distributed to investigators for other research.

Your signature on this form permits the investigator named above to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written consent.

AGREEMENT TO BE RECORDED

Subject/Surrogate Name (Print): ________________________________

Subject/Surrogate Signature ___________________________ Date __________

Investigator/Person Obtaining Consent Name (Printed): ______________________________

Signature ______________________________ Date __________
**Appendix B**

**SURROGATE SELF-CERTIFICATION**
Surrogate Decision Makers for Participation in Research

**SECTION ONE:**

I am willing to serve as a surrogate decision maker for _____________________________ (research participant) to participate in the research study titled Latency-Based Functional Analysis Screener for Problem Behavior Maintained by Automatic Reinforcement in Adults with ASD conducted by the principal investigator, Jacqueline Smith. By initialing and signing below I attest that, to the best of my knowledge, the information I am providing is true and accurate.

**SECTION TWO: CATEGORY of POTENTIAL SURROGATE**

a) Place your initials next to the category that best describes your relationship to the Subject.

b) For the categories ABOVE yours, provide the name(s) of other relative(s).
(For example, if you are the adult son/daughter of the Subject, provide the name(s) of adults, if any, in categories 1 through 4 only).

<table>
<thead>
<tr>
<th>Category</th>
<th>Name(s) of Individual(s) and Contact Information</th>
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<tbody>
<tr>
<td>1. ______</td>
<td>the guardian of the Subject who has authority to make health care decisions for the subject</td>
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<tr>
<td>2. ______</td>
<td>the healthcare representative of the Subject pursuant to an advance directive for healthcare</td>
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<tr>
<td>3. ______</td>
<td>the spouse or civil union partner of the Subject (identified by a civil union license or certificate)</td>
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<td>4. ______</td>
<td>the domestic partner of the potential research Subject (identified by a Certificate of Domestic Partnership)</td>
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<tr>
<td>5. ______</td>
<td>an adult son or daughter of the potential Subject</td>
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<td>6. ______</td>
<td>a custodial parent of the Subject</td>
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<td>7. ______</td>
<td>an adult brother or sister of the Subject</td>
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<tr>
<td>8. ______</td>
<td>an adult grandchild of the Subject</td>
</tr>
<tr>
<td>9. ______</td>
<td>an available adult relative with the closest degree of kinship to the Subject</td>
</tr>
</tbody>
</table>

Printed Name:  
Signature:  
Date:  
Home Telephone:  
Work Telephone:  
Address:  
Cell Phone:  
Email:
Appendix C

Latency Screener Data Collection Form

Subject ID: _______________

*Duration

**Latency Screener – 1 or 2 (circle)**

Date: ___________    Start Time: ___________    End time: ___________

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<th>Latency</th>
<th># of Intervals During Minute</th>
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Subject ID: _______________

*Frequency

**Latency Screener** – 1 or 2 (circle)

Date: _____________  Start Time: _____________  End time: _____________

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<th>Trial</th>
<th>Latency</th>
<th>Frequency During Minute</th>
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Appendix D

Analysis Criteria Handout

Traditional Functional Analysis Criteria (Hagopian et al., 1997)

Automatic Reinforcement:
- Rate of problem behavior is highest in the alone condition and is higher than the control condition
- Rates tend to be higher in alone, attention, and tangible and lower in demand and play
- All conditions are high and relatively stable; no trend

Not Automatic:
- Demand, attention, and/or tangible are differentiated
- Do not assume function if there is a downward trend

Automatic Reinforcement Screener Criteria (Querim et al., 2013)

Automatic Reinforcement:
- High rates of problem behavior are maintained for 3+ screener sessions (alone)

Not Automatic:
- Rates of problem behavior in screener sessions had clear downward trend ending at or near zero
- No problem behavior in screener sessions

Latency Screener Criteria

Automatic Reinforcement:
- Short latency to problem behavior is maintained for 3+ screener sessions (alone)

Not Automatic:
- Latency to target behavior increases across the alone sessions
- Target behavior does not occur