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Using Functionally Matched Interventions with Embedded Preferences to Reduce Transition-Related Challenging Behavior for Children with Autism Spectrum Disorder

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Using Functionally Matched Interventions with Embedded Preferences to Reduce Transition-Related Challenging Behavior for Children with Autism Spectrum Disorder

by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

May 2015

Dedication

I would like to dedicate this dissertation to all my family and friends who have supported and encouraged me on this journey, to the families I have worked with over the years who have inspired and motivated me along the way, and to my mentors and colleagues who have guided and challenged me to excel and never cease in the pursuit of knowledge.

Acknowledgements

First and foremost I would like to thank my parents, Tom and Debby Rojeski, for their unflagging support over the years. Their passion to help others in their respective careers allowed me to grow up in an incredibly encouraging and understanding environment. My mom spent most of her career in the field of special education, and my dad in the field of psychology, helping individuals who were deaf and hard of hearing. Listening to my parents talk about their work instilled in me a desire to help others as well. I am grateful to my parents for always pushing me to consider all options, learn new things, and explore the world on my journey to where and who I am today. This approach allowed me to see the world, expand my knowledge, and increase my understanding to new heights. I am grateful to my parents for listening to all my behavioral talk over the years, their support in reading and editing papers, and their belief in what I am doing. They have celebrated accomplishments with me and been a shoulder to lean on when things have been difficult. They are not only my parents, but my best friends, and I am thankful to be their daughter.

I would also like to thank several people who influenced me greatly during my time in my undergraduate program at Hope College. First, Dr. Pat Roehling helped me secure my first placement working with children with autism spectrum disorders. Her support in gaining experience in an internship in this venue, as well as her continued support through an independent study allowed me to start mastering many of the basic principles of applied behavior analysis. Dr. Roehling also continued to support me through my decisions to pursue a post-graduate degree in the field, and I would not have ended up at University of Texas without her. I would also like to thank the first family I

ever worked with, the Kiger family, for providing me with a great foundation in my chosen career. The Kigers were so encouraging in my learning process and trusting in my abilities. They allowed me to blossom and gain confidence in my skills within their loving family and home.

As I have had the opportunity to work with many families now over the years, I would like to thank all the families I have worked with both clinically and through research. They have inspired and motivated me to continue my work in this field, and allowed me to learn how clinical work affects research and vice versa. I appreciate their willingness to open up their homes to work with me, and their dedication to their children, whom they love. Working with these families allowed me to gain valuable experience, but also the ability to expand my problem solving and critical thinking skills, which are necessary in the field as both a clinician and as a researcher.

Next, I would like to thank my friends who have supported me on this journey. Allison Mankowski, whom I have known since middle school and who has been there for me in many ways over the years – listening when I needed an ear, or encouraging me when I needed support. Becky Hardiman, who I met during her brief stay in Austin when she was here to learn about functional analyses. She has been a positive light for me since the beginning. I appreciate not only her support, but also her absolute belief in my abilities and her constant encouragement. Cindy Gevarter, who has been my other half in so many ways throughout this journey. We not only shared the same program of study, but also the same research assistantship, the same private job, and many similar interests. She has supported and encouraged me in every way through our time at UT, and I am very thankful to have had her in my life. I am grateful for not only our brainstorming and research talk, but also our inside jokes, time spent hanging out, and travels together.

A special thank you to my advisor, Dr. Mark O'Reilly. I am incredibly grateful for his support and trust over the years. He enabled me to take a leadership role with Austin Travis County Integral Care (ATCIC), and trusted that I would run this program at a high standard. This opportunity allowed me valuable experience across a wide range of skills including hiring, training, staff management, budgeting, supervising, and program expansion. The research assistantship at ATCIC afforded me the ability to continue with clinical work, while also providing a pool of potential research subjects to work with. I greatly appreciate Mark's guidance with my research direction over the years. He knew when to support my vision, when to challenge it, and when to help me find a different direction to take. Without his help, I would not have been able to get to this point. I am grateful to have worked under an advisor with such a great record in the field that was so willing to share his knowledge about all aspects of the research process with his research team and help us begin to create our own lines of research.

I would also like to thank the other members of my committee for their support during this process. Dr. Amanda Little and Dr. Terry Falcomata, whom I have known since I was a masters student here, have provided great insight from their years of experience in the field. Dr. Falcomata has also been an amazing help with any questions related to the IRB process and single subject methodology. Dr. Andrea Flower has pushed me to think outside the box and ensure that my study reaches those beyond the field of ASD. Lastly, I am appreciative for the opportunity to collaborate internationally with Dr. Jeff Sigafoos, who has challenged me to think more technically about my study, as well as allowed me to collaborate on another project with him.

Finally, I would like to thank my peers who have helped me on this journey. Cindy Gevarter, who is my sounding board for new ideas and who is always there to help me problem solve or talk through any unexpected situations that arise during research.

Hollie Wingate, for her dedication in helping me conduct this study and devoting so much of her time driving around and running participants with me. Abby Hodges, Samantha Swinnea, Emer Lee, and Christy Ho, for their assistance in assessing and running intervention on participants. And lastly, the rest of the research team, Heather Gonzales, Michelle Kuhn, Nicolette Sammarco, Laci Watkins, and Claudia Zamora, for their support and input. This project would have been impossible without them.

Using Functionally Matched Interventions with Embedded Preferences to Reduce Transition-Related Challenging Behavior for Children with Autism Spectrum Disorder

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The University of Texas at Austin, 2015

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Transitioning between activities is a common challenge for individuals with autism spectrum disorder (ASD). While a body of research has examined effective interventions targeting transitions for individuals with ASD, very few studies have assessed the function of behavior relative to the transition. Determining functionally matched interventions is a critical component to successful outcomes, thus research into functionally matched transition interventions is warranted.

This study examined the effectiveness of a functionally matched embedded preference intervention for three young children with autism spectrum disorder. Using an ABAB reversal with an embedded multielement design, the function of transition-related challenging behavior was first assessed through a transition functional analysis. The functional analysis included two conditions for every traditional functional analysis condition, meaning there was an activity initiation (transitioning to) and activity termination (transitioning away from) component to each function. Transitions with elevated levels of challenging behavior were then targeted for individualized interventions based on participant preferences and behavioral function. Intervention components varied for each participant but included strategies such as using themed

materials (e.g., stickers, bookmarks), using "place savers" when interrupting routines, and using modified instructional materials (e.g., themed worksheets, flashcards).

Results for all three participants showed clear functions maintaining transition-related challenging behavior and included 2-3 targeted transitions for each participant. Results indicated the functionally matched interventions were effective for all three participants, with behavior decreasing to zero or near-zero levels during intervention across all conditions. Interventions appeared to be equally effective across functions of behavior. Results generalized to new skills or people for all participants. Behavior maintained at the 1-month follow up across all intervention conditions for two participants. One participant had less consistent maintenance data, however, behavior did reduce to near zero levels again after a second maintenance check with an added component for one condition. Results indicated important implications for the treatment of transition-related challenging behavior for individuals with ASD in both home and school settings. Results were discussed including limitations, implications, and direction for future research.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Autism Spectrum Disorder (ASD) is a developmental disability that currently affects an estimated 1 in 68 individuals (Center for Disease Control [CDC], 2010). ASD is characterized by deficits in three core areas: social (e.g., social-emotional reciprocity), communication (e.g., limited or no spoken language), and restricted or repetitive patterns of behavior or interests (e.g., stereotyped motor movements; American Psychiatric Association [APA], 2013). Individuals with ASD also often exhibit high levels of challenging behavior, with an estimated number of as many as 94% of individuals with ASD engaging in some form of challenging behavior (Matson, Wilkins, & Macken, 2009). Sigafoos, Arthur, & O'Reilly (2003) defined challenging behavior as "destructive, harmful, disruptive, or otherwise unacceptable behaviors that occur with sufficient frequency and/or severity to be of major concern" (p. 7).

One common trigger for challenging behavior among individuals with ASD is that of transitions, particularly when there are changes in typical routines, which may result in challenging behavior such as aggression, tantrums, noncompliance or self-injury (APA, 2013; Schreibman, Whalen, & Stahmer, 2000). A transition can be defined as a change from one activity or setting to another (Archer & Hosley, 1969; Newman et al., 1995), or more specifically as a "teacher initiated directive to students to end one activity and start another" (Arlin, 1979, p. 42). Transitioning successfully between activities is difficult for children with language or behavioral deficits, such as individuals with ASD (McCoy, 2009). It is estimated that between 20-35% of a preschool or elementary school day may be spent transitioning between activities (Berk, 1976; Schmit, Alper, Raschke, & Ryndak, 2000). Difficulty transitioning between activities may limit an individual's independence and success in a variety of environments or situations, particularly in

community settings (Newman et al., 1995; Schriebman et al., 2000; Sowers, Rusch, Connis, & Cummings, 1980). It may become necessary for an adult to aid in navigation of environments, which results in children with ASD becoming dependent on others to stay on-task, complete activities, or transition between activities (Bryant & Gast, 2000; Forest et al., 2004; Schreibman et al., 2000; Scheuermann & Weber, 2002). Thus, "a major task for the parent or teacher is to structure the environment so that the child can begin to direct his own behavior within that environment" (Osborn & Osborn, 1981, p. 142).

General education classrooms and special education classrooms often use different approaches to signal transitions. Teachers in these classrooms often have different expectations of students in these settings, which can be a challenge for students with ASD who need to navigate different environments (Rosenkoetter & Fowler, 1986). For example, general education classrooms typically use more complex cues, group cues, and longer sets of instructions given several minutes before a desired action for students, whereas special education classrooms tend to use simpler cues, individual cues, and brief instructions immediately before a desired action for students (Rosenkoetter & Fowler (1986). In addition, Rosenkoetter and Fowler (1986) found that special education teachers also tended to use more prompting strategies for individual students, as well as be in closer proximity to students when giving cues to transition. Looking at the classroom system, teacher and classroom management strategies can impact how transitions occur in the classroom (Arlin, 1979; Ferguson, Ashbaugh, O'Reilly, & McLaughlin, 2004). Strategies such as active supervision and pre-correction have been explored as improving the classroom environment as a whole during transitions (Colvin, Sugai, Good, & Lee, 1997; DePry & Sugai, 2002; Lewis, Colvin, & Sugai, 2000).

AUTISM SPECTRUM DISORDERS AND TRANSITIONING

Several core deficits of ASD may play a role in the challenge of transitioning between activities. Individuals with ASD may have trouble processing auditory information (e.g., a verbal cue to transition), and may respond better to other forms of information such as visual input (e.g., visual aids) to help transition between activities (Quill, 1995). Visually cued instruction may benefit individuals with ASD by accompanying gestural or verbal prompts, or by remaining as an environmental cue once these other prompts have been faded out (Quill, 1997). In addition, individuals with ASD may prefer objects to people, and when observing or attending to another person who is giving an instruction, they may focus on certain features rather than the person as a whole (Heflin & Alaimo, 2007). This may result in missing key cues or instructions. Many classroom routines include embedded expectations (e.g., routines teachers may expect students to follow without explicit instruction) that typically developing students may understand. However, oftentimes these hidden expectations may not be identified or understood by students with disabilities (McCoy, Mathur, & Czora, 2010). This means during transition times with embedded expectations, students with disabilities may show decreased levels of attention and decreased levels of appropriate behavior compared to their typical peers (McCoy et al., 2010).

Flannery and Horner (1994) proposed the predictability hypothesis as a possible explanation for why individuals with ASD have trouble transitioning. Essentially, the authors argue individuals with ASD have a higher need for predictability in their environments than those without ASD, and individuals with ASD may be unaware of naturally occurring cues that signal upcoming change in their environments. Thus, manipulating environmental events to make changes and transitions more predictable would serve to decrease challenging behavior for individuals with ASD (Flannery &

Horner, 1994). However, the predictability hypothesis does not fully explain why there are still some individuals with ASD who continue to have difficulty transitioning despite predictable, consistent routine transitions (Sterling-Turner & Jordan, 2007).

FUNCTIONAL ANALYSIS OF BEHAVIOR

Understanding the function of challenging behavior in individuals with ASD is a crucial first step in effective treatment (Carr, 1994; Emerson & Einfeld, 2011) and allows a "functional match" between behavior and intervention (Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990). The first studies on functional analysis were with animals (Holz & Azrin, 1961; Schaeffer, 1970), with only one early human study (Carr, Newsom, & Binkoff, 1976). Expanding upon this initial foundation, Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) introduced an operant methodology for the functional analysis of challenging behavior, which aimed to demonstrate and explain the relationships between challenging behavior and different environmental events. A functional analysis systematically manipulates antecedent and consequence environmental events and observes and records their effect on challenging behavior through four typical conditions: attention, demand, tangible, and play (Carr & Durand 1985; Iwata et al., 1982/1994). Results of functional analyses aim to show whether challenging behavior for that individual is maintained by access to attention, access to tangibles, escape or avoidance of demands, or automatically maintained (Carr & Durand, 1985; Iwata et al., 1982/1994).

Although functional analyses provide strong evidence as to the function maintaining challenging behavior for an individual, there may also be other factors to consider. Carr (1994) discussed the concept of escape-maintained challenging behavior and stated there are actually two types of escape behavior: task avoidance (i.e., avoiding demands or work tasks) and social avoidance (i.e., avoiding a person or form of social

interaction). Thus, a common intervention strategy for escape behavior for task avoidance, such as teaching the student to request a break or help, would be unsuccessful for students with social avoidance who want to avoid a person (Carr, 1994). Golonka et al. (2000) also investigated escape-maintained challenging behavior and found escape behavior was maintained by two different factors of either (a) wanting a break from the activity, or (b) the subsequent access to preferred activities, showing escape-maintained behavior should be assessed both by what participants are escaping *from* and what participants are escaping *to*. The authors found when given the opportunity to work for an enriched break (versus a break alone), challenging behavior decreased and adaptive behavior increased (Golonka et al., 2000). In a more recent study, Gardner, Wacker, and Boelter (2009) examined how low versus high quality attention during demands can influence the challenging behavior of escape-maintained participants. They found participants had lower levels of challenging behavior when given high quality attention during demands than when given low quality attention. In the analysis prior to intervention, neither participant showed an attention function of behavior, but high quality attention appeared to serve as reinforcement during demands and thus lowered the levels of challenging behavior for both participants.

TRANSITION-RELATED FUNCTIONAL ANALYSIS

Similarly to these studies examining elements of escape-maintained behavior, when deciding on an intervention to address transition-related challenging behavior, it is important to consider what individuals are transitioning *to* and what they are transitioning *from* through a functional assessment. Doss and Reichle (1991) first suggested recording various aspects of the transition process to assist in identification of the motivational basis for transition-related challenging behavior. They analyzed three types of transitions:

pleasant to pleasant, unpleasant to pleasant, and unpleasant to unpleasant. However, this initial study was difficult to interpret in terms of maintaining contingencies, as there appeared to be multiple functions involved. For example, in the unpleasant to pleasant condition, it would be difficult to determine if the participant had challenging behavior in order to escape the unpleasant or to access the pleasant or both. Kern and Vorndran (2000) collected data on challenging behavior during four transitions including school to evaluation session, evaluation session to school, school to lunch, and recreation to school. Results indicated the participant had the highest levels of challenging behavior during the evaluation session to school and the recreation to school, suggesting a possible avoidance function. It is again difficult to interpret these findings though as multiple functions may be involved. For example, when transitioning from recreation to school, the participant may not want to end recreation (i.e., tangible function) or may want to avoid school (i.e., escape function), or may seek attention from teachers or peers when transitioning between locations (i.e., attention function).

McCord, Thompson, and Iwata (2001) took their assessment of transition-related challenging behavior further and implemented a functional analysis of transition behavior. The authors implemented 20 transition conditions plus two control conditions examining three elements of transition: termination of an activity, initiation of an activity, and location change. Consider as an example, a potential tangible function of transition-related challenging behavior. In this study, a tangible item would have been explored in four conditions including (a) tangible to neutral without changing location, (b) tangible to neutral with a location change, (c) neutral to tangible without changing location, and (d) neutral to tangible with a location change. Conditions were approximately 5 min in length, beginning with 2 min at the first location, the length of time it took to transition, and then 2 min in the secondary location. Conditions were conducted similarly to a

traditional functional analysis (Iwata et al., 1982/1994), in that if the participant engaged in challenging behavior while transitioning or while in the secondary activity, s/he was returned to the original activity. The authors found elevated levels of challenging behavior for both participants across multiple conditions, including the no activity condition (i.e., transitioning from no activity to no activity), which might suggest the participants had difficulty with the transition itself, regardless of the transition activities. They also found the majority of challenging behavior to take place during transitions with location changes, although one participant had several conditions of high challenging behavior with and without location changes. This suggests some functions of behavior may only trigger challenging behavior when coupled with a location change during transitions, while others may trigger behavior regardless if there is a location change or not (McCord et al., 2001).

CURRENT TRANSITION-RELATED INTERVENTIONS

While few studies have implemented a systematic functional analysis of transition-related challenging behavior prior to intervention, there have been many studies that have targeted transition-related behaviors. The most common intervention is the use of visual schedules (Lequia, Machalicek, & Rispoli, 2012). Visual schedules assist in the organization of information through visuals (often pictorial), as well as aiding in comprehension of and attending to instructions (Banda, Grimmett, & Hart, 2009; Dettmer, Simpson, Myles, & Ganz, 2000; Flannery & Horner, 1994). Visual schedules have been used to promote positive behavior changes in individuals with ASD across a variety of skills. Betz, Higbee, and Reagon (2008) and Massey and Wheeler (2000) measured engagement in children with ASD related to transitions. Other studies have evaluated play skills and socio-dramatic play (e.g., Dauphin, Kinney, & Stromer,

2004; Morrison, Sainato, Benchaaban, & Endo, 2002), on-task behavior (e.g., Bryan & Gast, 2000) and self-management (e.g., Newman et al., 1995). In addition to these, independent transitions have also been investigated in the literature (e.g., Pierce, Spriggs, Gast, & Luscre, 2013). Several studies have implemented activity schedules through a different approach with the use of a personal digital assistant to aid in independent transitioning behavior (e.g., Mechling & Savidge, 2011; Palmen, Didden, & Verhoeven, 2012), while others have reached beyond academic settings to target independent transitions during daily living tasks (e.g., Pierce & Schreibman, 1994).

Few studies within the ASD population have utilized interventions other than activity schedules as the primary intervention to target transition-related challenging behavior. Many studies involve multiple intervention components and thus may include strategies such as verbal prompting (Cale, Carr, Blakely-Smith, & Owen-DeSchryver, 2009) or praise (e.g., Dettmer, Simpson, Myles, & Ganz, 2000). A couple of studies have utilized video modeling to assist during transitions. For example, Cihak, Ayres, and Smith (2010) used video modeling for elementary students with ASD to improve independent transitioning with participants. Results indicated video modeling was effective in improving independent transitioning for participants, and reduced transition-related challenging behavior. Another study examined traditional pictorial visual schedules through the use of video-based activity schedules with embedded video modeling (Cihak, 2011). Results were mixed, with two participants improving their independent transitioning with a static pictorial visual schedule, and one participant improving his independent transitioning with the video modeling within the video-based schedule.

STUDY PURPOSE

While these studies provide a foundation for effective treatments for transition-related challenging behavior with the ASD population, many of these studies lack functional assessment of challenging behavior and do not measure challenging behavior as a dependent variable. The purpose of this study is to examine the effect of functionally matched interventions based on participant preferences in order to reduce challenging behavior associated with transitions. The first step was to determine participant preferences, as well as conduct a transition functional analysis similar to that described by McCord et al. (2001). Based on these results, preferences were embedded into the secondary transition location and interventions were matched to behavioral function. The effectiveness of the intervention was examined through the use of an ABAB reversal with an embedded multielement design (Kennedy, 2005).

RESEARCH QUESTIONS

This study will address the following research questions:

1. Does the functional analysis of transition-related challenging behavior appear to be effective in identifying maintaining contingencies?

2. Will a functionally matched intervention utilizing embedded preferences be effective in reducing challenging behavior associated with transitions?

3. Does the intervention appear to be equally effective across functionally matched individualized interventions?

4. Will the effects of the intervention maintain over time, and when multiple settings, items or people for the same function exist, will the effects of the intervention generalize to the new items, settings or people?

Chapter 2: Review of Literature

There have been numerous studies exploring positive effects of interventions on transition-related behavior for individuals with ASD targeting behaviors such as engagement (e.g., Betz et al., 2008), self-management (e.g., Newman et al., 1995) and on-task behavior (e.g., Bryan & Gast, 2000). These studies have included a range of interventions including activity schedules (e.g., Lequia et al., 2012), personal digital assistants (e.g., Mechling & Savidge, 2011; Palmen et al., 2012), and video modeling (e.g., Cihak, 2011; Cihak et al., 2010). While the majority of these studies discuss the challenging behavior of their participants, they do not measure challenging behavior as a dependent variable during the intervention. Positive measures of behavior may capture effective change, however, it is possible some forms of challenging behavior could occur concurrently along with appropriate behavior. For example, a student may independently transition while crying or verbally protesting. Thus, if independent transitions were being measured, the student would meet criteria, but still be engaging in inappropriate behavior concurrently. In addition, few studies on transition-related behavior with the ASD population have identified various topographies of challenging behavior as dependent measures (e.g., Buschbacher, Fox, & Clarke, 2004; Dooley, Wilczenski, & Torem, 2001; Schmit et al., 2000). Of these, fewer still implemented a systematic functional assessment of transition-related challenging behavior prior to intervention (e.g., Leon, Lazarchick, Rooker, & DeLeon, 2013).

Sterling-Turner and Jordan (2007) conducted a brief review on interventions for individuals with ASD to address transition-related challenging behavior. They included all studies on transition, and did not limit their review to studies with dependent measures of challenging behavior. At the time of their review, few studies had targeted challenging

behavior related to transitions in the ASD population. The authors suggested strategies such as visual cues (e.g., Schmit et al., 2000), auditory cues (e.g., Tustin, 1995), and video priming (e.g., Schreibman, Whalen, & Stahmer, 2000) could be useful for individuals with ASD. However, the research on each of these interventions was quite limited, and the authors did not review assessment of transition-related behavior as part of their review (Sterling-Turner & Jordan, 2007).

It is therefore important to analyze this body of literature in a newer light and include more recent publications on transition-related challenging behavior in individuals with ASD. In order to focus on the reduction of challenging behavior during transitions, it is important to review studies that directly measured challenging behavior as a dependent variable during the study. In addition, it is critical to determine how studies have assessed the possible function of transition-related challenging behavior prior to implementing an intervention, and explore any trends that arise surrounding effective interventions across potential functions of behavior.

TRANSITION-RELATED INTERVENTIONS FOR INDIVIDUALS WITH ASD

There is currently a relatively small research base of studies that have measured challenging behavior as a dependent variable when looking at transition-related challenging behavior in individuals with ASD. Ample research has been conducted with the broader developmental disability population, and these strategies have begun to demonstrate evidence of success for individuals with ASD in the literature (Sterling-Turner & Jordan, 2007). Seventeen studies to date have directly measured challenging behavior during transition interventions for individuals with ASD utilizing a variety of strategies, although two of these had multiple studies within the publication (Cale et al., 2009; Flannery & Horner, 1994). Information on included studies can be found in

Table 1: Assessment and Interventions for Transition-Related Behavior for Individuals with ASD.

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
Angell et al. (2011)	1 male with ASD (age 11) Latency during transitions ABABAB design	Informal assessment based on teacher report Undetermined Function – Hypothesized Generalized	Power Card (pictorial & written cue with student interests on it giving instruction as to appropriate desired behavior), verbal script of power card action, and verbal praise School Classroom	Decrease in mean latency during transitions between activities
Banda & Kubina (2006)	1 male with ASD (age 13) Latency during transitions; prompt dependency ABAB design	Informal assessment based on teacher report Undetermined Function – Hypothesized Avoidance	High-p response sequence (verbal questions) prior to low-p transition behavior; verbal praise for compliance School Classroom	Trends showed decreased duration for task completion and decreased prompt usage, however, results between conditions had significant overlap
Buschbacher et al. (2004)	1 male with ASD & Landau-Kleffner syndrome (age 7) Tantrums, aggression, elopement, hyperactivity, inappropriate touching or material use Multiple Baseline Across Settings (transitions) design	Functional Assessment Interview with parents; formal observation with ABC data collection Tangible and/or Attention for two, & Escape for one	Multi-component support plan including long term supports, prevention strategies, replacement skills, and consequences for each of the three targeted transitions taught to parents with a variety of strategies to implement for each transition In-Home	Decrease in challenging behavior and increase in engagement in all three conditions

Table 1 (cont.)

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
Cale et al. (2009)	Study 1: 1 male & 2 females Male – Aspergers, (age 8) Females – both PDD, (age 5) Study 2: 3 males with ASD (ages 6-7) Study 3: 1 male & 2 females Male – Aspergers Female 1 – ASD Female 2 – PDD (ages 5-7) Latency during transitions, challenging behavior Multiple Baseline Across Participants design	Contextual Assessment Inventory by parents followed by structured interview with parents and/or teachers All studies were Undetermined Functions – Study 1: Hypothesized Generalized Study 2: Hypothesized Tangible Study 3: Hypothesized Avoidance/Escape	Study 1: Visual schedule, verbal warning of upcoming transition, environmental arrangements (e.g., proximity of location change), and "What did I miss?" cue card Study 2: Countdown cards to signal upcoming end of preferred activity and transition to next activity Study 3: Choice between equivalent activities where one was a feared stimulus and the other was not All three studies were conducted in a School Classroom	Study 1: Decrease in latency during transitions and increase in task completion for all participants. Very few sessions ended due to challenging behavior Study 2: Increased latency to the onset of challenging behavior once a preferred activity ended and increase in task completion. Very few sessions ended due to challenging behavior Study 3: Increased latency to the onset of challenging behavior and increase in task completion.
Clarke et al. (1999)	1 male with Aspergers syndrome (age 10) Latency during routine transition, disruptive behavior ABAB design	Functional Assessment Interview with family members; direct observation Undetermined Function - Hypothesized Escape/Avoidance and Tangible	Visual chart (pictorial and written cues for routine), modified clothing arrangements, and contingent reinforcement In-Home	Decrease in disruptive behavior, increase in engagement, and decrease in latency with the intervention

Table 1 (cont.)

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
Dettmer et al. (2000)	2 males with ASD (ages 5 & 7) Latency during transitions ABAB design	Informal observation and caregiver interviews Undetermined Function – Hypothesized Generalized	Visual schedule plus verbal prompting; physical prompting, additional visuals and a timer were required for the second participant Various community settings for one participant In-Home for second participant	Decrease in latency to complete transitions for both participants; less prompts required during intervention than during baseline
Dooley et al. (2001)	1 male with PDD (age 3) Tantrums, aggression, noncompliance ABC design	Direct observation and parent report Undetermined Function Hypothesized Generalized (automatic), Escape, Attention	Visual picture schedule with edible reinforcement for completing task, followed by visual schedule alone School Classroom	Decrease in disruptive behavior and increase in compliance, however, design did not show experimental control
Flannery & Horner (1994)	2 males with ASD (age 14 & 17) Disruptive behavior, noncompliance Study 1: ABAB with embedded alternating treatments design Study 2: ABCBC design	Functional Assessment Interview with staff and direct observation Undetermined Function Hypothesized Generalized (automatic)	Study 1: Description and modeling of task and assistance to complete task in two conditions – familiar and unfamiliar tasks Study 2: Added predictable components to randomized schedule including verbal prompting, visuals, and a timer School Classroom	Study 1: Decrease in levels of problem behavior for unfamiliar tasks when intervention components were in place Study 2: Decrease in problem behavior when predictable components were added to a randomized schedule

Table 1 (cont.)

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
Krantz et al. (1993)	3 males with ASD (ages 6-8) Tantrums, aggression, stereotypy, self-injury, property destruction Multiple Baseline Across Participants design	No Assessment Discussed Undetermined Function – Hypothesized Generalized (automatic)	Parent-implemented photographic activity schedules In-Home	Decrease in levels of disruptive behavior for all participants and increase in engagement
Leon et al. (2013)	1 female with ASD (age 9) Self-injury, aggression, disruptions, arranging materials ABAB with embedded multiple baseline across behaviors design	Formal assessment - control condition vs. blocked condition in multielement format Ritualistic (automatic)	FCT + extinction in two conditions including disruption of ritualistic arrangements (rearranged an item) & item removal (removed an item completely). Item removal condition was to simulate activity termination (i.e., transition) In-Home	Decrease in problem behavior and increase in appropriate communication in both conditions
Machalicek et al. (2009)	3 males with ASD (ages 6, 7, 12) Stereotypy, self-injury, aggression, tantrums Multiple baseline across participants design	Informal assessment based on teacher report Undetermined Function – Hypothesized Ritualistic (automatic) for two Hypothesized Tangible for one	Visual schedule, verbal instructions, graduated guidance, praise, edible reinforcement Recess at School	Decrease in challenging behavior, increase in play and increase in task correspondence for participants

Table 1 (cont.)

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
O'Reilly et al. (2005)	1 male with ASD (age 12) Self-injury ABAB design	Traditional Functional Analysis Escape/Avoidance	Activity Schedule with similar content to functional analysis conditions School Classroom	Decrease in self-injury and increase in engagement, particularly when the order was no interaction – play – demand
Sainato et al. (1987)	3 males with severe ASD (ages 3-4) Latency during transitions, inappropriate behavior (e.g., wandering) Alternating Treatments design across three settings	Direct observation and teacher report Undetermined Function – Hypothesized Generalized (automatic)	Peer-mediated intervention (peer aided in transition by holding participant's hand and prompting to next location) Antecedent prompt intervention (child was instructed to go to next area and ring a bell) School Classroom	Both the peer and antecedent interventions were effective in improving the rate of movement for participants across settings
Schmit et al. (2000)	1 male with ASD (age 6) Tantrums Multiple Baseline across settings (transitions) design	Informal parent/teacher report Undetermined Function – Hypothesized Generalized (automatic)	Photographic cue representing the next activity and a verbal cue School Classroom	Decrease in tantrums across settings, however, one setting had some unstable, overlapping data
Schreibman et al. (2000)	3 males with ASD (ages 3, 3 & 6) Tantrums, Aggression Multiple Baseline Across Participants design	Direct observation and parent report Undetermined Function – Hypothesized Avoidance for one, Tangible for one, and Generalized (automatic) for one	Video priming immediately prior to transition Home for one participant; Community settings for two participants	Decrease in tantrum behavior with video priming for all three participants across all settings

Table 1 (cont.)

Citation	Participants, Target Behavior & Design	Functional Assessment & Function	Intervention & Setting	Results
Tustin (1995)	1 male with ASD (age 28) Stereotypy ABAB design	Direct observation and ABC data collection Undetermined Function Hypothesized Function – Generalized (automatic)	Advanced verbal notice of transition 2 minutes prior to change and praise for compliance Vocational Center	Decrease in stereotypy when given advance notice of upcoming transition
Waters et al. (2009)	2 males with ASD (age 6) Aggression, disruption Alternating Treatments design	Brief functional analysis of activity initiation, activity termination and control Tangible & Escape for both participants	Visual schedule alone followed by alternating treatments of DRO + extinction compared in two conditions – one with a visual schedule and one without a visual schedule School Classroom	Visual schedule alone was not effective; DRO + extinction was effective with and without visual schedule but slightly more effective with visual schedule, however, results had significant overlap

Table 1. Included studies were identified through a literature search in EBSCOhost Research Databases including the key word of "autism" paired with "transition" and "activity transition" with several additional Boolean operators serving to eliminate studies focusing on the transition to adulthood (e.g., NOT "rehabilitation counseling"). A hand search was then conducted of the Sterling-Turner and Jordan (2007) review and of any other articles that were identified as meeting criteria following the initial literature search.

Transitions are an integral part of the school day, and the ability to transition is a critical skill for students in order to have independence and classroom success (Newman et al., 1995; Schriebman et al., 2000). In addition, preschool and elementary school students spend a large portion of their day spent in transition (Berk, 1976; Schmit et al., 2000). Therefore, almost all participants have been of elementary school age (e.g., Angell, Nicholson, Watts, & Blum, 2011; Krantz, MacDuff, & McClannahan, 1993) with the exception of a couple of studies including teenagers (Banda & Kubina, 2006; Flannery & Horner, 1994) and one study with an adult (Tustin, 1995). Similarly, many of the studies have also been conducted in school classrooms (e.g., Cale et al., 2009; Dooley et al., 2001), including one conducted during recess (Machalicek et al., 2009), while a few have also been conducted in the home (e.g., Krantz et al., 1993), in the community (e.g., Dettmer et al., 2000; Schreibman et al., 2000), and at a vocational center (Tustin, 1995). A variety of topographies of behavior were included as dependent measures with the most common challenging behaviors being latency during transitions (e.g., Angell et al., 2011; Banda & Kubina, 2006; Cale et al., 2009; Dettmer et al., 2000; Sainato, Strain, Lefebvre, & Rapp, 1987) and tantrums (e.g., Buschbacher et al., 2004; Dooley et al., 2001; Krantz et al., 1993; Schmit et al., 2000; Schreibman et al., 2000).

ASSESSMENT OF TRANSITION-RELATED CHALLENGING BEHAVIOR

Indirect assessment of challenging behavior in the form of parent or teacher report was utilized in the majority of studies. Most studies simply reported informally collecting information from parents or teachers without identifying or describing a specific method (e.g., Angell et al., 2011; Banda & Kubina, 2006), although a few studies implemented structured indirect assessments with parents and teachers. For example, Cale et al. (2009) used the Contextual Assessment Inventory (CAI) with parents prior to selecting

participants for the study. The CAI is a rating scale used to help parents identify contexts that trigger challenging behavior in a variety of settings (Carr, Ladd, & Schulte, 2008). Several studies also used structured interviews with parents or teachers. Buschbacher et al. (2004), Clarke, Dunlap, and Vaughn (1999), and Flannery and Horner (1994) all used the Functional Assessment Interview (FAI) with parents or teachers, which aims to identify the variables that trigger and maintain challenging behavior (O'Neill, Horner, Albin, Storey, & Sprague, 1990).

Direct assessment of challenging behavior was conducted in several studies. Buschbacher et al. (2004) directly observed the participant following the FAI with parents and collected antecedent-behavior-consequence (ABC) data on challenging behavior during transitions. Several other studies also directly observed participants but did not explicitly state data collection procedures during observation (Clarke et al., 1999; Dooley et al., 2001; Flannery & Horner, 1994; Sainato et al., 1987; Schreibman et al., 2000; Tustin, 1995). Thus, while direct observation was conducted, without procedures for data collection, it is impossible to know how rigorously or systematically these direct observations were conducted.

Only three studies systematically assessed transition-related challenging behavior through direct manipulation of conditions. Leon et al. (2013) assessed the behavior of a participant who exhibited challenging behavior when her ritualistic toy arrangements were disrupted. The authors conducted a control condition and a test condition in a multielement format. The control condition consisted of removing a piece of a board game and setting in back on the board every minute, while the participant was allowed to rearrange or straighten the piece as she desired. In the test condition, the removed piece was placed in a different spot and any attempts by the participant to rearrange or straighten the piece were blocked. Results indicated the participant engaged in higher

levels of challenging behavior when her responses were blocked and she was not allowed to rearrange or straighten the pieces. The item removal condition was meant to simulate the potential termination of the activity, demonstrating how activity termination would likely trigger challenging behavior (Leon et al., 2013). A second study by O'Reilly, Sigafoos, Lancioni, Edrisinha, and Andrews (2005) conducted a traditional functional analysis including attention, demand, play, and no interaction conditions to assess self-injury in a participant with ASD. The no interaction condition was included to assess behavior without social consequences. Results indicated the participant engaged in self-injury in order to escape or avoid work in the demand condition. Results also later indicated behavior levels were tied to the order in which conditions were presented, suggesting how transitioning between certain conditions may serve to trigger or prevent challenging behavior from occurring.

A final study by Waters, Lerman, and Hovanetz (2009) assessed the function of three transitions for two participants following a similar protocol to that of McCord et al. (2001). The authors examined activity initiation (no activity to non-preferred activity; escape/avoidance function), activity termination (preferred activity to no activity; tangible function), and a control condition (no activity to preferred activity). Contingent on challenging behavior during any of the conditions, the participant was moved back to the original location and activity he was at prior to the transition. Results indicated both participants had challenging behavior when an activity was initiated (i.e., escape/avoidance) and when an activity was terminated (i.e., tangible) and no behavior during the control condition (Waters et al., 2009).

FUNCTIONS OF TRANSITION-RELATED CHALLENGING BEHAVIOR

As the majority of studies did not implement systematic procedures for assessment of challenging behavior, the identified functions of behaviors were primarily considered "undetermined", although many of the studies hypothesized as to the function of behavior. Four studies implemented procedures that allowed a determination of function. Through the use of ABC data collection, Buschbacher et al. (2004) determined the participant to have challenging behavior maintained by access to tangibles and/or attention for transitions related to dinner and family television watching, and behavior maintained by escape or avoidance during transitions related to his bedtime routine. Leon et al.'s (2013) test and control conditions demonstrated disruptions to ritualistic toy arrangements triggered challenging behavior, suggesting a "ritualistic" function, as it included both elements of tangible and automatic functions directly related to disruption of a routine. The participant in the study by O'Reilly et al.'s (2005) study was found to engage in self-injury in order to escape or avoid transitioning to demands. Lastly, the brief functional analysis by Waters et al. (2009) showed both an escape/avoidance and tangible function for both participants.

Of the studies with undetermined functions, the majority of studies focused on "generalized" transitions, meaning the transitions themselves seemed to trigger behavior (e.g., Angell et al., 2011; Dettmer et al., 2000; Flannery & Horner, 1994). As individuals with ASD often have difficulty with changes in routines and transitions (APA, 2013), this "generalized" transition difficulty may be best categorized under the automatic function (i.e., adherence to routines, difficulty with transitions). For example, Flannery and Horner (1994) compared predictable and unpredictable elements and found making elements of a transition more predictable led to less challenging behavior. Dooley et al. (2001) also discussed the participant's behavior as being triggered in situations when he did not have

control, suggesting an automatic function. Of the other functions, the maintaining contingency for challenging behavior was hypothesized as escape or avoidance in several studies (e.g., Banda & Kubina, 2006; Dooley et al., 2001), tangible in two (Cale et al., 2009; Schreibman et al., 2000), and attention in one (Dooley et al., 2001). Finally, Machalicek et al. (2009) had two participants whose challenging behavior appeared to have a "ritualistic" function seemingly triggered by disruption of stereotypy or ritualistic behavior at recess.

INTERVENTIONS FOR TRANSITION-RELATED CHALLENGING BEHAVIOR

Numerous studies included multiple components in a treatment package for intervention to reduce challenging behavior associated with transitions. Common strategies included as package components were verbal praise (e.g., Angell et al., 2011; Banda & Kubina, 2006) and prompting (e.g., Dettmer et al., 2000). No studies included a component analysis evaluating which elements of the treatment packages were most effective, thus individual elements of intervention packages cannot be evaluated independently. In targeting transition-related challenging behavior, visual cues and auditory cues were the interventions implemented most frequently across studies, although several studies explored other types of strategies.

The most common intervention used to treat transition-related challenging behavior was the use of visual cues. Several studies implemented an activity schedule as the main component of their intervention (Cale et al., 2009; Dettmer et al., 2000; Dooley et al., 2001; Krantz et al., 1993; O'Reilly et al., 2005; Waters et al., 2009), with a couple of studies implementing a visual schedule alone as the transition intervention (Krantz et al., 1993; O'Reilly et al., 2005). However, often more than a visual schedule alone was necessary for successful transitions. Cale et al.'s (2009) first study included a verbal

warning of transition, environmental modifications (i.e., reduced distance between activity locations), and an additional visual cue card (i.e., "What did I miss?" card for entering activities already in progress) along with the visual schedule. In another study, Dettmer et al. (2000) included verbal prompting and a timer in addition to the visual schedule. Both studies found positive results of the intervention resulting in a decrease in challenging behavior. Another study used a visual schedule in conjunction with verbal prompting, graduated guidance, praise, and edible reinforcement during recess for three participants to decrease challenging behavior and increase play by rotating through different recess activities (Machalicek et al., 2009). The authors found the intervention reduced challenging behavior, increased play, and increased task correspondence (i.e., taking visual schedule picture to correct activity on the playground) for all participants. Dooley et al. (2000) initially used edibles to reinforce successful transitions along with the visual schedule and then later faded out the edibles and used the visual schedule alone to facilitate transitions. In one study, a visual schedule alone had no effect on the challenging behavior of the participant (Waters et al., 2009). In this study, it was necessary to add differential reinforcement of other behavior (DRO) plus extinction. This intervention's effectiveness was compared with and without the use of a visual schedule. Results indicated that DRO plus extinction was effective overall, but slightly more effective with the additional support of the visual schedule.

Three studies used visuals other than an activity schedule. Instead of an activity schedule, Schmit et al. (2000) used a simple photographic cue along with a verbal cue to signal the next activity. This photographic cue was presented to the participant when it was time to transition (no advance warning was given) in order to aid in the transition process. This strategy was effective for the participant and resulted in a decrease in tantrum behavior across settings, although one setting showed overlapping data. In their

second study, Cale et al. (2009) used countdown cards to signal the upcoming end of an activity, which was successful in reducing challenging behavior associated with transitioning away from the activity. In another study, Clarke et al. (1999) utilized a visual of a dressing routine along with modified clothing arrangements and a reinforcement contingency to improve the morning dressing routine and transition behavior of their participant. This intervention package was successful at decreasing latency and disruptive behavior as well as increasing engagement. Finally, Angell et al. (2011) implemented a strategy called a Power Card to assist in transitions for an individual who had an unacceptable latency during transitions. The Power Card was a pictorial and written cue that included the participant's interests (i.e., SpongeBob) and provided an instruction as to the desired transition behavior. In addition to the Power Card, a verbal script of the Power Card action and verbal praise were used, and this treatment package resulted in a decreased latency during transitions (Angell et al., 2011).

There were several studies that implemented interventions other than visual strategies. Banda and Kubina (2006) used a high-probability (high-p) response sequence to assist in transition behaviors that were considered low-probability (low-p) behaviors. High-p demands (i.e., questions the participant regularly answered) were presented prior to the low-p transition (e.g., going to his locker), and verbal praise was given for compliance with transitions. Results demonstrated a decrease in transition latency and a decrease in prompt usage, although there was significant overlap of data points across conditions (Banda & Kubina, 2006). Tustin (1995) implemented a simple advanced verbal warning 2 min prior to the transition along with praise for compliance, which was successful in reducing the stereotypy of the participant. Cale et al.'s (2009) third study involved participants who seemed to fear certain stimuli involved in typical classroom demand activities. The authors implemented a choice procedure where the participant

could choose between two academically equivalent activities where one included the feared stimulus and one did not. Results indicated a decrease in challenging behavior and an increase in task completion.

Flannery and Horner (1994) conducted two studies to target disruptive behavior and noncompliance during transitions involving unfamiliar tasks. In the first study, a description of the task and assistance in completing the task were provided in two conditions – familiar and unfamiliar tasks. With the intervention in place, challenging behavior decreased for unfamiliar tasks. In the second study, predictable components were added into a randomized schedule along with verbal prompting, visuals and a timer, which resulted in a decrease in challenging behavior (Flannery & Horner, 1994).

Schreibman et al. (2000) was the only study to utilize video priming as the intervention for tantrums and aggression related to transitions. The brief videos demonstrating the appropriate transition behavior were shown to participants immediately prior to the transition. This resulted in a decrease in challenging behavior for all participants across various settings. Another study was unique in their approach to transition-related challenging behavior to target ritualistic toy arrangements in a child with ASD (Leon et al., 2013). Of the two conditions used (i.e., rearranging an item and item removal), the item removal phase was used to simulate activity termination (i.e., transitioning away from the item). The authors used functional communication training (FCT) plus extinction as well as disruption of routine to target self-injury in the participant, which was effective in decreasing challenging behavior and increasing appropriate communication for the participant (Leon et al., 2013).

Only one study implemented a peer intervention to target challenging behavior during transitions for participants. Sainato et al. (1987) conducted two studies, and in the first study a peer aided in the transition process by holding the participant's hand and

prompting the participant to the next location. This intervention resulted in an improved rate of movement across settings. In their second study, an antecedent-prompt intervention was used. Participants were instructed to transition to the next activity and ring a bell once they arrived in the next location (Sainato et al., 1987). This procedure was also effective in improving transition behavior for all participants.

Bushbacher et al. (2004) took a more holistic approach to intervention in the home setting for several routine transitions. The authors created a multi-component support plan that included long-term supports, prevention strategies, replacement skills, and consequences for each of the three targeted transitions. These skills were taught to parents through a variety of strategies (e.g., description, modeling) and the parents implemented the intervention for each transition routine. Intervention strategies were individualized to each type of transition and the hypothesized function of behavior for each transition. The results showed a decrease in challenging behavior and an increase in engagement across all three settings targeted by the intervention package.

FUTURE RESEARCH

Expansion of literature on transition-related challenging behavior in individuals with ASD is needed through future research. As a whole, there is a need to look at transitions in the ASD population across different ages, settings, and functions. Proximity of the secondary location should be taken into consideration in future studies in order to examine whether shorter or longer transitions respond better to treatment and which types of treatments might work better in these situations. For example, if a transition is going to take several minutes (e.g., from recess back to the classroom), a different strategy is likely needed than when transitioning between activities within the classroom. In addition to these general expansions, future research needs to implement stronger assessment

procedures prior to intervention to systematically examine which functions are maintaining transition-related challenging behavior. Indirect assessment was implemented in the majority of studies, and while a useful first step, these indirect assessments should then be verified through direct assessment.

As many of the interventions included treatment packages, it may also be helpful for future research to conduct a component analysis of effective treatments to evaluate which aspects provide the strongest evidence of effectiveness. It is also necessary for research to expand upon and examine other strategies that have been used in the broader developmental disability population but not the ASD population, such as looking at teacher behaviors and classroom management strategies as a whole (e.g., DePry & Sugai, 2002; Doke & Risley, 1972; LeLaurin & Risley, 1972). Additionally, it would be beneficial for future research to look at strategies that have been used to intervene on positive behaviors but have not been used while measuring challenging behavior. For example, the use of technology in following activity schedules has been used with children with ASD to promote positive behaviors such as independent transitioning and self-management, (e.g., Mechling & Savidge, 2011; Palmen et al., 2012) and these same strategies could be used while exploring challenging behavior as a dependent variable.

Research should consider strategies that have been effective with a particular function within in the ASD population but not yet implemented, or explored in depth, as an intervention for transition-related challenges. For example, response interruption and redirection is a well-known strategy for ritualistic behavior, but this strategy has not been explored in terms of transitioning away from rituals (e.g., Lydon, Healy, O'Reilly, & McCoy, 2013). Rodriguez, Thompson, Schlichenmeyer, and Stocco (2012) treated the arranging and ordering of individuals with ASD, however, the intervention consisted of blocking or using matched items during the rituals, but did not interrupt the activity and

ask the individual to transition away from the ritual. In addition, high-p response sequences are used frequently for escape or avoidance behaviors, but only one study to date has explored this strategy with individuals with ASD for transition-related behavior, although a few studies have implemented this strategy with other populations (Ardoin, Martens, & Wolfe, 1999; Lee, 2006; Wehby & Hollahan, 2000).

CONCLUSIONS

Interventions addressing challenging behavior associated with transitions for individuals with ASD have an overall lack of direct assessment of challenging behavior and functional properties. While many of the studies hypothesized as to a function, there was no formal assessment to verify the function (e.g., Banda & Kubina, 2006; Dettmer et al., 2000). Despite this lack of direct assessment, interventions have shown effectiveness in reducing challenging behavior associated with transitions across a variety of interventions including visual activity schedules (e.g., Dooley et al., 2001), other visuals (e.g., Angell et al., 2011), timers (e.g., Tustin, 1995), high-p response sequences (e.g., Banda & Kubina, 2006), peer-mediated strategies (e.g., Sainato et al., 1987), and video priming (e.g., Schreibman et al., 2000). Except for visual activity schedules, few studies have been conducted with the ASD population on the rest of these strategies. The body of literature regarding interventions for transition-related challenging behavior in individuals with ASD thus far is limited but promising.

Chapter 3: Methods

PARTICIPANTS

Three children with ASD (all male) between the ages of 2 years 10 months and 7 years 4 months old participated in this study. The participants were recruited from a local agency providing services to individuals with intellectual and developmental disabilities. Initially an age range of 3 to 11 years old was used due to the current body of literature surrounding transitions for preschool and elementary aged students. However, the decision to include one participant who was 2.10 years old was made based on the structured preschool setting of his daycare in addition to being only 2 months shy of turning 3 years old.

In order to participate in the study, participants had to have an independent diagnosis of autism spectrum disorder, have stable preferences based on indirect assessment (e.g., parent or teacher report), have challenging behavior associated with transitions, and have at least two different transitions that triggered challenging behavior. Prior to implementing the study, the Childhood Autism Rating Scale, Second Edition – Standard Version (CARS2-ST; Schopler, Reichler, & Renner, 1986) was administered to one participant and the Childhood Autism Rating Scale, Second Edition – High-Functioning Version (CARS2-HF; Schopler, Van Bourgondien, Wellman, & Love, 2010) was administered to two participants. While the CARS2-ST and CARS2-HF both provide a range of mild to severe symptoms of ASD, the CARS2-HF was used for participants who had an IQ in the average range. Basic participant information on age, assessment results, preferences, and challenging behavior is included in Table 2.

Jackson was a 7-year-old Caucasian male with high-functioning ASD. He received a score of 34 on the CARS2-HF, which places him as having severe symptoms of ASD, although he is right on the border between Mild-Moderate and Severe. Jackson

lived at home with his mother and his mother's girlfriend, and visited his father every other weekend. Jackson was in second grade at a public school at the time of the study where he was placed in inclusion with some pull out time. He was able to communicate in full sentences and was of average intellectual ability, but had high levels of repetitive behaviors and strict routines accompanied by high levels of challenging behavior

Table 2: Participant age, assessment, preference, and behavior information.

Participant	Age	CARS2 Score	Preferences	Challenging Behavior
Jackson	7.4	CARS2 - HF 34 (Severe)	Cat in the Hat; Pete the Cat	Verbal protesting; tantrum; elopement
Oscar	5.6	CARS2 – HF 29 (Mild-Moderate)	Monsters Inc.; Angry Birds; Superheroes	Tantrum; aggression; elopement
Charlie	2.10	CARS2 – ST 36.5 (Mild-Moderate)	Sparkly items; stickers; animals	Tantrum; aggression; elopement

associated with disruptions in these activities. His challenging behavior included verbal protesting, defined as vocalizations above a normal voice level or a minimum of three mild verbal protests in a row (i.e., whining); tantrums, defined as any combination of verbal protesting, crying, screaming, physical resistance (i.e., refusal to move), or flopping (i.e., falling to ground); and elopement, defined as intentional movement away from the target area after being asked to move. Jackson had trouble with several transitions at home, including transitioning to homework and transitioning away from interrupted activities. His family and his behavior therapist reported his preferences as being Cat in the Hat and Pete the Cat-themed books or items.

Oscar was a 5-year-old male who was Hispanic and African American with high-functioning ASD. He received a score of 29 on the CARS2-HF, which places him in the

Mild-Moderate range of ASD. Oscar lived at home with his father and grandmother and rarely had visitations with his mother. He attended Pre-K at a public school during the day where he was primarily in inclusion, with some pull out time during the day. Oscar was able to communicate in full sentences and was of average intellectual ability, however, he had trouble with emotional regulation during changes in activities or changes in routine. His challenging behavior included tantrums, defined as any combination of verbal protesting (i.e., verbal refusal; name calling), crying, screaming, flopping (i.e., falling to ground) and may also include aggression; aggression, defined as hitting (i.e., forceful contact of his hand to another) and kicking (i.e., forceful contact of his foot to another); and elopement, defined as intentional movement away from the target area after being asked to move. Oscar had difficulty with multiple transitions at home including transitioning to complete homework or putting on shoes, and transitioning away from preferred activities or objects. His family and behavior therapist reported his preferences to be themed items from or the movies/cartoons of Monsters Inc. (including Monsters University), Angry Birds, and various superheroes.

Charlie was a 2-year-old Caucasian male with Mild-Moderate ASD. He received a score of 36.5 on the CARS2-ST, which places him as having mild-moderate symptoms of ASD, but right on the border of severe symptoms. Charlie lived at home with both parents and a baby brother. During the day, he attended a full day daycare that was set up very similar to a preschool classroom setting. Charlie was nonverbal at the time of the study. He engaged in some nonsensical babbling, but did not appear to have any consistent meaningful sounds or language apart from an occasional “uh oh”. Charlie also engaged in repetitive behavior and high levels of wandering. Disruptions of these routines appeared to cause challenging behavior. His challenging behavior included tantrums, defined as any combination of verbal protesting (i.e., vocal sounds above

normal voice level), crying, screaming, flopping (i.e., falling to ground), physical resistance (i.e., refusal to move or resistance to guidance), and stomping feet; aggression, defined as hitting (i.e., forceful contact of his hand to another), kicking (i.e., forceful contact of his foot to another), and pushing (i.e., continued forceful contact with one or both hands to another); and elopement, defined as intentional movement away from the target area after being asked to move. Charlie had difficulty transitioning to group circle times, and away from preferred objects and activities, particularly if they were interrupted. His family, daycare teachers, and behavior therapists reported his preferences to be sparkly items, stickers, and animals.

SETTING AND INTERVENTIONISTS

Jackson and Oscar both participated in this study in their homes. For Jackson, the majority of his assessment and intervention took place in his bedroom, and Oscar's assessment and intervention took place in the downstairs open area of his house, which included the kitchen, dining area and living room area. Charlie's assessment and intervention took place in his daycare classroom and on the playground outside at the daycare. For all participants, assessment and intervention sessions were conducted by either the author, or trained students in the field of special education. All three participants had masters level student behavior therapists, so these students were utilized as interventionists in the study, along with an additional doctoral student. For Jackson and Oscar, about half of the sessions were conducted by the author, and the other half were conducted by the trained students. With Charlie, another doctoral student was primarily responsible for assessment and intervention implementation. For all sessions not implemented by the author, the author was present for supervision and data collection throughout the study.

MATERIALS

Materials included visual aids, worksheets, and preferred items for participants based on preferences and targeted transitions. Visual aids were used for Charlie (i.e., a "wait" visual; a "time to go inside" visual) and Jackson (i.e., a themed bookmark; a place-saver for games; a token economy). Individualized work materials were made for Oscar (i.e., worksheets of skills in preferred theme such as Monsters Inc.) and Jackson (i.e., math flashcards in preferred theme such as Cat in the Hat). Other preferred items included stickers (used for all three participants), themed pencils and buttons (Oscar), and toy animals (Charlie).

EXPERIMENTAL DESIGN AND CONDITIONS

An ABAB reversal with an embedded multielement design was used to assess and address transition-related challenging behavior (Kennedy, 2005). Sessions were conducted during natural transitions in the home and daycare settings, thus the number of sessions conducted in one day depended on the number of opportunities available that day. However, assessment and intervention sessions were run over a minimum of two different days (typically it was about 3 days) per phase to ensure results were not based solely on how a participant was responding on a given day.

PREFERENCE ASSESSMENT

A free operant preference assessment was initially planned for any participants with a tangible function of behavior (Roane, Vollmer, Ringdahl, & Marcus, 1998). However, the natural set up of the environment for tangible functions of participants did not require a preference assessment. Oscar had a clear tangible function but his natural environment was set up so he would have access to a toy area during breaks that he had difficulty transitioning away from. Thus, it was unnecessary to assess preference between

toy items as he was able to play with whichever toys he wanted in the play area during tangible conditions. Similarly, Charlie's behavior related to terminating outside activity would be deemed as a tangible function, but again, he could access anything outside during recess, so no preference assessment was necessary. And finally, two participants had tangible items that were related to interruption of activities, thus it was not the tangible item itself (once a ritual or activity was completed, the participant could transition away without behavior), but the interruption that was the trigger for behavior, indicating an automatic (i.e., "ritualistic" disruption of routine) function.

FUNCTIONAL ANALYSIS

Functional analysis of transition-related challenging behavior was based on McCord et al.'s (2001) procedures, with elements of Iwata et al.'s (1982/1994) traditional functional analysis data collection procedures. Informal assessment of transition-related challenging behavior was collected through parent or teacher report. Based on these, a functional analysis of hypothesized functions was conducted, including a control condition. Participants did not participate in all conditions of a functional analysis depending on the reported transition difficulties for each participant. Each traditional function contained two conditions: initiation (transitioning to) and termination (transitioning away from) a given function. In order to establish control, all transitions included a neutral activity as the first or second location. This neutral activity was individualized to each participant, but included neutral or mildly preferred items for the participant to engage with. All conditions were conducted with a location change; thus, activity changes without location change were excluded. Each condition started with 2 min in the first activity and concluded with 2 min in a secondary activity and therefore lasted a total of 4 min. However, data was only collected during the second 2 min

following the discriminative stimulus (S^D) to transition. Data on challenging behavior was collected using a 10 s partial interval recording system with each condition repeated five times.

Potential conditions were demand termination, demand initiation, tangible termination, tangible initiation, attention termination, attention initiation, and control. Two participants (Jackson and Charlie) were identified as having trouble transitioning away from interrupted activities, thus their tangible termination included both an interrupted and a completed activity transition targeting a potential "ritualistic" (automatic/tangible) function. As participants only participated in conditions for hypothesized functions, not all conditions were used (namely attention termination and initiation). Following are the descriptions of conditions conducted with participants.

Demand Termination

The participant worked on a task for 2 min that parents or teachers had reported as difficult. Prompting was provided as necessary and minimal to no praise was given to the participant. Challenging behavior was ignored during the initial 2 min of work. After 2 min, the participant was given the S^D to transition to a neutral activity and was directed using least-to-most prompting to change location. If challenging behavior occurred during the transition or during the neutral activity, the participant was returned to the original demand location. After 10 s, the S^D to transition was presented again and the same procedure was followed.

Demand Initiation

The participant began in a neutral activity for 2 min where challenging behavior was ignored. After 2 min, the S^D to transition was given and the participant was directed using least-to-most prompting towards an area where demands were set up. If the

participant engaged in challenging behavior during the transition or during the demand activity, he was returned to the neutral activity. After 10 s, the S^D to transition was re-presented and the same procedure was followed. Different types of demands were identified for participants. Oscar had two different demand conditions – one for academic tasks and one for daily living skills (i.e., transitioning to put on shoes). Jackson had a demand condition specific to math homework, and Charlie had a demand condition of going to circle or group time in his classroom.

Tangible Initiation

Participants began in a neutral activity for 2 min where challenging behavior was ignored. The S^D to transition was given and participants were directed using least-to-most prompting to a location where a preferred item or activity was available. If the participant engaged in challenging behavior following the S^D or during the transition, he was returned to the neutral activity and after 10 s the same procedure was followed.

Tangible Termination

Participants began with 2 min access to their most highly preferred tangible or activity. Challenging behavior was ignored. After 2 min, the S^D to transition to a neutral location was delivered. Least-to-most prompting was used to direct the participant to the neutral activity. If challenging behavior occurred during or after the transition, the participant was returned to the tangible. Following 10 s, the S^D to transition was redelivered and the same procedure was followed. Different tangible functions were identified for participants. Oscar's tangible included an entire toy section of a room (not a specific toy), whereas Charlie had a tangible transition from terminating outside activity during recess.

Automatic/Tangible Termination – Interrupted versus Complete

Jackson and Charlie also had difficulty with transitions away from an interrupted tangible activity. As it was the interruption of the activity that seemed to trigger behavior, this condition was conducted similarly to a tangible condition, but considered an automatic (i.e., interruption of routine or "ritualistic") function. Thus, for these participants, two tangible-terminations were conducted. For termination interruption, the participant was allowed to begin a ritualistic task or task with a clear ending. Once in the middle of the task, the participant was given the S^D to transition and was directed using least-to-most prompting to a neutral location. If the participant engaged in challenging behavior following the S^D or during the transition, he was returned to the interrupted activity and allowed to continue. After 10 s, the same procedure was repeated. For completed termination, participants were allowed to complete a ritual or task with a clear ending and then given the S^D to transition. Least-to-most prompting was used to direct the participant to the neutral activity. If challenging behavior occurred after the S^D, the participant was returned to the completed activity. After 10 s, the S^D was re-presented and the same procedure was followed.

Control

In the control condition, the participant engaged in one neutral activity for 2 min, was given the S^D to transition, and was directed using least-to-most prompting to a secondary neutral activity for an additional 2 min. If challenging behavior occurred after the S^D to transition, the participant was returned to the first neutral activity for 10 s and then the procedure was repeated. This condition was intended to control for any participants who had challenging behavior related to the transition itself.

Neutral activities varied for each participant and were selected based on parent, teacher, or therapist report, along with informal observation of participant engagement

during these activities. For Jackson, neutral consisted of either having conversations about neutral or preferred topics (without tangibles present), or playing a game with a ball that he enjoyed that was only mildly preferred. For Oscar, neutral consisted of social engagement during an active dodge ball-like game that was mildly preferred. Lastly, for Charlie, neutral consisted of social interaction in the form of singing, tickles, simple imitation, or being picked up to be spun or go upside-down, and/or interaction with mildly preferred objects including blocks, toy kitchen items, or toy animals. As Charlie enjoyed wandering, a larger variety of potential neutral activities were used to ensure Charlie was able to remain in one location before and after transitions.

Data Collection and Response Definitions

During the functional analysis, data on challenging behavior was collected using a 10 s partial interval recording system starting from the S^D that it was time to transition and for a total of 2 min. Similarly, during the intervention, data on challenging behavior was collected using a 10 s partial interval recording system starting from the S^D to transition, during the transition itself, and then for 2 min in the secondary location. Thus, the total length of the observation varied during intervention depending on how long it took a participant to transition between two activities, with maximum intervention data collection period of 5 min. After 5 min, the participant was still required to complete the transition, but data was no longer collected due to the fact if a participant was not able to comply with a transition in less than 5 min, it was not considered a successful transition.

Challenging behavior was operationally defined for each participant on an individualized basis (see Participants).

INTEROBSERVER AGREEMENT

Interobserver agreement (IOA) was collected for at least 40% of sessions for both the functional analysis and the intervention for each participant using interval-by-interval interobserver agreement. A secondary trained observer was present for live IOA collection. IOA was calculated by taking the number of intervals of agreement divided by the number of intervals of agreement plus disagreement, multiplied by 100. IOA for the functional analysis (collected during 40% of sessions) for Jackson, Oscar, and Charlie was 99% (range 98-100%), 97% (range 95-100%), and 99% (range 98-100%) respectively. For the intervention, IOA was collected for 42% of sessions for Oscar and Charlie, and 44% of sessions for Jackson. Oscar's IOA was 97% (range 93-100%), Jackson's IOA was 99% (range 97-100%), and Charlie's IOA was 98% (range 96-100%).

PROCEDURAL FIDELITY

Procedural integrity data was collected for 40% of sessions for both the functional analysis and for the intervention for each participant. A secondary trained observer collected procedural integrity data in person during live data collection. Procedural integrity was calculated by dividing the number of steps completed correctly by the total number of steps and multiplying by 100. During the functional analysis, procedural fidelity was 97% (range 94-100%), 97% (range 92-100%), and 95% (range 88-100%) for Jackson, Oscar, and Charlie respectively. For the intervention, procedural fidelity was 98% (range 96-100%) for Jackson, 98% (range 94-100%) for Oscar, and 97% (range 95-100%) for Charlie.

PROCEDURES

Baseline

Results from the functional analysis were used for the initial baseline. Any conditions that showed elevated levels of challenging behavior were included in baseline to be targeted for intervention.

Intervention

The intervention embedded participant preferences into the secondary activity during problematic transitions. Interventions included a S^D (individualized to the participant and function) that signaled the availability of the embedded preferences in the next activity. Interventions were also functionally matched, so each participant had 2-3 different interventions in place targeting each identified function.

Jackson

Jackson had two interventions put in place. To assist in transitioning away from an interrupted book, matching themed bookmarks were created (e.g., if the book was Blues Clues, the bookmark was also Blues Clues). After reading part of the book, the S^D was introduced: "Ok, we're going to take a break from our book. Let's get our book mark and save our place for later". After giving the S^D, the interventionist showed Jackson the bookmark was in place and then directed Jackson to transition to another part of the room to engage in a neutral activity for a minimum of 2 min where he was able to do mildly preferred activities (e.g., playing with a ball) or talk about preferred topics of conversation (e.g., favorite movies).

Jackson also had difficulty transitioning to do math homework. There were several aspects of this task that seemed to have become aversive (i.e., sitting at the table, using a pencil, completing an entire worksheet at once) due to Jackson's rigidity in

completing tasks (i.e., having to write perfectly; erasing and rewriting constantly; needing to complete the entire worksheet in front of him despite being frustrated or being offered a break). Jackson began each session in a neutral activity (e.g., talking about preferred topics or playing with mildly preferred items). He was then given the S^D to transition: "Look, I have some Cat in the Hat stickers. Let's go do some math on the whiteboard so you can earn your stickers". The intervention for math homework consisted of allowing Jackson to sit on the floor and work on a whiteboard instead of at the table with a pencil. Individual math flashcards were also made to take away the pressure of completing an entire worksheet. Any word problems included were about preferred topics (i.e., Cat in the Hat or Pete the Cat), and a token system was used to designate the amount of work he was expected to complete, where he earned Cat in the Hat stickers for each completed math problem.

Oscar

Oscar had three transitions targeted for intervention. The first was transitioning to the table to do homework. Oscar began the session in a neutral activity, and was then given the S^D to transition to the table to do work: "Let's go look at some cool Monsters Inc. and Angry Birds worksheets I brought today". Once at the table, Oscar was given a choice between two different themed worksheets that were targeting the same skills as his regular school homework. He was also given a choice of different Monsters Inc. pencils to use while working. After completing his worksheet, he was allowed to color the themed cartoon figures if he desired.

The second targeted transition for Oscar was transitioning to put on his shoes for something other than going outside, and was set up as practicing putting his shoes on during sessions. Oscar began in neutral and was then given the S^D to transition: "Look at

these Monsters Inc. buttons I brought. Let's go practice putting on your shoes and you can pick one button to put on each shoe". After the S^D, Oscar was directed to put his shoes on. He was required to put his feet into his shoes independently, but received assistance in tying his shoes. Once both shoes were on, he was given his choice of buttons. The two selected buttons were pinned one on each shoe. He was then required to keep his shoes on for at least 2 min.

Lastly, transitioning away from tangible items was targeted for intervention for Oscar. Oscar began with getting to play in his toy area. A specific tangible was not selected as Oscar's natural environment included an area of the room with a number of toys he was given access to during breaks from therapy sessions. After several minutes of playing, Oscar was given the S^D to transition: "Look at these cool stickers I brought. Let's go over to the couch and pick a sticker and then we can play ball for a little bit". Once Oscar reached the couch, he was allowed to choose a Monsters Inc. or Angry Birds sticker and then he was directed to engage in his neutral activity (i.e., playing ball) for at least 2 min with the interventionist.

During intervention, it appeared Oscar became somewhat satiated on the sticker intervention when transitioning away from tangible items. He seemed disinterested in the stickers when choosing, or just wanted to play without choosing a sticker during some of the sessions. While this did not cause problems during the intervention itself, it seemed during 1 and 2-month follow ups that the stickers were no longer effective enough on their own to elicit successful transitions away from tangible items. Thus, the addition of a timer was included after the second unsuccessful maintenance probe. At the start of playing with his tangibles, Oscar was told a timer was being set and when it went off, it would be time for a break where he could choose a sticker if he liked and play ball. The S^D to transition became the sound of the timer paired with: "That's our timer. It's time to

take a break from playing. You can choose a sticker if you like and we'll go play ball for a little bit". Oscar was directed to the stickers and neutral area to play ball for at least 2 min.

Charlie

Charlie had three transitions targeted for intervention. The first was transitioning to circle or group time in the daycare. There were several different circle time activities included in both baseline and intervention as there were various circle times throughout the day and they were not always consistent. Charlie began with at least 2 min in a neutral activity and then was given the S^D to transition: "Look at the animals on the ground over there. Let's go sit at circle and you can hold them". Charlie was then directed to walk to circle time where he had 2-4 toy animals available for him to interact with if he wanted. He was then directed to remain at circle for at least 2 min. As wandering around the room was a frequent challenging behavior of Charlie's, the circle intervention only aimed to keep him physically present at circle time during this initial stage. Therefore, participation was not required as long as Charlie remained seated in the appropriate area.

Charlie's second targeted transition was transitioning away from interrupted puzzles. Charlie was given the chance to begin working on a puzzle, and then was directed to transition away from an incomplete puzzle: "Ok, we're going to save our place and we can come back later". The interventionist placed a visual cue on top of the puzzle that signaled pausing the activity and Charlie was directed to another location to engage in neutral activities for at least 2 min.

Finally, Charlie's third transition was transitioning inside after playing outside. He began with at least 2 min playing outside during recess, and then was given the S^D to

transition inside: “Ok, it’s time to go inside. Here are some stickers you can go play with for a few minutes”. Charlie was first shown a visual signaling it was time to go inside, followed by handing him a sheet of sparkly stickers he was able to hold while walking inside. Once inside, Charlie was allowed to play with the stickers for several minutes or engage in other neutral activities.

Reversal

During reversal, participants went back to baseline conditions and sessions were conducted in the same manner as the functional analysis during baseline.

Maintenance and Generalization

Maintenance probes were conducted for all intervention conditions 1 month after the last intervention session for all participants. These probes were conducted in an identical manner to the intervention conditions. Oscar also had an additional maintenance probe conducted at 2 months, following an unsuccessful 1-month maintenance check in two of his three conditions.

Generalization probes were conducted for all participants. For Oscar and Jackson, generalization assessment was conducted during a different activity, and included the same intervention that was used for the matching behavioral function from intervention. Oscar’s Tangible Termination intervention was assessed through generalizing to termination of outdoor play. Oscar began with playing outside for at least 2 min. He was then given the S^D that it was time to transition: “Look at these cool stickers I brought. Let’s go inside and pick a sticker and then we can play ball for a little bit”. Oscar was then directed inside to the stickers and to play ball for at least 2 min. This type of generalization assessment was chosen for Oscar based on parent reports that Oscar has a difficult time transitioning away from any preferred activity or item in the home.

For Jackson, generalization was assessed by implementing the Interrupted Book Termination intervention to interrupting a game, where he began by playing a board game for at least 2 min. Then, the S^D to transition was provided: "Ok, we're going to take a break from our game. Let's get our place saver and save our place so we know whose turn it is when we come back later". Jackson was then directed to another part of the room where he was allowed to engage in neutral activities for at least 2 min. This type of generalization was chosen for Jackson based on parent report of his overall difficulty to stop in the middle of anything, particularly in natural settings when situations such as the phone ringing may interrupt an activity he is doing with family members.

For Charlie, generalization was assessed with a different therapist and included the same interventions for each condition (i.e., Circle Initiation, Outside Termination, and Interrupted Puzzle Termination) implemented by a different person. This type of generalization was chosen for Charlie because he had two different therapists working with him in the daycare and had been exhibiting higher levels of behavior with his newer therapist than the longstanding therapist. Thus, the more familiar therapist conducted the intervention, and these skills were then generalized to the newer therapist to support Charlie's generalization across people at the daycare.

Chapter 4: Results

The use of functionally matched embedded preference interventions was effective in reducing challenging behavior across all three participants. Results across each research participant for each research questions are presented below, followed by individual results presented via text and graphically presented in Figures 1 through 6.

IDENTIFICATION OF MAINTAINING CONTINGENCIES (QUESTION 1)

Maintaining contingencies (i.e., functions) of behavior appeared to be identified for all three participants through the transition functional analysis procedure. Identified functions of behavior for each participant are found in Table 3. For all three participants, clear patterns emerged, with elevated levels of challenging behavior in three conditions for Oscar and Charlie, and elevated levels of challenging behavior in two conditions for Jackson. All other conditions showed little to no challenging behavior.

Table 3: Identified functions of behavior for Jackson, Oscar, and Charlie.

Participant	FA conditions	Identified Functions
Jackson	Demand (math) Initiation, Demand (math) Termination, Hide & Seek Initiation, Hide & Seek Termination, Book Initiation, Book Termination (complete), Book Termination (interrupted), Control	Demand (math) Initiation, Book Termination (interrupted)
Oscar	Demand (academic) Initiation, Demand (academic) Termination, Shoes Initiation, Shoes Termination, Tangible Initiation, Tangible Termination, Control	Demand (academic) Initiation, Shoes Initiation, Tangible Termination
Charlie	Circle Time Initiation, Circle Time Termination, Outside Initiation, Outside Termination, Puzzle Initiation, Puzzle Termination (complete), Puzzle Termination (interrupted), Control	Circle Time Initiation, Outside Termination, Puzzle Termination (interrupted)

EFFECTIVENESS OF FUNCTIONALLY MATCHED INTERVENTIONS (QUESTION 2)

Table 4 shows the mean levels of challenging behavior across baseline, intervention, return to baseline, and reintroduction of intervention phases. Results were clearly demonstrated for all three participants, with behavior reaching near zero levels during both intervention phases. Jackson and Oscar had similar levels of behavior in baseline and return to baseline conditions, as well as in intervention and reintroduction of intervention conditions. Charlie's baseline and return to baseline levels of behavior were similar, however, he showed a decrease in behavior during reintroduction to intervention compared to the first intervention phase.

Table 4: Mean percentage of challenging behavior for participants across phases.

Participant	Baseline	Intervention	Return to Baseline	Reintroduction of Intervention
Jackson	49.9%	1.0%	39.6%	2.6%
Oscar	53.9%	4.0%	45.0%	3.8%
Charlie	66.7%	13.8%	71.3%	4.6%

EQUITY OF INTERVENTION EFFECTIVENESS ACROSS FUNCTIONS (QUESTION 3)

Results appeared to be equally effective across intervention conditions for each of the participants overall, with only slight differences in levels of challenging behavior across different conditions. Table 5 shows the mean percentages of challenging behavior across each individual condition for all participants across each phase of the study. While there were differences between baseline levels of challenging behavior for participants, there were not significant differences between intervention condition results for any participants.

Jackson's baseline and return to baseline levels of challenging behavior were almost equivalent across conditions. Oscar and Charlie had differences between baseline conditions, and shifts across which condition had the highest level of challenging behavior across baseline phases. During baseline for Oscar, Tangible Termination had the highest level of challenging behavior (M = 66.6%) followed by Shoes Initiation (M = 48.3%) and Demand Initiation (M = 46.7%; greatest difference = 19.9%). However, during return to baseline, Demand Initiation had the highest levels of challenging behavior (M = 63.9%), followed by Shoes Initiation (M = 41.7%) and Tangible Termination (M = 33.4%; greatest difference = 30.5%). For Charlie, Circle Initiation had the highest levels of challenging behavior during baseline (M = 90.0%), followed by Outside Termination (M = 56.6%) and Interrupted Puzzle Termination (M = 53.3%; greatest difference = 36.7%). During the return to baseline phase, levels of challenging behavior were more similar with Outside Termination at the highest levels of behavior (M = 75.0%), followed by Circle Initiation (M = 72.2%), and Interrupted Puzzle Termination (M = 66.7%; greatest difference = 8.3%).

Despite some initial differences in level of challenging behavior during baseline and return to baseline data, intervention data remained relatively consistent across conditions. The greatest difference between intervention conditions within the same phase of intervention was 3.9% (0% to 3.9%) for Jackson during the reintroduction of intervention phase, 10% (0% to 10%) for Oscar during the first intervention phase, and 5.9% (9.6% to 15.5%) for Charlie during the first intervention phase. There was no clear pattern indicating higher baseline levels of behavior resulted in higher levels of behavior in intervention phases, nor the opposite. For example, with Charlie, the Circle Initiation condition had the highest levels of behavior during baseline, but the lowest levels during the first intervention phase. Whereas for Oscar's Demand Initiation condition, results

were consistently at zero, with his other two conditions altering slightly (i.e., Shoes Initiation was slightly higher in the first intervention phase, and Tangible Termination was slightly higher in the reintroduction of intervention phase).

Table 5: Mean percentage of challenging behavior for participants for each condition across phases.

Participant	Baseline	Intervention	Return to Baseline	Reintroduction of Intervention
Jackson	Demand-I *49.8%* Book-T (int) *50.0%*	Demand-I *1.9%* Book-T (int) *0.0%*	Demand-I *41.7%* Book-T (int) *37.5%*	Demand-I *3.9%* Book-T (int) *0.0%*
Oscar	Tangible-T *66.6%* Demand-I *46.7%* Shoes-I *48.3%*	Tangible-T *0.0%* Demand-I *0.0%* Shoes-I *10.0%*	Tangible-T *33.4%* Demand-I *63.9%* Shoes-I *41.7%*	Tangible-T *8.9%* Demand-I *0.0%* Shoes-I *2.6%*
Charlie	Circle-I *90.0%* Outside-T *56.6%* Puzzle-T (int) *53.3%*	Circle-I *9.6%* Outside-T *15.5%* Puzzle-T (int) *15.4%*	Circle-I *72.2%* Outside-T *75.0%* Puzzle-T (int) *66.7%*	Circle-I *5.0%* Outside-T *3.3%* Puzzle-T (int) *5.6%*

Note: "I" indicates activity initiation; "T" indicates activity termination; "int" indicates interrupted activity.

MAINTENANCE AND GENERALIZATION (QUESTION 4)

Information about maintenance and generalization can be found in Table 6. Reduced levels of challenging behavior maintained for two out of three participants at the 1-month maintenance probe. Jackson and Charlie maintained low levels of behavior across all conditions during maintenance with 0% behavior for Jackson across both conditions and low levels of behavior across conditions for Charlie (Circle Initiation

0.0%; Outside Termination 0.0%; Interrupted Puzzle Termination 13.3%). Oscar's maintenance results were more mixed. At the 1-month follow up, low levels of behavior only maintained for one out of three intervention conditions (i.e., Demand Initiation 16.7%; Shoe Initiation 100%; Tangible Termination 83.3%). However, due to hypothesized setting events, a 2-month maintenance probe was then conducted with Oscar, which yielded positive results again for Demand Initiation (0.0%), and also for

Table 6: Maintenance and generalization information for all participants.

Participant	Maintenance (1-month)		Generalization Condition	Generalization
Jackson	Demand-I *0.0%* Book-T (int) *0.0%*		Generalize Book-T (int) to new interrupted activity (i.e., Game-T (int))	Game-T (int) *0.0%*
Oscar	*1-month* Tangible-T *83.3%* Demand-I *16.7%* Shoes-I *100.0%*	*2-months* Tangible-T *100.0%* Tangible-T (with added component) *0.0%* Demand-I *0.0%* Shoes-I *0.0%*	Generalize Tangible-T intervention to new Tangible (i.e., Outside-T)	Outside-T *0.0%*
Charlie	Circle-I *0%* Outside-T *0%* Puzzle-T (int) *13.3%*		Generalize interventions for Circle-I, Outside-T, and Puzzle-T (int) to new therapist	Circle-I *0.0%* Outside-T *6.7%* Puzzle-T (int) *0.0%*

Note: "I" indicates activity initiation; "T" indicates activity termination; "int" indicates interrupted activity.

Shoe Initiation (0.0%). However, behavior for Tangible Termination remained high (100%). Thus, a timer was added as an additional component to the initial intervention, and this returned behavior to zero again for three sessions.

Generalization was effective for all three participants. Jackson's generalization was based on the Interrupted Book Termination condition and consisted of using a "place saver" to save whose turn it was during an interrupted game and resulted in 0% challenging behavior. Oscar's generalization was based on the Tangible Termination intervention and consisted of using stickers as a reward for transitioning inside to a neutral activity after playing outside and resulted in 0% challenging behavior. While the timer was added as a component to return Tangible Termination behavior back to zero at the second maintenance probe, this additional component was not necessary during Outside Termination during generalization. Finally, Charlie's generalization included generalizing the same intervention used across all three conditions to a different therapist and resulted in near zero or zero levels of challenging behavior across conditions (i.e., Circle Initiation 0.0%; Outside Termination 6.7%; Interrupted Puzzle Termination 0.0%).

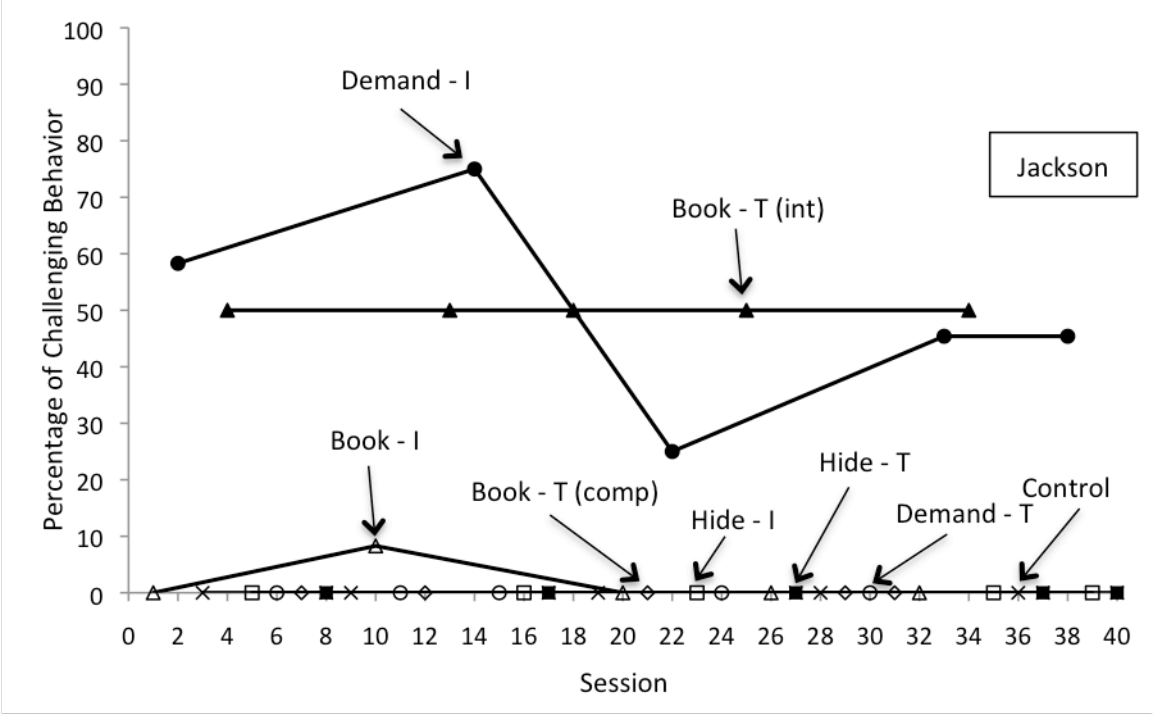
JACKSON

Functional Analysis

Results of Jackson's transition functional analysis indicated elevated levels of challenging behavior in two conditions: Interrupted Book Termination and Demand Initiation. Jackson's percentage of challenging behavior was similar across both conditions. Book Termination yielded slightly higher levels of challenging behavior (M = 50%) compared to Demand Initiation (M = 49.8%; range 25 - 75%). Jackson's challenging behavior surrounding Book Termination was solely when the book was interrupted, thus the Completed Book Termination condition yielded no challenging

behavior, suggesting a ritualistic (automatic) function related to interruption of routines. The behavior therapist had thought terminating a preferred activity (i.e., Hide and Seek) would likely trigger behavior, but this was not evidenced during the functional analysis. Results for Jackson's transition functional analysis are displayed in Figure 1.

Figure 1: Percentage of challenging behavior during transition functional analysis conditions for Jackson.



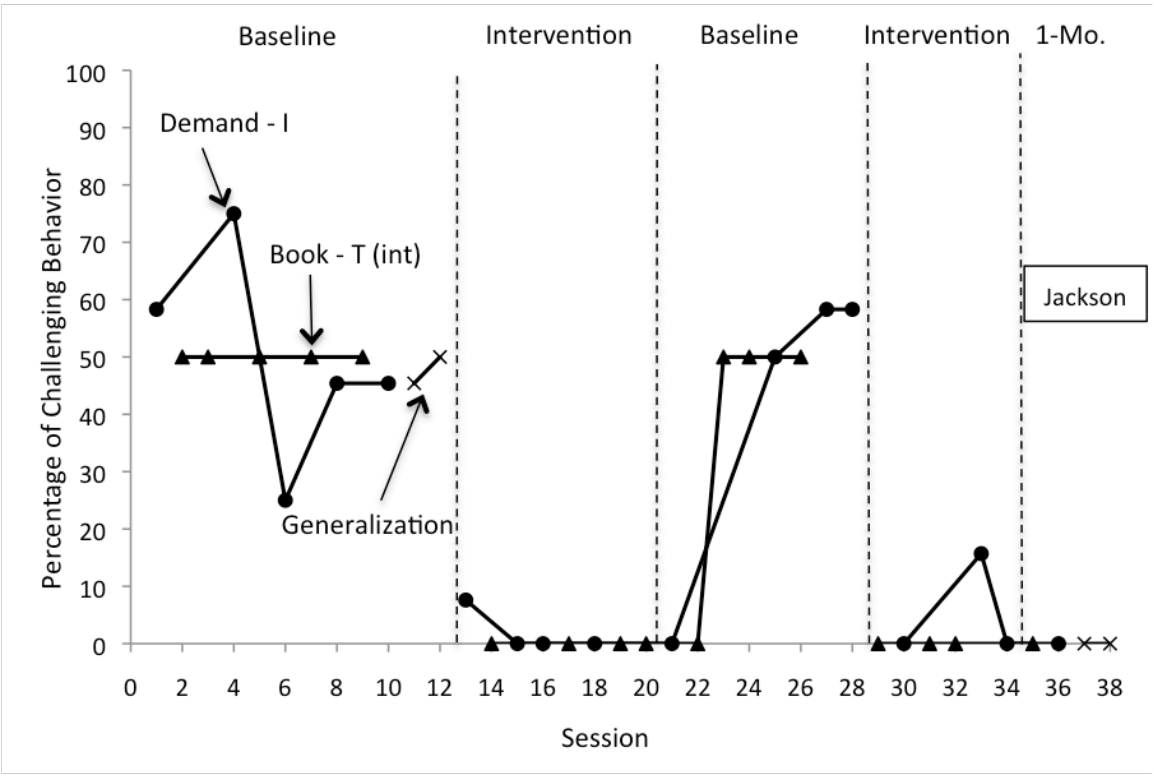
Note: "I" indicates activity initiation; "T" indicates activity termination; "int" indicates interrupted activity; "comp" indicates completed activity.

Intervention, Maintenance, and Generalization

The interventions for Interrupted Book Termination and Demand Initiation were immediately successful in reducing Jackson's challenging behavior to zero. Results of the intervention can be seen in Figure 2. Interrupted Book Termination reduced to zero with the first intervention, whereas Demand Initiation had one session with a low level of

behavior (7.6%) before reducing to zero. During the return to baseline phase, there was a slight carryover effect where behavior remained at zero without the intervention in place for one session of each condition before returning to previously high levels of challenging behavior for both Interrupted Book Termination (*M* = 37.5%) and Demand Initiation (*M* = 41.7%). Once the intervention was reintroduced, behavior again dropped to zero for both conditions and remained at zero except for one spike in the Demand Initiation condition during one session (15.7%).

Figure 2: Percentage of challenging behavior during functionally matched embedded preference intervention, 1-month maintenance, and generalization for Jackson.



Note: "I" indicates activity initiation; "T" indicates activity termination; "int" indicates interrupted activity.

At the 1-month maintenance probe, Jackson's behavior remained at zero for both Demand Initiation and Interrupted Book Termination. Generalization probes were conducted assessing the effects of the Interrupted Book Termination intervention to an Interrupted Game Termination condition. Results indicated the intervention from the Interrupted Book Termination condition generalized effectively to the interruption of a game during multiple generalization probes.

OSCAR

Functional Analysis

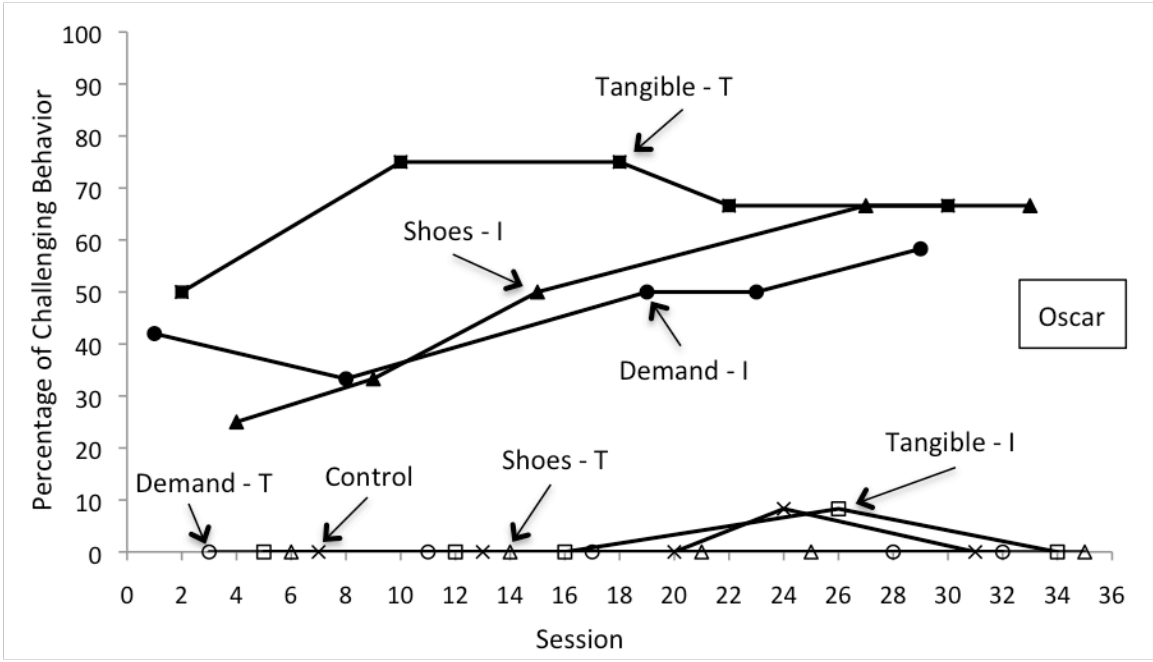
Oscar's transition functional analysis had three conditions with elevated levels of challenging behavior including Demand Initiation, Shoes Initiation, and Tangible Termination. Results for Oscar's transition functional analysis are displayed in Figure 3. Both an academic demand condition (i.e., doing homework) and a daily living demand condition (i.e., putting on shoes) were included for Oscar. Percentage of challenging behavior was highest in the Tangible Termination condition (M = 66.6%; range 50 - 75%), followed by the Shoes Initiation condition (M = 48.3; range 25 - 66.6%), and the Demand Initiation condition (M = 46.7%; range 33.3 - 58.3%)

Intervention, Maintenance, and Generalization

The intervention had immediate effects on Oscar's challenging behavior across conditions, reducing behavior to zero. Results for Oscar can be seen in Figure 4. All three conditions reduced to zero and remained at zero except for one Shoes Initiation session with a behavior spike to 40%, which again returned to zero the following session. There was some carryover behavior during the return to baseline phase, with behavior remaining at zero for the first few sessions and then returning to previous baseline levels (M = 63.9% for Demand Initiation; M = 44.5% for Tangible Termination; M = 41.7% for

Shoes Initiation). Once the intervention was reintroduced, behavior again reduced to zero for all three conditions and remained at zero except for one session during Tangible Termination (26.7%) and one during Shoes Initiation (7.7%). Behavior returned to zero again after these sessions prior to completion of the second intervention phase.

Figure 3: Percentage of challenging behavior during transition functional analysis conditions for Oscar.

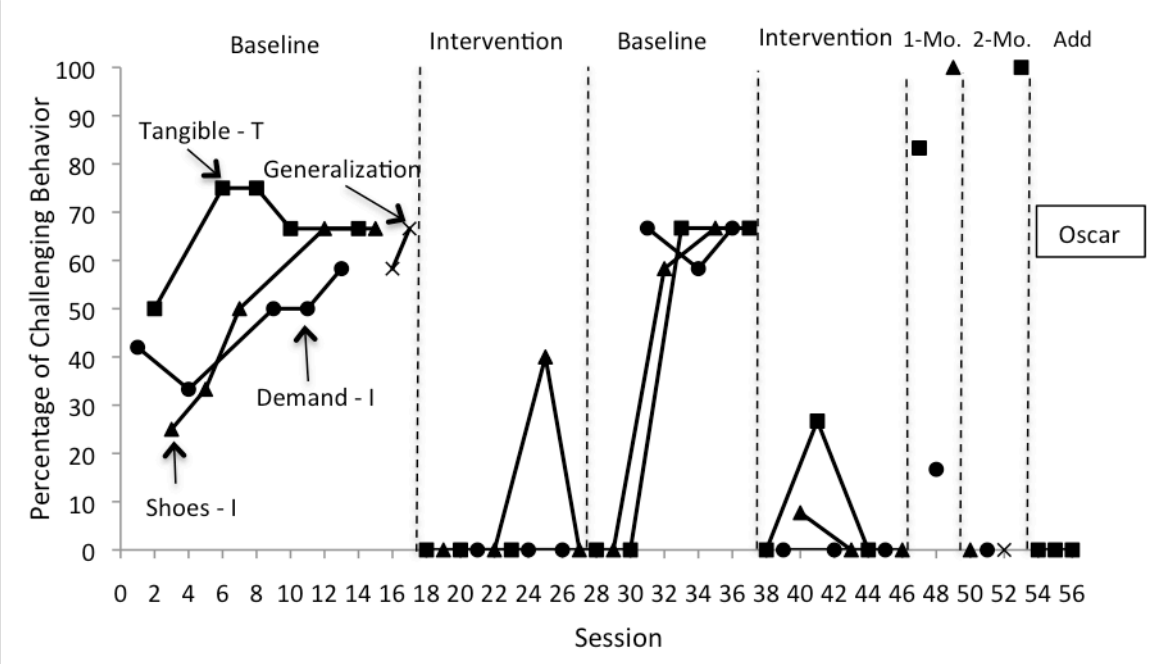


Note: "I" indicates activity initiation; "T" indicates activity termination.

At the 1-month maintenance probe, Oscar's behavior only maintained in the Demand Initiation condition at 16.7%. While this percentage was lower than baseline phases, it was also higher than both intervention phases for that condition. Low levels of behavior did not maintain during the Tangible Termination (83.3%) or Shoes Initiation (100%) conditions at the 1-month follow up. However, due to the likelihood of setting events, a 2-month maintenance probe was also conducted for Oscar. During the second maintenance probe, both the Demand Initiation (0.0%) and Shoes Initiation (0.0%)

conditions showed successful maintenance. However, Tangible Termination remained at high levels of challenging behavior (100%). At this stage, another component (i.e., a timer) was added to the original Tangible Termination intervention. The addition of the timer to signal the end of playtime combined with the original intervention, was effective in returning behavior to zero again. Three sessions were run with the addition of the timer and behavior remained at zero.

Figure 4: Percentage of challenging behavior during functionally matched embedded preference intervention, 1 and 2-month maintenance, generalization and additional tangible phase for Oscar.



Note: "I" indicates activity initiation; "T" indicates activity termination; "Add" indicates additional phase with added tangible intervention component.

Generalization probes were conducted assessing the effectiveness of the Tangible Termination intervention to an Outside Termination condition. Results indicated that the intervention from the Tangible Termination condition generalized effectively to the

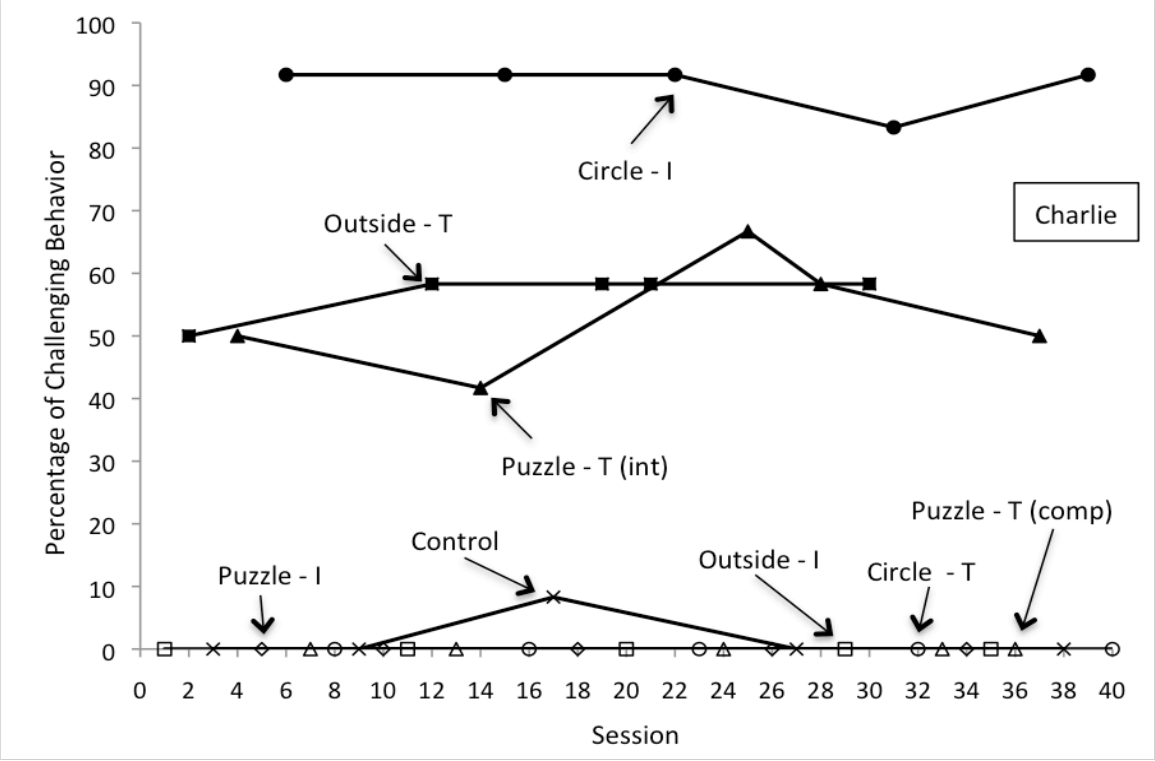
termination of outdoor play during the generalization probe. While the addition of a timer as an additional component was necessary to reduce behavior to zero again during Tangible Termination maintenance probes, the original intervention (without a timer) was effective during generalization to Outdoor Termination.

CHARLIE

Functional Analysis

Results for Charlie's transition functional analysis are displayed in Figure 5. The results of Charlie's transition functional analysis identified three conditions with elevated

Figure 5: Percentage of challenging behavior during transition functional analysis conditions for Charlie.



Note: "I" indicates activity initiation; "T" indicates activity termination; "int" indicates interrupted activity; "comp" indicates completed activity.

levels of challenging behavior: Circle Initiation, Outside Termination, and Interrupted Puzzle Termination. Levels of challenging behavior were highest in the Circle Initiation condition (*M* = 90%; range 83.3 – 91.7%), followed by Outside Termination (*M* = 56.6%; range 50 – 58.3%) and Interrupted Puzzle Termination (*M* = 53.3%; range 41.7 – 66.7%). Charlie's challenging behavior surrounding puzzle termination was solely when the puzzle was interrupted, thus the Completed Puzzle Termination condition yielded no challenging behavior, suggesting a ritualistic (automatic) function related to interruption of routines.

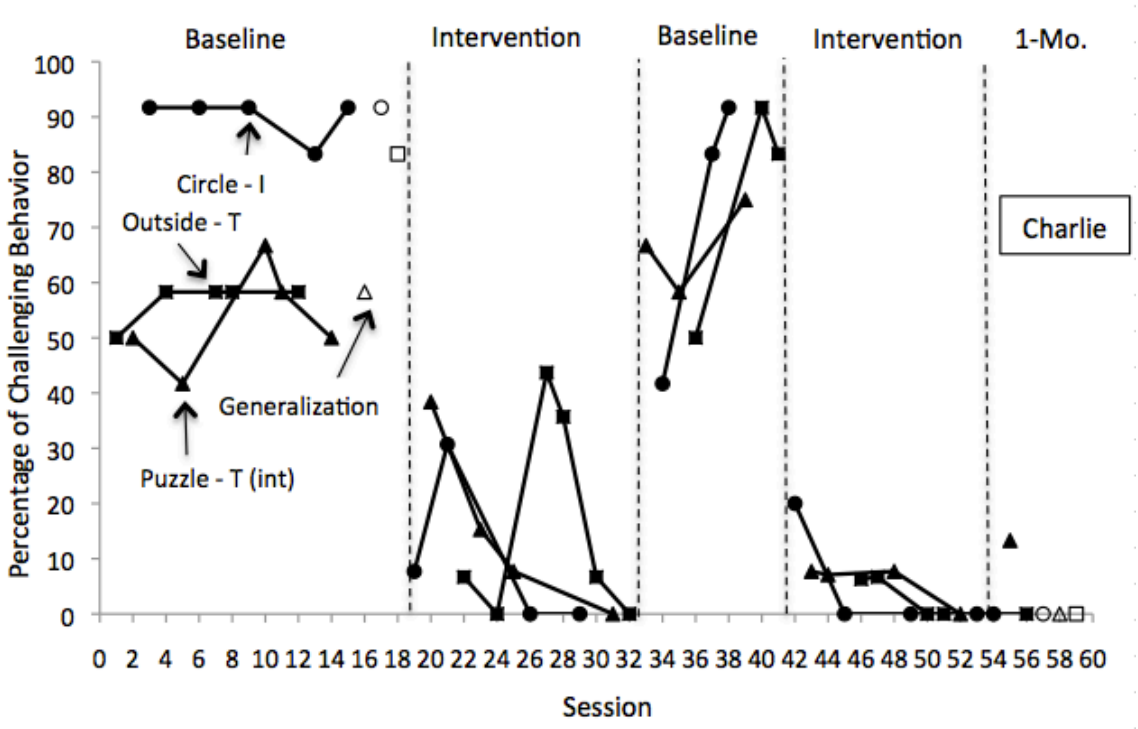
Intervention, Maintenance, and Generalization

Results for Charlie indicated the intervention was effective across all three conditions, although results were slightly slower and more variable than the other two participants. His results can be seen in Figure 6. During the initial intervention, behavior levels reduced to a mean of 15.5% for Outside Termination, 15.4% for Interrupted Puzzle Termination, and 9.6% for Circle Initiation, with behavior reducing to zero or near zero levels prior to the reversal phase. Behavior returned to previously high levels across all three conditions during the return to baseline phase (*M* = 75.0% for Outside Termination; *M* = 72.2% for Circle Initiation; *M* = 66.7% for Interrupted Puzzle Termination). When the intervention was reintroduced, behavior again returned to the low levels of 3.3%, 5.0% and 5.6% for Outside Termination, Circle Initiation, and Interrupted Puzzle Termination respectively.

Maintenance data indicated challenging behavior remained low at the 1-month maintenance check. Circle Initiation and Outside Termination remained at zero levels, and Interrupted Puzzle Termination had low levels of behavior (13.3%) that remained significantly lower than baseline levels. Generalization probes were conducted for each

of the three intervention conditions using a second behavior therapist that also worked with the participant. Charlie's behavior remained at zero for all three generalization probes across functional conditions.

Figure 6: Percentage of challenging behavior during functionally matched embedded preference intervention, 1-month maintenance, and generalization for Charlie.



Note: "I" indicates activity initiation; "T" indicates activity termination' "int" indicates interrupted activity.

Chapter 5: Discussion

The results of this study suggest functionally matched interventions incorporating embedded preferences to target transition-related challenging behavior were successful in reducing challenging behavior during transitions for children with ASD. The successful demonstration of function identification within transitions and functionally matched interventions supports the current body of research highlighting the importance of identifying behavioral function (Carr & Durand 1985; Iwata et al., 1982/1994; McCord et al., 2001), and the value of functionally matched interventions in practice (Iwata et al., 1990). Furthermore, as the majority of current research articles on activity transitions for individuals with ASD did not systematically assess transition-related behavior, it serves to fill a gap in the current transition intervention literature. As multiple functions of transition behavior were identified for each participant, implementing one type of intervention would not likely have been effective in reducing behaviors maintained by different functions during different transitions.

With regard to research question 1 (i.e., Does the functional analysis of transition-related challenging behavior appear to be effective in identifying maintaining contingencies?), all three participants showed clear results. For Oscar and Charlie, the hypothesized functions based on parent, teacher, or therapist report appeared to be verified by the transition functional analysis. With Jackson, two of the three indirectly identified functions appeared to be verified by the functional analysis. However, a third hypothesized function of termination of Hide and Seek (tangible) did not yield any challenging behavior. Still, it appears clear functions were targeted for intervention for each participant with two functions for Jackson, and three functions for Oscar and Charlie.

The functionally matched interventions seemed effective in reducing challenging behavior during transitions for all participants (research question 2) in both intervention phases and for all functional conditions. Immediate decreases in challenging behavior were evident across all three participants regardless of level of severity of ASD symptoms when interventions were introduced for each function. However, the two participants with high-functioning ASD (Jackson and Oscar) dropped immediately to zero levels, whereas the participant with moderate-functioning ASD (Charlie) had a significant drop from baseline, but did not drop straight to zero. Thus, effects might be slightly impacted by the level of severity of ASD symptoms of participants. This may be due to the fact individuals with higher functioning ASD might identify the cues signaling the intervention is in place more quickly than those with lower-functioning ASD, although this is speculation at this point. Conversely, this slight difference in immediacy of effectiveness may also be due to the fact Charlie was the only participant with sessions conducted in a less controlled daycare setting, compared to the more controlled home setting where intervention took place for Jackson and Oscar. In the home setting, a larger number of variables were controlled as research often took place in a room with only the participant, interventionist, and data collector(s), and any distracting items could be removed from the research area. However, in the daycare setting, other children and daycare staff were continually present, and it was not possible to remove distracting items from the classroom. Another possible explanation could be that Charlie was also the youngest participant by about 2 years. It may be that Charlie's slower initial success was impacted by his age, indicating developmental age may be an important factor to consider in intervention implementation.

In addition to being seemingly effective overall, the interventions appeared to be equally effective across functions for all three participants (research question 3). While

there were some slight differences in effectiveness between functional conditions, these differences could be seen as small and did not appear to represent a clear pattern. Conditions with the highest levels of challenging behavior during baseline did not necessarily produce more elevated levels of behavior during intervention. For example, Charlie had the highest levels of behavior during Circle Initiation in baseline (M = 90.0%), but when the intervention was put in place, Circle Initiation had the lowest levels of challenging behavior (M = 9.6%) compared to the other two conditions (M = 15.4% and 15.5%). The condition with the highest level of challenging behavior during intervention also shifted between intervention conditions for participants. For example, during the initial intervention, Oscar had a mean of 10% challenging behavior for Shoes Initiation (compared to a mean of 0.0% for the other two conditions), whereas during the reintroduction of intervention phase, Tangible Termination had the highest levels of behavior (M = 8.9%) compared to the other two conditions (M = 2.6% and 0.0%). Jackson's results across phases remained the most consistent. His baseline levels were almost the same for both conditions, and while both behaviors dropped immediately to low levels, Demand Initiation was slightly elevated during both intervention phases (M = 1.9% and 3.9%) compared to a mean of 0% across both intervention phases for Interrupted Book Termination.

Low levels of behavior maintained over time across all conditions for two of three participants, and generalization was evident for all three participants (research question 4). For Jackson and Charlie, low levels of behavior remained at the 1-month follow up across all conditions. Anecdotally, since the 1-month follow up, Jackson's behavior therapist has continued to fade out and modify intervention elements from Demand Initiation to slowly reintroduce natural math homework conditions (i.e., sitting at a table, using a pencil, completing a full worksheet) with continued low levels of behavior. As

the natural homework conditions appeared to have become aversive, these were modified for intervention (i.e., sitting on floor, using whiteboard, using math flashcards). Once Jackson's behavior was stable with these interventions in place, the therapist begun systematically modifying the intervention. For example, she began using a pencil to write answers but still allowing Jackson to sit on the floor and use math flashcards. The token system has remained in place as these changes have been made and Jackson's behavior has remained low throughout these sequential intervention steps.

Oscar's maintenance data showed less successful results. At the 1-month follow up, behavior had only maintained in one condition (Demand Initiation), but high levels of behavior had returned during Shoes Initiation and Tangible Termination. Oscar had finished intervention right before the holiday break in December, so his 1-month maintenance probe happened soon after the break ended. It was noted anecdotally that overall, Oscar's behavior had deteriorated in all settings and situations following the break, suggesting setting events were likely involved in the high levels of behavior observed during maintenance. Thus, a 2-month follow up was conducted with Oscar, and these results fared better. Demand Initiation and Shoes Initiation resulted in 0% challenging behavior, however, Tangible Termination still resulted in high levels of challenging behavior (100%). It was determined the addition of another component was warranted to return behavior to zero levels again. A timer was added to the original intervention to signal the end of playtime during Tangible Termination. Originally, this was intentionally excluded from the intervention in order to simulate a more natural environment where transitioning away from playtime without an explicit signal is expected. However, as the intervention used during both intervention phases did not maintain effectiveness, the timer was added after an unsuccessful 2-month follow up, and

resulted in 0% behavior. This condition was conducted three times and resulted in zero behavior each time.

Generalization was successful for all three participants. Jackson and Oscar had generalization probes consisting of applying a functional intervention to another situation with the same function of behavior. As Jackson had difficulty with most activity interruptions, his Interrupted Book Termination intervention (i.e., a bookmark) was applied to a different condition – Interrupted Game Termination using a place saver for whose turn it will be after taking a break. For Oscar, terminating a preferred activity was consistently difficult, so his Tangible Termination intervention was generalized to Outside Termination. While an additional component (i.e., timer) was a necessary addition to his Tangible Termination intervention during maintenance, this additional component was not necessary during generalization. Thus, Oscar's generalization probe included the original Tangible Termination intervention applied to this new functionally matched context.

Charlie's generalization consisted of generalizing all three functional interventions to a different therapist at the daycare. The therapist who was the primary interventionist for Charlie had been working with him for about a year, and was observing very low levels of behavior with him. However, his new therapist who had only been working with him for several months was still observing elevated levels of challenging behavior throughout the day. It was decided it would be most beneficial for Charlie to generalize the interventions to his new therapist, in order to assist the therapist in gaining better instructional control and building rapport. The interventions' effects were successfully generalized to the new therapist. Anecdotally, the "wait" visual used during Interrupted Puzzle Termination has also been used in different situations successfully. For example, during a preferred activity, Charlie needed to be taken to the

bathroom, which would usually result in challenging behavior. However, the therapist implemented the "wait" visual signaling he would get to come back to the activity later, and Charlie was able to successfully transition away without behavior.

BEHAVIORAL PRINCIPLES INVOLVED

Several behavioral principles could be viewed as key elements within the functional interventions used for participants. The primary behavioral components are discussed below.

Stimulus Control

Firstly, this study exemplified a common behavioral principle in demonstrating stimulus control. Stimulus control occurs when an individual behaves one way in the presence of a stimulus, and another way in its absence (Dinsmoor, 1995a, b). This principle was evident across all three participants. During the study, when various stimulus signals (i.e., S^D's) were in place indicating it was time to transition and signaling the availability of the embedded preference intervention, participants exhibited appropriate transition behavior. Whereas in the absence of these stimuli, participants showed challenging behavior during transitions. For example, Charlie was given a verbal S^D and shown a visual aid signifying it was time to transition inside, along with being allowed to carry a sheet of stickers as he transitioned. During the reversal phase when these stimuli were taken away, Charlie immediately reverted back to high levels of challenging behavior. Jackson and Oscar demonstrated similar effects during their intervention phases, although both of these participants had slight carryover effects during reversal before reverting back to high levels of challenging behavior. Additionally for Jackson, it was evident he wanted the intervention in place after it had been removed. Anecdotally he was reported to request the intervention stimulus during reversal for

Interrupted Book Termination when it was not available (i.e., "Where is the bookmark?").

As stimulus control can only be acquired when a behavior is reinforced more in the presence of one stimulus than in its absence, the reinforcement provided by the embedded preferences in the secondary activity served to assist in the development of stimulus control. However, the reinforcing properties of the embedded preference interventions did not surpass the effectiveness of the stimuli in controlling participant behavior. While the secondary locations were made more reinforcing, appropriate transition behavior was only demonstrated in the presence of the relevant $S^{D.}$ Anecdotally, this was observed in that none of the participants attempted to transition prior to the presentation of the transition-related S^{D}. All participants continued with their normal routines and activity levels, until the transition-related S^{D}'s were presented, at which point participants exhibited appropriate transition behavior.

Motivating Operations

Motivating operations (MOs) are events that temporarily alter the value of a consequence and the frequency of behavior previously associated with that consequence (Michael, 1982). The majority of studies manipulating MOs to target challenging behavior have had an abative effect on behavior (i.e., reduction in behavior) through abolishing operations (AO; Laraway, Snycerski, Michael, & Poling, 2003). Typically in the intervention, participants were allowed to satiate on the maintaining function, such as playing with a tangible until it became less desired and thus less reinforcing (e.g., Lang et al., 2010; McComas, Hoch, & Paone, 2000; O'Reilly et al., 2012). However, in the present study, establishing operations (EOs) were manipulated to make the appropriate behavior more reinforcing to engage in. For example, in order to make transitioning to

and completing homework more rewarding for Oscar, his worksheets were Monsters Inc. themed, and he was able to use Monsters Inc. pencils. These intervention components served as an EO and had an evocative effect (i.e., increase in behavior) on transitioning to the table and homework completion. Similarly, in order to make transitioning inside after recess more rewarding, Charlie was allowed to carry and then play with sparkly stickers for a couple minutes once inside. This served to make the transition to inside more rewarding.

This study might serve as a preliminary examination of how EOs might also be used to target reductions in challenging behavior. While satiation (AOs) have proven effective in the current body of literature, there are situations in which satiation is not a possible or appropriate intervention. For example, satiation may take too long and within educational settings, staff may not have time to wait until a student has satiated before transitioning. In addition, some activities may be resistant to satiation, such as playing on the computer or other electronic devices. Students are able to switch games and activities on the computer and may continue to remain engaged and not reach satiation. In these situations, it may be more appropriate to put EOs in place for the next activity to support a student in transitioning away from an activity without waiting for satiation to occur.

While EOs were put in place in all intervention conditions to make appropriate transitions more rewarding, and as such decrease levels of challenging behavior associated with these transitions, an AO also became evident for one of Oscar's conditions: Tangible Termination. During the initial intervention and reintroduction of intervention phases, the Tangible Termination intervention was effective in reducing challenging behavior to zero or near zero levels, although anecdotally it appeared Oscar was becoming less interested in the stickers throughout sessions. During maintenance, Oscar no longer found the stickers rewarding enough to serve as an EO; instead, it

appeared he had satiated on the stickers as an intervention. Their novelty initially captured his interest as they were stickers of preferred characters, but this intervention lost its evocative effect over time, leading to the necessity of the added timer component to the Tangible Termination intervention.

Extinction

When reinforcement is no longer in place for a behavior, that behavior reduces over time through operant extinction (Skinner, 1953). During intervention, transitioning to the next activity was mandatory, and any challenging behavior that occurred did not result in reinforcement. Thus, when transitioning away from a preferred activity, if challenging behavior occurred, the participant still had to transition away from that activity. When transitioning to a non-preferred activity, if challenging behavior occurred, the participant still had to transition to that activity. As the interventions across conditions were immediately effective, there were few sessions where extinction was necessary to implement. If participants did exhibit above zero levels of behavior, often it occurred in the first interval or two after data collection began, and once the participant realized the intervention was in place behavior ceased, suggesting this type of intervention may help avoid or reduce time participants may spend in extinction or lessen the severity of an extinction burst. For example, Charlie often engaged in mild physical resistance for 1-2 intervals, but after that, complied with the transition and the following activity. Extinction was most prevalent during maintenance for Oscar. As he exhibited high levels of behavior during several maintenance conditions, primarily Tangible Termination, Oscar was still expected to transition and engage in the appropriate secondary activity. Data collection ended after 5 min, however, the interventionist would continue to

implement extinction until the appropriate transition and secondary activity were completed.

Premack Principle

For Jackson and Charlie, the Premack Principle was included as part of their intervention during interrupted activity conditions (i.e., Interrupted Book Termination for Jackson and Interrupted Puzzle Termination for Charlie). The Premack Principle (also known as the response-deprivation hypothesis) states if engaging in a high-frequency behavior is made contingent upon engaging in a low-frequency behavior, the high-frequency behavior will act as reinforcement for the low-frequency behavior (Premack, 1959; Timberlake & Allison, 1974). When interrupting activities for Jackson and Charlie, part of the S^D included the concept of being able to come back and finish later. Thus, first participants had to transition away from the activity and engage in another behavior (low-frequency behavior), but if they complied, they were allowed to return later to finish their interrupted activity (high-frequency behavior). Therefore, the ability to finish the activity later served as reinforcement to engage in transitioning and neutral activities.

High-p Response Sequence

With Jackson and Oscar, a high-p response sequence was evident in both of their Demand Initiation conditions. A high-p response sequence (also called behavioral momentum) involves having an individual comply with several high-probability requests (i.e., easy tasks the individual is likely to comply with), followed by a low-probability request (i.e., harder task the individual does not usually comply with) in order to increase the likelihood the individual will do the low-probability task (Mace & Belfiore, 1990; Sprague & Horner, 1990). Several easy choice tasks were often presented to assist in the initiation of a transition or the secondary activity. For example, for Oscar's Demand

Initiation intervention, he was first given a choice of which chair to sit in, then which themed worksheet he wanted to do, and finally which themed pencil he wanted to use. Jackson's Demand Initiation involved choosing which math flashcard problem he wanted to do first, and the choice of whether he wanted to read the problem or have the interventionist read the problem. Beginning with a couple of simple questions the participants were likely to answer, assisted with the compliance of the harder tasks targeted for intervention.

ASD-Specific Characteristics

While transitions can be difficult for individuals with a number of different disabilities, several characteristics of ASD seem to be associated with increased difficulty during transitions. These key characteristics are discussed below.

Routines and Ritualistic Behavior

Individuals with ASD may have ritualistic behavior and/or strict adherence to routines (APA, 2013), which can impact transitioning between activities. The functional analysis results for both Jackson and Charlie identified a ritualistic function of behavior tied to interruption of activities. When an activity was interrupted before it was complete, both participants exhibited challenging behavior when asked to transition away. However, if the activity was done to completion, no challenging behavior was exhibited. The lack of behavior once the activity was completed demonstrated it was not purely a tangible function, but instead tied to the interruption of a routine, indicating an automatic function of behavior.

Predictability

Similar to strict adherence to routines, individuals with ASD also respond better with a high level of predictability in their environment, as they are often unaware of

naturally occurring cues within their environment (Flannery & Horner, 1994). All participants had at least one intervention component that included assisting in making a transition more predictable. Charlie and Jackson had visual and verbal cues to signal an activity was being interrupted but could be continued at a later time. However, Oscar showed the clearest need for predictability after maintenance probes when his low levels of challenging behavior did not maintain for Tangible Termination. In this instance, the S^D was modified to state that a timer was being set and would signal the end of playtime. The modified S^D and addition of the timer was successful in returning Oscar's behavior back to zero, thereby showing how an added predictable activity termination component assisted in successful transition behavior.

Visual versus Verbal Cues

Visual aids were used in conjunction with verbal S^D's with Charlie and Jackson since individuals with ASD may respond better to visual input over auditory information (Quill, 1995). Jackson had a visual aid to save his place in an interrupted book, and a token economy to help show how much work he needed to complete during math work. Charlie had a visual aid to signal it was time to go inside from recess, as well as a visual aid to signal waiting and coming back to his interrupted puzzle. In addition, Charlie was in a daycare environment set up similar to a classroom, which included classroom routines with embedded or hidden expectations that are often difficult for individuals with ASD to identify or understand (McCoy et al., 2010). Charlie was nonverbal and it appeared his receptive language was also limited. Therefore, these visuals were integrated into natural routines and have since been generalized to other settings and to the teachers in the classroom to help facilitate Charlie's understanding of routine transition expectations.

STUDY LIMITATIONS

There were several limitations in the current study. First, as this is a preliminary step toward functionally matched interventions using embedded preferences as an intervention for transition-related challenging behavior, the ability of this study to generalize to other settings, functions, or participant characteristics is unknown. Two of the three participants were high functioning, and only one participant was lower functioning. Two participants had sessions conducted in home settings, where more confounding variables could be controlled, whereas Charlie's sessions were in the daycare classroom within the naturally occurring activities. No participants in the current study had sessions conducted in schools or in community settings where transitions might also be difficult. For example, many families may have difficulty running errands with their child who has to transition to and from the car and away from preferred items in the store. In addition, all interventions in the present study were conducted by trained behavior therapists at the masters or doctoral level and were not generalized to any parents or teachers as part of the study. It is unknown whether these interventions could translate to low-functioning individuals with ASD, or whether these interventions would be effectively generalized to teachers or parents across different settings.

An additional limitation with regard to generalization lies with the fact only one generalization target was conducted with each participant. For Oscar and Jackson, this included generalizing an intervention to a new functionally matched activity, whereas for Charlie it was generalizing all interventions to a new behavior therapist. Anecdotally, some of the interventions have been further generalized since the completion of the study, but these applications were not documented as part of the current study. Thus, it is unknown whether the functionally matched interventions would generalize to all activities of the same function. For example, Jackson's Demand Initiation intervention

was for math homework specifically, but it is unknown whether the same type of intervention would be effective with reading or science homework. Similarly, with Charlie, it is unknown whether his Interrupted Puzzle Termination intervention would be effective across all interrupted activities in his day.

Next, this study was also confined in application by its sole use of functionally matched interventions instead of an intervention that may target multiple functions. While, functionally matched interventions are important, it might be more time consuming to treat each function separately. In addition, oftentimes in a natural setting, transitions combine multiple functions (i.e., transitioning away from a preferred object to a demand). This intervention may also be difficult for teachers to implement in the natural classroom setting where there are limited resources, personnel, and time. As determination of function is not always easy, it may be difficult for untrained personnel to understand, identify, and address functions separately. Functional analyses are difficult to implement in natural settings where trained staff and time are more limited. Thus, this study did not provide a clear answer for these types of transitions or situations, as it was a preliminary exploration into the concept of functionally matched transition interventions.

Similarly, the use of neutral activities as the first or second location during all transitions was contrived in order to have experimental control over functions during the interventions. However, in a natural environment, it is not always possible to start or end in a neutral activity. In the home setting, this may be more feasible, but in schools, there is often a scheduled routine where neutral activities would delay transitions or limit the individual's participation in regular classroom activities. For example, if students transition away from tangibles to a neutral activity to ensure the tangible function alone is being targeted, they may miss the first few minutes of instruction in the next academic activity with their peers while they are in that neutral activity.

In addition, multiple components were used in all functionally matched intervention conditions across participants and a component analysis was not included in the current study. Thus it is unclear if all aspects of the intervention were necessary, or if only certain elements of the intervention were required in order to reduce challenging behavior to zero or near zero levels. For example, with Oscar's Demand Initiation intervention, he was given themed worksheets, themed pencils, and the reward of getting to color parts of the worksheet after completion. Perhaps it was only necessary to have the themed worksheet to reduce behavior to zero, or perhaps it was only necessary to have the ability to color the worksheet after completion. It is impossible to know based on the current study.

IMPLICATIONS FOR PRACTICE

This study has numerous implications for practice in a variety of settings. First, this study replicates the findings of McCord et al. (2001) using a modified procedure, demonstrating the functional contingencies of different transitions. Functional assessment of transition-related challenging behavior has been sparse in the current transition intervention literature; thus, this study supports the use of functional assessment prior to transition intervention for individuals with ASD. The two-way nature of transitions (i.e., transitioning to and away from activities) is an important aspect to consider, and provides critical information regarding transitional difficulties for students. For example, if a student only has challenging behavior related to transitioning away from tangibles, it can be hypothesized the student has a tangible function of behavior. However, if the student has difficulty transitioning both to and away from tangibles, the function may in fact be more automatic in nature (i.e., the transitions themselves are difficult due to a change in

routine or interruption of activities). These idiosyncrasies are important to assess in order to successfully target reductions in challenging behavior.

The present study also highlights the importance of implementing an intervention that is a functional match for that student. Without identification of function, an intervention targeting transitions may be ineffective. For example, a common intervention for transitions is the use of activity schedules (Lequia, et al., 2012), which assist in making transitions more predictable (Flannery & Horner, 1994). However, it does not address the function of behavior behind the transition. In keeping with this example, if a student does not want to leave a preferred activity to transition to the next activity, showing a picture of the next activity does not target the tangible function of that student's behavior. Similarly, targeting the wrong function ends in a functional mismatch between intervention and function. Thus, if a student does not want to transition away from a preferred activity, implementing an intervention that provides attention for appropriate transitions may not be effective, as it does not target the tangible function of the transition.

Correspondingly, this study also demonstrated the relatively equal effectiveness of interventions across all included functions. This provides practitioners with support showing that, regardless of function, embedded preference interventions can effectively reduce challenging behavior across transitions. While not all functions of behavior were studied, effective results were found for tangible, demand, and ritualistic (automatic) functions of behavior. In addition, the study showed the functional transitions with the highest levels of challenging behavior were not necessarily slower to decrease than other functional transitions. Interventions appeared to be fairly equally effective across all functions regardless of baseline levels of challenging behavior, suggesting to

practitioners that transitions with the highest levels of challenging behavior will not necessarily be more difficult to intervene on.

Next, while the transitions in the study were to and from a neutral activity to control for function, this study still provides preliminary support for the use of embedded preferences in the secondary activity. This has important implications for practitioners who have a routine set up and would like transition interventions to work within an existing structure. For example, for a student who has transition-related challenging behavior to avoid having to go work at the table, the teacher can embed preferences into the work, so as to facilitate the student transitioning with the class, but still providing an individualized intervention for that student. Having a themed worksheet of equivalent academic content does not take away from what the student is supposed to be doing in the classroom, and at implementation does not take time away from the teacher (although the teacher would have to take time to develop themed worksheets in advance).

The success of this intervention also has implications for parents who have difficulty with transitions with their children in home or community settings. As the intervention uses child preferences, parents may be able to easily modify current troublesome situations involving transitions through the use of embedded preferences. While parents would need training and assistance from trained professionals to assist in understanding and identifying functions, the interventions themselves could be easily taught to parents or other family or community members. For example, transitioning from the car into the grocery store is a common challenge for many parents of children with ASD. As an escape/avoidance function, parents could create themed grocery lists for the child including their child's preferences to facilitate transitioning into the grocery store.

Additionally, this study demonstrated the potential immediacy of intervention effects for reducing challenging behavior during transitions. Oscar and Jackson dropped

immediately to zero levels of behavior, and Charlie also had a significant initial reduction in challenging behavior. Oftentimes, extinction is a part of transitions (i.e., it is time to go inside since recess is over; there is not an option to stay longer), and this study demonstrated the potential benefit of reduced time in extinction and/or the ability to reduce behavior without having to implement extinction procedures.

Finally, as the majority of literature on MOs and challenging behavior has focused on satiation, this study provides evidence that satiation is not necessary to engage in successful transition behavior away from preferred activities. This is important, as oftentimes in structured settings, a transition is a necessity, not a choice. Thus, the ability to transition away at whatever moment the teacher or clinician deems is appropriate, regardless of satiation, has important clinical implications.

FUTURE RESEARCH

First and foremost, future research related to transition interventions for individuals with ASD should focus on the inclusion of functional assessment of transition-related challenging behavior prior to intervention. As this has been limited so far, future research should attempt to strengthen the validity of results through this practice. This will help ensure interventions are matched to behavioral function, and help identify potential idiosyncratic variables associated with functional transitions prior to intervention. In addition, future research should seek to expand upon the methods of transition functional analyses to explore other methodology. For example, in the current study, participants were assessed both transitioning to and away from any given function of behavior (e.g., transitioning to and away from demands). However, it would be hypothesized challenging behavior would only occur in one direction. For example, when assessing behavior triggered by demands, challenging behavior should only occur when

transitioning to demands, and not when transitioning away. Transitioning away from demands would be considered a form of control, as challenging behavior would not be expected. However, there was also an overall control condition (i.e., neutral to neutral) included in the current study's assessment. Thus, perhaps it would be advantageous to reduce the number of conditions assessed by limiting the bi-directionality of transition assessment and only assess the transition in the direction hypothesized to trigger challenging behavior in relation to one overall control condition.

Also, while not observed in the current study, reexamining the methods for transition functional analyses may help limit the carryover effects that may occur within a given condition. Consider again the assessment of transitioning to and away from demands. In the current study, when assessing the transition away from demands, the participant had to begin with 2 min of working on demands. This often triggered behavior during the first 2 min where data was not yet being collected. When given the S^D to transition (commencement of data collection), it would be expected that some participants would have carryover effects while transitioning to neutral. The protocol would then require the participant be returned to working on demands if challenging behavior occurred during the transition. However, if challenging behavior was in fact due to carryover effects, the true nature of behavior would not be accurately identified.

As predictability also appears to play a role in the transition behavior of many individuals with ASD, it may also be beneficial to explore elements of predictability within the functional analysis of challenging behavior. While predictability does not appear to apply to all individuals with ASD, many seem to respond better with predictable components in the environment. These components could be explored through functional analysis and then also through interventions seeking to fade from predictable transitions to more naturalistic transitions. For example, given a tangible

function of behavior, participants could be assessed being asked to transition away from tangibles when given a clear warning of when playtime would end and without being given any warning at all of the end of playtime. Then, intervention may begin with clear, predictable signals for transition that are then faded back to the natural (i.e., less predictable) signals that occur in the regular environment.

Next, future research should replicate and expand upon the current study's results and apply this intervention to participants with different characteristics, in different settings, with different functions, and by different interventionists. Individuals with ASD who have more severe ASD symptoms should be targeted, as well as older individuals with ASD to see if results can be equally effective across these different characteristics. In addition, school and community settings should be targeted to see if functionally matched embedded preference interventions are an effective tool in these situations as well. None of the participants in the current study had an attention function of behavior, so this function should be explored, along with replication of results with other functions. It is also possible that some students will have trouble transitioning between any activities regardless of whether the activity is preferred or not, producing elevated levels of behavior in all functional analysis conditions. This would suggest an automatic function (i.e., the transitions themselves are challenging), and would be another interesting application of the current study. As transitions are part of many natural environments, it would also be beneficial for future research to examine training teachers or parents to implement intervention components and study the effectiveness of this study under those conditions.

Additionally, future research should consider taking this study one step further to intervene on transitions that are multiply maintained in natural settings to address this social validity concern. For example, students may often have to transition away from a

preferred activity (tangible) to an academic activity (escape/avoidance). As the use of a neutral activity before or after transition is not always possible, developing an effective intervention for this type of multiply maintained transition difficulty would have important implications in many natural settings. While this often arises in school settings, home settings also have many natural transitions that may include multiple functions, such as transitioning away from the TV (tangible) to brushing teeth (escape/avoidance).

Another variable to examine in future studies is the proximity of the secondary location during transitions in order to determine whether shorter or longer transitions respond better to intervention and which types of interventions might work better in these situations. For example, if a transition is going to take several minutes (e.g., from recess back to the classroom), a different strategy might be needed that is different from the intervention that is successful for shorter transitions between activities within the classroom. With a longer transition, there is a greater likelihood other variables may confound the intervention, as well as a possibility of the function shifting during transition. For example, a student may initially engage in challenging behavior when asked to leave recess (tangible), but when walking down the hall, this behavior may shift to not wanting to go back to the classroom (escape/avoidance) or to gain attention from the teacher or peers (attention).

Furthermore, future studies should consider conducting a component analysis of intervention features included in the embedded preference interventions. As multiple components were included in each intervention, it is unclear as to whether all intervention components were necessary. Thus, future research could implement functionally matched embedded preference interventions, and then analyze which components were necessary for successful transition behavior for participants. While interventions are individualized to each participant, this could still provide useful information as to which components are

commonly necessary, and approximately how many intervention components are required for participants to have successful transition behavior.

Finally, other study designs could also be explored in future research studies. For example, if there were multiple students in one classroom with transition difficulties, a multiple baseline across participants design (Kennedy, 2005) could be used to evaluate the effectiveness of sequentially adding in individualized functionally matched transition interventions for different students in the classroom. Alternatively, a multiple baseline across functions design could also be used to evaluate interventions across different functions for one participant.

CONCLUSION

This study demonstrated the effectiveness of targeting transition-related challenging behavior in individuals with ASD through the use of functionally matched embedded preference interventions. Results showed immediate reductions in challenging behavior for all participants once the interventions were put in place, and showed maintenance over time and generalization to other activities or people. Despite several limitations, this study had important implications for practitioners regarding the importance of functional assessment, functionally matched interventions, and the ability of these interventions to be easily embedded within current transitions in the natural environment.

Appendices

Appendix A
Transition Functional Analysis

Client _____ Observer _____ Date _____

Condition _____ Session # _____

Mark instances of challenging behavior by circling the appropriate corresponding number for any behaviors that occur in a 10 s interval from the S^D until the end of 2 min.

1	1 2 3 4	**7**	1 2 3 4
2	1 2 3 4	**8**	1 2 3 4
3	1 2 3 4	**9**	1 2 3 4
4	1 2 3 4	**10**	1 2 3 4
5	1 2 3 4	**11**	1 2 3 4
6	1 2 3 4	**12**	1 2 3 4

Operational Definitions of Challenging Bx:

1.

2.

3.

4.

1. _____ ___/12x100=____%

2. _____ ___/12x100=____%

3. _____ ___/12x100=____%

4. _____ ___/12x100=____%

Total: ___/12x100=_____%

Appendix B

Transition Intervention Data Collection

Client _____ Observer _____ Date _____

Condition _____ Session # _____

Mark instances of challenging behavior by circling the appropriate corresponding number for any behaviors that occur in a 10 s interval from the S^D, during the transition, and for two minutes in the secondary location/activity or until reaching a maximum 5 min.

1	1 2 3 4	**7**	1 2 3 4	**13**	1 2 3 4	**19**	1 2 3 4	**25**	1 2 3 4
2	1 2 3 4	**8**	1 2 3 4	**14**	1 2 3 4	**20**	1 2 3 4	**26**	1 2 3 4
3	1 2 3 4	**9**	1 2 3 4	**15**	1 2 3 4	**21**	1 2 3 4	**27**	1 2 3 4
4	1 2 3 4	**10**	1 2 3 4	**16**	1 2 3 4	**22**	1 2 3 4	**28**	1 2 3 4
5	1 2 3 4	**11**	1 2 3 4	**17**	1 2 3 4	**23**	1 2 3 4	**29**	1 2 3 4
6	1 2 3 4	**12**	1 2 3 4	**18**	1 2 3 4	**24**	1 2 3 4	**30**	1 2 3 4

Operational Definitions of Challenging Bx:

1. _____ / _____ x 100 = _____%

2. _____ / _____ x 100 = _____%

3. _____ / _____ x 100 = _____%

4. _____ / _____ x 100 = _____%

Total: _____ / _____ x 100 = _____

Appendix C

Transition Intervention Treatment Fidelity Checklist

Observer _____ Date _____ Session # _____

Mark a "+" for steps completed correctly by interventionist and a "-" for steps completed incorrectly during intervention procedures.

Step	+ / -	Notes
Child is in 1st activity for a minimum of 2 min		
Interventionist gives appropriate S^D to transition _____		
Interventionist directs child to next location		
Interventionist ignores challenging behavior		
Interventionist provides prompts with least-to-most hierarchy as needed		
Interventionist provides praise for appropriate transition behavior		
Interventionist provides functionally-matched embedded preference into secondary activity _____ _____		
Child is in 2nd activity for a minimum of 2 min		

_____ / 8 x 100 = _____ %

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Vita

Laura Rojeski grew up in Michigan and is the daughter of Tom and Debby Rojeski. Being raised by parents in helping professions allowed Laura numerous opportunities to get involved in working with children and individuals with disabilities. After graduating from Mt. Pleasant High School in 2003, Laura began her higher education pursuits at Hope College where she first discovered her passion for working with children with autism spectrum disorder. She earned her bachelors in psychology with a minor in French in 2007. Laura then enlisted in the Peace Corps and spent two years in Burkina Faso in West Africa as a health and community development volunteer in a small village, where she focused on health education and girls empowerment with primary school students. Following this experience, Laura enrolled in her masters program in special education at the University of Texas in 2010, and continued directly into the special education doctoral program in 2011. Both her masters and doctoral work were under the specialization area of Autism and Developmental Disabilities. Laura was involved in a variety of research projects and book chapters, taught courses and guest lectured, as well as supervised, trained, and mentored masters students.

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