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Training Responding to Joint Attention Bids Using Gaze Following and Multiple Bid Types

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Training Responding to Joint Attention Bids Using Gaze Following and Multiple Bid Types

By

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A Thesis

Submitted to the Graduate Faculty of

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree of

Master of Science in

Applied Behaviour Analysis

December 2020

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Abstract

This study evaluated the implementation of behavioural intervention (i.e., prompting, prompt fading, discrete trial teaching, social reinforcement, and multiple exemplars) to teach three children all diagnosed with autism spectrum disorder (ASD) how to respond to bids for joint attention by following another's eye gaze. Additionally, generalization of each child's responding was evaluated across four different bid types (i.e., varied presentation and/or stimuli used), as well as with a parent/caregiver. To promote generalization, teaching occurred in both the child's home and clinical environment, as well as when seated at a table or on the floor while engaging in an activity. Using a multiple baseline design across bid types for each participant, the results showed that behavioural intervention to teach responding to joint attention bids using gaze following was successful for all participants. Response generalization was shown across bid types for all participants. All participants' skills were also generalized to their parent or caregiver.

Acknowledgements

First, I would like to thank my advisor and committee chairperson, Dr. Ben Witts. Thank you for your teaching, patience, and guidance from first year Experimental Analysis of Behaviour through to the completion of this thesis project. I will forever be a better behaviourist and critical thinker because of you.

I'd also like to extend my thanks to my thesis committee, Dr. Michele Traub and Dr. Odessa Luna for their feedback and support. A special thanks to Dr. Kim Schulze for supporting me in my practicum and the beginning of my research on joint attention.

Thank you to two inspiring women, Julide Peace and Erin Bond, who have supported and encouraged me, professionally and personally, for the past 8 years of my career. I am so grateful for all you have taught me about ASD, ABA, and childbirth over the years.

Thank you to all the participants and their parents for their support and contributions to this project. Thank you to Melissa, Amy, and Maggie for all their hard work as instructors on this project. The kiddos you work with are incredibly lucky to have you as teachers.

Asia, thank you for being the guinea pig and sharing all your wisdom and resources from your time at SCSU before me.

I'd also like to extend my gratitude to my friends for their unwavering support over the past few years (you know who you are). A special thanks to my roommates, Jen and Kim, for enduring and tolerating "the worms project".

Finally, I'd like to thank my family: my mom for her endless support, love, and pride in what I do and who I am, my dad and Carol for all their love and encouragement, and the rest of Famjam for being the most loving and supportive crew of siblings I could ever ask for.

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Chapter I: Introduction and Literature Review

Several diagnostic criteria for autism spectrum disorder (ASD), defined in the Diagnostic and Statistical Manual for Mental Disorders (American Psychiatric Association, 2013), are related to eye contact and sharing experiences—such as interests and emotions—with others. One of the earliest indicators of ASD is a deficit in what cognitive and developmental psychologists call *joint attention*, which appears in typically-developing children between 8 and 15 months of age (Jones and Carr, 2004 and Whalen, Schriebman, & Ingersoll, 2006). Joint attention refers to interactions between two (or more) people that share their attention toward the same stimulus. Additionally, joint attention might be an important milestone that, when not developed, could impede appropriate social development. Behaviour-analytic research has classified joint attention as a behavioural cusp or pivotal skill, as it increases an individual's potential exposure to social consequences that may shape their language and social skills (Charman, T., 2003; Jones and Carr, 2004; Mundy et al., 2007; Whalen, Schriebman, & Ingersoll, 2006).

Developmental research has described the progression of joint attention skills through infancy, beginning with dyadic joint attention from birth to triadic joint attention developing as early as three months of age (Butterworth, 2004). Dyadic joint attention refers to two individuals sustaining attention to each other's faces, while exchanging facial expressions (e.g., an infant and caregiver imitating each other's smiles, tongue movements or silly faces). Triadic joint attention is explained to be the highest level of the skill that continues to develop between 3 and 18 months of age, which involves the alternation of gaze between a stimulus and another person, as if to "share" the experience. Cognitive psychologists believe that joint attention is made up of both the topographically-defined gaze shift toward a stimulus and back to the communication

partner, as well as “having the intent to share” the experience with another person. Behavioural researchers of joint attention explain the “intent” of joint attention by determining the function of this behaviour. As developmental and cognitive psychologists have identified, some joint attention skills are maintained by access to tangibles (sometimes referred to as protoimperatives), while what is thought to be “true” joint attention is maintained by social consequences (sometimes referred to as protodeclaratives). Social consequences such as facial expressions, smiling, or social comments likely develop as conditioned social reinforcers (i.e., they have been conditioned with primary reinforcers delivered by a caregiver over a child’s early childhood) that maintain joint attention in typically-developing children.

Given this common deficit in children diagnosed with ASD, behavioural research has begun to evaluate effective interventions for teaching children to respond to joint attention bids (RJA) and initiate joint attention bids (IJA) (Isaksen & Holth, 2009; Jones, Carr, & Feeley, 2006; Jones & Feeley, 2007; Krstovska-Guerrero & Jones, 2013; Martins & Harris, 2006; Taylor & Hoch, 2008; Whalen & Schriebman, 2003). RJA is defined as an “infant’s ability to follow the direction of the gaze and gestures of another in order to share a common point of reference”, while IJA is defined as an “infant’s use of gestures and eye contact to direct others’ attention to objects, to events, and to themselves” (Mundy and Newell, 2007). Behavioural interventions have taught responding to joint attention skills using common evidence-based behavioural strategies, such as prompting, prompt fading, activity interspersal, and reinforcement (Isaksen & Holth, 2009; Jones, Carr, & Feeley, 2006; Jones & Feeley, 2007; Krstovska-Guerrero & Jones, 2013; Martins & Harris, 2006; Taylor & Hoch, 2008; Whalen & Schriebman, 2003). Although effective intervention has varied across the research, most used a combination of both Discrete Trial Teaching (DTT) and Pivotal Response Training (PRT).

In a study by Whalen and Schriebman (2003), RJA was taught to five participants using a multiple baseline by subject design. Intervention took place in similar rooms in a research laboratory, each with different toys and pictures placed around the room each session. RJA training was conducted through six phases: response to hand on object (i.e., the experimenter placed the child's hand on a different toy and expected the child to look at or manipulate the toy for 5 seconds), response to object being tapped (i.e., the experimenter presented and tapped a new toy and expected the child to look at or manipulate the toy for 5 seconds), response to showing of object (i.e., the experimenter showed a toy to the child and expected them to look at or manipulate the toy for 5 seconds), eye contact (i.e., using PRT shaping procedures, the experimenter showed or tapped new toys and the child was expected to establish eye contact with the experimenter in order to gain access to the toy), following a point (i.e., the experimenter established eye contact with the child, then turned their head and pointed to another object in the room and expected the child to turn their head in the same direction to gain access to the toy or to continue playing), following gaze (i.e., as described for following a point, but the experimenter only turned their head to the object without a point). All five participants successfully completed response training and increased their responding to target bids from pre- to post-treatment, although not with statistical significance, likely due to their variability in responding during baseline. Although this study showed some success in teaching children diagnosed with ASD to respond to joint attention bids, any response of establishing eye contact was reinforced and maintained by access to tangibles rather than social reinforcement. Participants also showed mostly decreases in responding at a 3-month follow-up, while 3 of the 5 participants maintained responding scores above baseline.

In 2006, Martins and Harris conducted a study teaching three participants diagnosed with ASD to respond to an adult's joint attention bid by following the adult's gaze and head turn toward an object. Training sessions were set up in the participant's specialized classroom and implemented by classroom staff. The adult and child sat across from each other either in a work or play session, while target stimuli were placed approximately 3-5 feet away (at a 90-degree angle). As done by Whalen and Schriebman, their intervention consisted of four phases with modifications to the bid initiated by the adult. All phases used bids that included an attention-getting phrase (e.g., saying the child's name), followed by the adult turning their head toward the target stimulus. Bids in phase one were accompanied by a point that touched the object, as well as an additional vocal cue, "Look!". In phase two the point was faded to a distal point that did not touch the stimulus and in phase three the point was eliminated altogether. In the final phase, the additional vocal cue was eliminated, so that the bid included only an attention-getting phrase followed by a head turn towards the target stimulus. All participants increased their responding to joint attention bids by turning their heads/gaze shifting toward the target stimulus. Reinforcement used in training included both social praise and access to tangibles (i.e., preferred target stimuli used). Martins and Harris argued that by demonstrating maintenance and generalization of participants' responding involving non-preferred items, with an adult not involved in training sessions, and in a new room within the school, it was unlikely that their responding was maintained solely by access to preferred tangibles.

Unlike the two previously described studies, Jones, Carr, and Feeley (2006) trained five children diagnosed with either pervasive developmental disorder-not otherwise specified or ASD to respond to joint attention bids by not only shifting their gaze toward a target stimulus, but also by alternating their gaze to the adult and back to the stimulus. Joint attention responding with

gaze alternation more closely meets the definitions of RJA described in cognitive and developmental psychology. Training sessions in this study were conducted in the participants' classroom or other school areas. Instructors provided ten opportunities for RJA each session by activating a toy less than 1.5 meters from the child, turning toward and pointing at the toy while providing an attention-getting phrase or comment (e.g. "Wow, it's Elmo!"). Participants were expected to respond by shifting their gaze toward the toy within 2 seconds and then back to the adult and again to the stimulus. Correct or prompted responses were followed by social comments related to the stimulus. Although social consequences to RJA were implemented, if the child did not display positive affect following the social consequence provided, preferred food reinforcement was paired and thinned across following training trials. Similar to Martins and Harris (2006), training opportunities were generalized to different toys or pictures not used in training. Generalization opportunities were presented less frequently (i.e., average of 4 opportunities per day) during the child's free time. Generalization and maintenance was achieved after variable lengths of time for each participant (between 1.5 to 10 months).

Taylor and Hoch (2008) conducted a study that taught three children diagnosed ASD to respond to joint attention bids by turning toward a stimulus, making a comment, and looking back to the communication partner. Taylor and Hoch had noted that no behavioural research had yet documented that social contingencies alone could function as effective reinforcement for RJA in children diagnosed with ASD. Intervention was conducted for three participants in a specialized school setting with "putative visually enticing or unusually placed items" in the training room. During training of RJA, instructors sat across from participants at a table and initiated bids by pointing to a target stimulus and providing one of the following vocal cues, depending on the stimulus: "wow!", "look!", "that's silly!", "uh oh!", "aaah!", "oh no!". Each

training session measured the percentage of trials that the child (a) looked in the direction of the stimulus within 5 seconds, (b) made a comment about the stimulus, and (c) looked back at the instructor within 2 seconds of commenting. Instructors responded to the child's correct or prompted responding with "social interaction in an enthusiastic manner" and physical social interaction (e.g., tickles). The dependent variable with the lowest percentage of accurate responses during baseline was the child looking back to the instructor (range = 4-15%), whereas looking toward the stimulus was higher for all participants (range = 62-88%). All participants' responding to joint attention bids increased on all responses following training (range = 15-50%). Generalization and maintenance of RJA was not clearly demonstrated. Taylor and Hoch suggested that future research should vary the training setting to promote generalization.

Gaze Following

Responding to joint attention bids requires the child to attend to several different attentional cues (e.g., gaze shifts, points and gestures, vocal cues). A study conducted by Presmanes et al. (2007) evaluated the difference in responding to joint attention bids between a group of younger siblings of children with ASD and a group of younger siblings of typically developing children. Several prompt sets for bids for joint attention were implemented and compared: gaze shift only without verbal cue, gaze shift with eliciting phrase, gaze shift with directive verbal cue, gaze shift with eliciting or directive phrase and point. This study found that gaze shifts that paired eliciting and directive vocal cues were more effective cues for siblings in the typically developing group siblings. Siblings in the ASD group improved their responding when a point was added to bids using gaze shift and eliciting or directive vocal cues, while a point did not significantly change the responding of children in the typically developing group. Although presenting bids for RJA using a more salient cue, such as a point, might increase a

child's responding, training children diagnosed with ASD to respond to bids without a point may increase their ability to attend to other's faces in order to interpret non-verbal cues. As developmental and cognitive psychologists describe that joint attention involves one's understanding that they are sharing the same experience, teaching children with this deficit to attend to and interpret another's gaze may be the closest way to operationally define this response and lead to improvements in perspective-taking. In addition to the importance of behavioural intervention for teaching RJA using natural consequences, as in Taylor and Hoch's (2008) study, future research could also modify the training bids for joint attention to require a more "intentional" following of another's head turn/gaze shift. It is possible that training RJA using gaze following rather than point following may act as a motivating operation for the additional behaviour of looking back to the communication partner, as the child may check to confirm that both parties are looking at the same stimulus (i.e., "sharing").

Generalization and Variation of Bids

As mentioned above, some previous studies on training RJA have aimed to train responding in a varied setting (e.g., home, classroom, different areas of school, while engaged in play or work activities). As Taylor and Hoch (2008) suggested, future research should train RJA by presenting bids in a varied setting to promote generalization to more natural opportunities. Training RJA while the individual is playing or engaged in an activity is important but may create initial challenges as the child will need to shift their attention away from their current activity. Another way to vary the presentation of bids during training is doing so while the child is walking with the adult from one location to another. Although it's possible training with this set-up may be more challenging than when sitting, these variations could play an important role in response generalization and maintenance.

Another commonality in joint attention research is the type and presentation of stimuli used when teaching both RJA and IJA. Most studies use toys or pictures as the stimulus referenced in joint attention bids (Isaksen & Holth, 2009; Jones, Carr, & Feeley, 2006; Jones & Feeley, 2007; Krstovska-Guerrero & Jones, 2013; Martins & Harris, 2006; Taylor & Hoch, 2008; Whalen & Schriebman, 2003). When thinking of natural opportunities that an adult may initiate bids for joint attention, toys and pictures are not likely to be the most common stimuli referenced. More natural opportunities may include other people performing a salient action or presenting a novel or salient stimulus (e.g., someone wearing a costume or mask). Previous studies have used toys that will be salient to the child by selecting toys that light up or make sounds and movement upon activation (Jones, Carr, and Feeley, 2006). Although these types of stimuli may increase the likelihood of a child attending to the stimulus, when training RJA it may be important to choose stimuli that don't elicit the child's attention prior to the adult initiating their bid for the child's attention. Taylor and Hoch (2008) are the only study to list multiple types of bids used in training RJA (i.e., "wow!" in reference to an oversized balloon, "look!" in reference to a doll hanging from the ceiling, "that's silly!" in reference to a stuffed animal wearing a wig, "uh oh!" in reference to a spilled liquid, "aaaah!" in reference to a scary mask, "oh no!" in reference to a bike turned upside down). Although Taylor and Hoch used a variety of bids to evoke RJA, including both stimuli that may be preferred or perceived as interesting and stimuli that may be aversive, they presented all bids while the child was sitting at a table. Additionally, they did not formally evaluate differences in responding to the type of stimulus. An anecdotal note suggested that although getting their participants to look back at the instructor was a difficult response to shape, they observed more accurate occurrences of this

response when the stimulus being referenced was aversive. It was suggested that gaze shifting could be taught more effectively when there is a sufficient motivating operation for escape.

The purpose of this study is to (a) apply previously successful strategies from past research (i.e., prompting, prompt fading, social reinforcement) to teach children diagnosed with ASD to respond to joint attention bids by following another's gaze shift and (b) assess acquisition and generalization of RJA across a variety of bid types.

Chapter II: Method

Participants and Setting

Three young children, each independently diagnosed with ASD, participated in this study. All participants were recruited from a private clinic that provides behavioural intervention for children with ASD. All participants had not been observed to initiate or respond to bids for joint attention consistently.

Brooks, a 5-year-old boy, had been receiving behavioural intervention since the age of 2 years. He used vocal behaviour to get his needs and desires met, in both English and Spanish. He spoke in 4-5 word sentences though often erred on grammatical concepts or word order. Brooks continued to receive approximately 16 hours per week of behavioural therapy at home or clinic, while also attending a community kindergarten program with aide support 3 days a week. Brooks struggled to consistently engage appropriately with peers and read social cues.

Noel, a 3-year-old boy, began receiving behavioural intervention seven months prior to the start of this study and continued to receive approximately 16 hours of therapy per week throughout the duration of this study. Additionally, Noel began attending a community pre-school program with the assistance of a behavioural aide part way through this study. He spoke in 3-4 word sentences, primarily to mand for tangible items or actions. Noel's language was often a delayed echo of phrases or questions that familiar adults used. He could make basic requests and express dislike of certain events. Noel initiated comments that primarily included factual or rote information, as opposed to personal experiences, and rarely established eye contact when communicating with others.

John, a 3-year-old boy, had been receiving behavioural intervention since the age of 2 years. He spoke in 2-3 word sentences, but often repeated himself several times before

establishing eye contact with his communication partner. Approximately 25% of his vocal verbal behaviour was understood by an unfamiliar listener. John frequently made comments and sought out others for attention and social interaction, but rarely did so by establishing eye contact.

All participants received behavioural therapy primarily in the home setting, as well as in a clinic setting 3-4 times per month. Sessions in home occurred in a room or area of the house where extraneous stimuli could be limited to typical household items/furniture. In the clinic, sessions occurred in a room with a couch, table, chairs, and select toys to engage the child in play activities. Each participant worked one-to-one with a trained behavioural aide. All sessions were conducted with the adult sitting directly across from the child at a table or on the floor, while engaging in a familiar play or routine activity (e.g., playing a memory game, drawing, playing cars, eating snack). Stimuli were set-up for each trial within 10 feet of the child and adult during baseline, intervention, and generalization. All baseline and generalization probes were conducted in the participant's home environment, with one parent implementing generalization probes throughout the study.

Materials

The materials used in this study included primarily toys and pictures, as well as common furniture or commonly used items (e.g., a chair, coat, lunch bag, toque). Toys and pictures were chosen for each participant based on a brief preference assessment that was also used to identify preferred topics/interests and potential social reinforcers. Examples of potential social reinforcers were chosen based on the child's engagement and manding (e.g., tickles, sound effects, songs, funny voices). Several different stimuli were used for each bid type for joint attention targeted during intervention, including: pictures of silly animals, toys in strange/novel locations, videos on an iPad, wigs, masks or costume pieces, picture on a shirt/backpack/hat. Stimuli and the

location of items were changed for each trial to promote novelty and possibly act as an establishing operation for social reinforcement (i.e., something novel and interesting for the adult to comment on and “share”). Due to the global pandemic at the time of this study, all instructors were required to wear masks that adequately covered their mouth and nose. Children and parents were not required to wear masks, based on agency policy.

Dependent Variable and Response Measurement

There were three dependent variables: (a) the percentage of trials in which the participant looked in the direction of the instructor’s face in response to the instructor’s vocal cue and head turn/gaze shift (defined as the child having his or her head facing the instructor within 5 seconds of the vocal cue), (b) the percentage of trials in which the participant looked at the target stimulus in response to the instructor’s head turn/gaze shift (defined as the child having his or her head facing the stimulus and having both eyes directed toward the stimulus within 3 seconds of looking at instructor or within 5 seconds of vocal cue), and (c) the percentage of trials in which the participant looked back at the instructor within 5 seconds after looking at the stimulus and/or making a comment (defined as the child having eyes directed toward the instructor’s face) (Appendix B). Complete responses were also measured per trial. Correct complete responses were scored per trial, when the participant demonstrated correct responding for all three responses (i.e., a, b, and c) or correct responses for ‘b’ and ‘c’ only.

Independent Variables

The following variables were scored to assess integrity of the implementation of the intervention: (a) presentation of a vocal directive assigned to the target stimulus paired with a simultaneous head turn/gaze shift toward the stimulus (e.g., “wow!”, “woah!”, “cool!”, “look at that!”, “aaaah!”, “oh no!”, “that’s silly/funny!”, “what?!”, “check that out!”), (b) presence of the

target stimulus, based on the current bid type, (c) instructor's response to the child following their successful gaze/head turn toward the stimulus and back to their face (e.g., "Did you see that?!", "That was so silly!", *stimulus-related comment*) or ignoring an incorrect response or no response within 5 seconds, (d) pairing of additional social reinforcement following successful responding (e.g., tickles, re-enactment related to stimulus, silly voices/laughter), (e) correct use of prompting strategies, and (f) recording accurate trial-by-trial data on dependent variables defined above. Components (d) and (e) are only to be included during intervention and not during baseline or generalization sessions.

Experimental Design and Inter-observer agreement (IOA)

A multiple baseline across bid type design was used to evaluate the effectiveness of intervention on responding to multiple types of joint attention bids, as well as assess for generalization across bid types and to parents. Each participant was assigned a randomized order of bid types to be taught during intervention. Bid type order was chosen for each participant by placing the numbers 1-4 in a container and drawing at random. Noel was assigned the bid type order: 4, 1, 3, 2. Brooks was assigned the bid type order: 1, 4, 3, 2. John was assigned the bid type order: 1, 3, 4, 2.

An independent observer collected interobserver agreement (IOA) data on all dependent variables for 20% of sessions for Brooks, 13% of sessions for Noel, and 14% of sessions for John. IOA was scored using the same data sheet as the instructors (Appendix B) while watching video recordings of sessions. Each response was scored as an agreement or disagreement. An agreement was defined as both the instructor and observer recording the occurrence, non-occurrence, or prompt for each response within each trial, as listed on the data collection form. A disagreement was defined as the instructor and observer scoring a response differently from one

another. IOA percentages were calculated by dividing the number of trials with agreements by the total number of trials (i.e., agreements and disagreements) and multiplying by 100. A low percentage of sessions were scored in this study due to recording errors by the instructors (i.e., incomplete videos, video frames that did not accurately show both subjects). The total mean agreement for all participants was 88% (range, 86% to 95%).

Procedure

Instructor training. Instructors participated in one training session with the primary investigator that included: a review of intervention setting, preference assessment, procedure and treatment integrity checklist, video modelling of intervention by experimenter with unfamiliar child, question and answer opportunities. Due to agency policy of limited contact between staff, training had to be conducted via video platform and no role-playing opportunities with other staff or children not involved in the study was possible. Training continued with the experimenter observing and providing in-the-moment verbal and written feedback (Appendix C). Mastery of instructor training was achieved when each instructor had scored above 90% on treatment integrity for at least one baseline and one intervention session. Ongoing supervision and direction was provided by the experimenter to ensure most effective strategies were being used.

Parent/caregiver training. A parent or caregiver was trained for purposes of implementing generalization probes. Parents/caregivers were provided with instruction, modeling and feedback for each of the types of RJA bids by either the experimenter or their child's instructor. Instructors assisted parents with setting up stimuli during generalization sessions, while prompting parents to implement each bid.

Preference assessment. Each participant's instructor was asked to create a list of their assigned child's interests, preferred toys and social interactions (Appendix D). Instructors rated

the child's engagement/interest with each item or interaction by rating their level of interest, as defined by the following rating scale:

1 – mands frequently for item or social interaction or continuously sustains attention with positive affect

2 – mands occasionally for item or social interaction or attends periodically with positive affect

3 – does not mand for or attend to item or social interaction, but tolerates (i.e., remains in area or with adult)

4 – does not mand for or attend to item or social interaction, refuses and/ or shows negative affect

Baseline and probe sessions. Three baseline sessions occurred for each participant prior to intervention and were implemented by their assigned instructor. Baseline probe sessions were conducted for each participant following mastery of each bid type during intervention. There were four different types of bids for which joint attention responding was measured:

Bid 1: A novel or out-of-place item (e.g., toy, furniture, or picture).

Bid 2: Another person enters the room wearing a novel or abnormal clothing item or costume piece, or carrying a novel, large, or unexpected item.

Bid 3: Bid 1 or 2, when child and adult enter another room or area together.

Bid 4: No specific stimulus being referenced.

All baseline sessions were conducted at home or in the clinic setting. Each baseline and probe session involved the instructor setting up stimuli and presenting a corresponding bid for joint attention twice for each bid type, interspersed throughout a regular therapy session (i.e., over the course of 3-hour session). Each bid during baseline was presented with at least 2

minutes between trials. Bid types 1, 2, and 4, the instructor and child sat across from each other at a play or routine activity, either on the floor or at a table. For bid type 3, the instructor and child walked into another room or area of the house or clinic. If the child did not respond to their bid, the instructor ignored and allowed the child to continue engaging in the current activity. The instructor responded to any successful complete joint attention responses with a comment acknowledging that they saw the same stimulus (e.g., “that was cool!”).

Generalization probes. Generalization probe sessions were implemented by a caregiver in the child’s home, pre-intervention and post-intervention, as well as following mastery of each bid type during intervention. These probes followed the same procedure as baseline probes, measuring responses during 2 trials for each bid type, interspersed throughout a regular therapy session.

Responding to joint attention training. One session per day was conducted four to five days per week during the participant’s regular therapy sessions, unless there were pre-planned breaks in the participant’s schedule or sessions were cancelled due to presence of Covid-19 symptoms in child, parent, or instructor. Each session, the instructor set up ten trials of joint attention bids. Training sessions were conducted as described in baseline with the addition of prompting and social interaction as potential reinforcement for correct responding.

Prior to each trial, the instructor set up a stimulus (for bid types 1 and 2) or prepared a parent or other adult with the stimulus to present (for bid type 3). A trial began with the instructor initiating a bid for joint attention (i.e., vocal cue while shifting their gaze toward the stimulus) and prompting the child to look in the direction of their face and then toward the stimulus. Instructors were given a list of prompts that they could use during intervention for any of the three targeted responses:

V = verbal description of response expected prior to the trial

D = delay (i.e., waits 3 seconds following vocal cue before turning head)

R = repeat Sd (i.e. repeats gaze shift up to 3 times in a row)

P = physical (i.e., gentle nudge of child's chin or cheek to direct their gaze)

G = gesture (i.e., point to instructor's face; or point used to draw line between stimulus and instructor's face or vice versa)

All instructors were previously trained to use in-the-moment prompting and prompt fading, allowing them to make the decision of which prompt would be most effective in the moment with the child they are teaching, based on the child's behaviour/responding. Instructors used gesture or point prompts to reference the stimulus as a last option, as the goal of this study was to teach RJA with gaze following as opposed to point following. Instructors followed up prompted trials with unprompted trials. If these unprompted trials were unsuccessful, instructors provided more prompted trials in a row to ensure successful responding and establish the desired response. If the child did not look to the instructor or toward the stimulus within 5 seconds of the instructor's vocal cue + gaze shift (e.g., "Look at that!", "Woah!"), the instructor prompted the child to look toward their face and then shifted their gaze toward the stimulus. This prompting was required for John, as he rarely attended to the instructor's face to determine where to look. If the child looked to the instructor's face following their vocal cue, but did not shift their gaze toward the stimulus, the instructor prompted the child's gaze shift toward the stimulus. If the child did not shift their gaze back to the adult once they had looked toward the stimulus, the instructor prompted the child to shift their gaze back to the adult's face. Social reinforcement, including social interaction and comments (e.g., "Wow! That was so cool! *tickles/high five*"), was only provided by the instructor once the child had shifted their gaze toward the stimulus and

back to the adult, independently or prompted. If the child did not return their gaze to the instructor independently or with prompting within 5 seconds of attending to the stimulus, the trial was ended and corrective feedback was provided (e.g. “You didn’t look back at me. Let’s try again.”). If the child did not respond or accept the instructor’s prompt for two consecutive trials, the instructor ended the current activity and continue presenting bids while the child was not concurrently engaged in an activity to decrease distractions. Once the child responded independently, while not engaged in an activity, for three consecutive trials, the instructor began presenting bids while the child was engaged, as in the original set-up. For two of the participants (i.e., Noel and Brooks), verbal trace prompting was used to described the desired response (e.g., “remember, I might want to show you something cool. So, you need to look where my eyes are looking and look back at me”) prior to beginning a trial.

An example of a typical training trial was as follows: The instructor said “Cool! Look at that!” and shifts their gaze toward novel stimulus. The child looked toward instructor’s face, but didn’t follow gaze toward toy. Within 3 seconds, instructor physically prompted child’s head toward the novel toy, waited 3 seconds for child to look back and when they did not look back at instructor, the instructor physically prompted the child’s gaze back toward the instructor’s face. After the child looked at the instructor, they commented: “Did you see that dinosaur?! He was eating your snack!”, while pretending to make their hand a dinosaur mouth saying “nom, nom, nom!”.

Intervention for each bid type continued until the participant met criteria for correct responding in at least 80% of trials, across two consecutive sessions. Following mastery of one bid type, a baseline session was conducted by the instructor and a generalization probe session was conducted by a parent/caregiver. If the participant scored 80% or higher for the next session

with a new bid type, only one session of scoring at least 80% responding to that bid type was required for mastery. Intervention continued with training sessions for each bid type in the order determined by prior randomization.

Chapter III: Results

Complete Responding to Joint Attention Bids

Figures 1-3 show the percentage of opportunities that each participant (Brooks, Noel, John, respectively) responded to joint attention bids by looking toward the stimulus/following the instructor's gaze and looking back to the instructor. Each of the figures displays the percentage of opportunities per session across bid types. Bid types were introduced to intervention in a random order for each participant. Initial baseline session data, as well as baseline probe session data, reflect the percentage of correct responding across two trials per bid type. Generalization probe session data reflect the participant's responding across two trials per bid type, when presented by their parent. Data points during intervention sessions reflect the participant's percentage of correct responding across ten trials of the same bid type.

Brooks. During baseline, Brooks' responding across all four bid types (total of 24 trials) was 8.3%. Brooks' responding to bid types one, three, and four was 0% across all baseline sessions. His responding to bid type two was 33% across all baseline trials (i.e., total of 6 trials across 3 sessions). Brooks' baseline responding during a generalization probe session conducted by Brooks' mother, across all bid types, was 0% in all sessions. Intervention for Brooks trained responding to bid types in the following randomized order: one, four, three, then two. Brooks' responding to bid type one (i.e., a novel or out-of-place item/picture) increased to 90% after five sessions of training and increased to 100% by the sixth session. Following mastery of responding to bid type one, Brooks' responding to all other bid types increased to 100% (i.e., 2 trials per bid type) during a baseline probe session with his instructor. Brooks' responding to joint attention bids presented by his mother during a generalization probe session also increased to 100% for all bid types, except bid type three (i.e., child and adult walking into another room). An intervention

session was then conducted for the remaining bid types to check mastery across a full intervention session (i.e., 10 trials). For bid types four (i.e., no stimulus) and three, Brooks' responding remained at 100% for both intervention sessions. During the intervention session for bid type two, Brooks' responding met mastery at 90%. Following mastery of responding to all bid types, a final generalization probe was conducted by Brooks' mother. Brooks' responding was 100% for bid types three and four and 50% for the other two bid types (i.e., across only 2 trials for each bid type).

Noel. Noel's baseline responding across all four bid types (total of 24 trials) was 0%. His responding was also 0% across all bid types during the initial generalization probe, conducted by his mother. Intervention for Noel trained responding to bid types in the following randomized order: four, one, three, then two. Noel's responding to bid type four (i.e., no stimulus) increased to 90% by the eighth training session and was maintained in the ninth session. Following mastery of responding to bid type four, Noel's responding to bid types four and one increased to 100% (i.e., 2 trials per bid type) during a baseline probe session with his instructor. Responding to bid types three and two remained at 0% during the baseline probe session. Noel's responding to joint attention bids presented by his mother during the second generalization probe increased to 50% for all bid types, except bid type three (i.e., child and adult walking into another room). Intervention sessions then began for bid type one. Noel's responding to bid type one increased from 20% to 80% over four training sessions and maintained for mastery at 90% by the fifth session. Baseline and generalization probe sessions were again conducted by his instructor and mother, respectively. During the baseline probe session, Noel's responding increased to 100% for all bid types, except bid type two which he responded correctly in only one of the two trials. Noel's responding to bids for joint attention presented by his mother increased to 100% for bid

types four and three and remained at 50% for bid types one and two. Following mastery of responding to bid type one, a 2-week break in sessions occurred due to the instructor's absence and the family's precaution of Covid-19. Upon introduction of training responding to bid type three, Noel responded correctly in 40% of trials in the first two sessions and increased responding to 70% in the third and fourth sessions. Due to the unexpected 2-week break in sessions, mastery of bid type three and two has not yet been achieved.

John. During baseline, John's responding across all four bid types (total of 24 trials) was 4.2%. John's responding to bid types one, three, and four was 0% across all baseline sessions. His responding to bid type two was 16.7% across all baseline trials (i.e., total of 6 trials across 3 sessions). John's baseline responding during generalization probes, presented by his mother across all bid types, was 0% in all sessions. Intervention for John trained responding to bid types in the following randomized order: one, three, four, then two. John's responding to bid type one (i.e., a novel or out-of-place item/picture) increased to 90% after twenty-three training sessions and remained at 90% to meet mastery criteria in the twenty-fourth session. Following mastery of responding to bid type one, John's responding to all other bid types increased to 100% (i.e., 2 trials per bid type) during a baseline probe session, while he responded correctly to only one of two probes for bid type one. John's responding to joint attention bids presented by his mother during a generalization probe session also increased from baseline of 0% to 50% for bid types one, two, and three, and increased to 100% for bid type four. Intervention sessions then began for bid type three (i.e., child and adult walking into another room). John responded correctly to 40% of opportunities in the first training session and his responding increased to 80% by the third training session, maintaining at 80% in the fourth session. Following mastery of responding to bid type three, John demonstrated correct responding in 100% of opportunities during a baseline

probe session for bid types one, three and four, and 50% for bid type two. John responded correctly to his mother's bids for his attention, during a generalization sessions, in 100% of opportunities for bid types one, two, and three, and 50% of opportunities for bid type four. In the first training session for bid type four, John reached mastery by responding correctly in 80% of opportunities. In the following training session, John responded to bid type two correctly in 60% of opportunities and increased his responding to 90% in the second session. Further training sessions have not yet been conducted to check mastery of responding to bid type two.

Responding to Vocal Cue/Following Gaze

All bids for joint attention were presented by the instructor providing a vocal cue (e.g., "woah!", "that's cool!") and shifting their gaze toward the stimulus. The percentage of opportunities that the participant shifted their eye gaze toward the adult within five seconds of their vocal cue is displayed in figures 4-6, for Brooks, Noel, and John, respectively. The percentage of opportunities that the participant shifted their eye gaze toward the stimulus within three seconds of shifting their gaze to the adult or hearing the vocal cue is shown in figures 7-9, for Brooks, Noel, and John, respectively.

Brooks. At baseline, Brooks' responding to the instructor's vocal cue by shifting his gaze toward them was 4.2% of all baseline trials (Figure 4). During intervention, beginning with training of bid type one, Brooks' responding by shifting his gaze toward the instructor's face increased from 60% in the first session to 100% by the fourth session. Brooks continued to respond to the instructor's vocal cue by shifting his gaze toward their face, in 100% of opportunities, during all the following baseline probes and training sessions for other bid types. Contrary to his responding to the instructor during baseline, Brooks demonstrated a high level of responding (i.e., 100%) to his mother's vocal cue by shifting his gaze toward her face in all

baseline generalization probes, except for one response to bid type four. Brooks' responding to his mother's vocal cue remained at 100% throughout the study, except for one trial of bid type three following mastery of the first intervention phase.

The percentage of opportunities that Brooks responded by shifting his gaze toward the stimulus that the adult was referencing, across all baseline trials and bid types, was 29%. Brooks' responding by looking toward the stimulus increased to 80% in the first training session, then dropped in the following session to 10%, and increased to 100% by the sixth session. This response remained at 100% for Brooks for the remainder of the study across baseline probes and intervention sessions for the other bid types. Brooks increased his responding by following his mother's gaze shift to 100% for bid types one, two, and four, in the second generalization probe, and for all bid types in the third generalization probe session.

Noel. At baseline, Noel's responding to the instructor's vocal cue by shifting his gaze toward them was 71% of all baseline trials (Figure 5). During intervention, beginning with training of bid type four, Noel's responding by shifting his gaze toward the instructor's face increased to 100% by the sixth session. Noel's responding during training sessions for bid type one remained above 80% across five sessions until mastery of the complete response. His responding across baseline probe sessions throughout intervention remained at 100% for all sessions, except one probe following mastery of responding to bid type one. Noel's responding to his mother's vocal cue by shifting his gaze toward her face in baseline generalization probes was 100% for bid types one and two and 50% for bid types four and three. Noel responded to his mother's vocal cue by looking toward her face in 100% of opportunities across all bid types, in all generalization probes for the remainder of the study.

The percentage of opportunities that Noel responded by shifting his gaze toward the stimulus that the adult was referencing, across all baseline trials and bid types, was 25%. Noel's responding by looking toward the stimulus increased to 60% in the first training session and varied between 60-90% across eight training sessions. During a generalization probe session following mastery of bid type four, Noel responded to his mother's bids for attention by looking toward the stimulus in 100% of opportunities for bid types four and one, 0% for bid type three, and 50% for bid type two. Noel's responding to bid type one by looking toward the stimulus increased from baseline to 80% in the first intervention session and increased to 100% by the fifth training session. This response remained at 100% for all baseline probe sessions throughout the study. Noel's responding increased to 100% for all bid types in a generalization probe session following mastery of bid type one training. Additionally, Noel responded correctly to 100% of opportunities by shifting his gaze to the stimulus in training sessions on bid type three. Intervention for bid type four was not introduced.

John. John responded to the instructor's vocal cue by shifting his gaze toward them in 25% of all baseline trials (Figure 6). Beginning with training of bid type one, John's responding by shifting his gaze toward the instructor's face throughout training sessions was variable (mean 14.6%; range 0-70%). During a baseline probe session following mastery of responding to bid type one, John's responding by looking to the instructor's face was 0% for bid types one, two, and three, and 50% for bid type four. John's responding to his mother's vocal cue by shifting his gaze toward her face in baseline generalization probes was 0% for all bid types. Following mastery of responding to bid type one, John's responding to his mother's vocal cue in a generalization probe session increased to 100% for bid type four and 50% across all other bid types. John's responding decreased to 0% at the beginning of intervention for bid type three and

remained at 0% across all sessions. Following mastery of complete responding to bid type three, John's gaze shift toward the instructor's face in baseline probes occurred in 50% of opportunities for bid types one and four and 0% for bid types two and three. In the third generalization probe, John shifted his gaze to his mother's face in response to her vocal cue in 50% of opportunities for bid type four and 0% for all other bid types. Only one intervention session was required for John to meet mastery criteria for bid type four, though his response to the instructor's vocal cue by looking toward their face remained low at 20% of opportunities. During intervention for bid type two, John's gaze shift to the instructor following their vocal cue increased to 80% of opportunities.

The percentage of opportunities that John responded by shifting his gaze toward the stimulus that the adult was referencing, across all baseline trials and bid types, was 21%. John's responding by looking toward the stimulus remained low (range 0-40%) for the first nine training sessions for bid type one. Responding increased to 90% after twelve sessions and then varied between 50-90% for the following eight sessions. Responding stabilized and remained above 80% for the last five training sessions for bid type one. This response remained at 100% for all bid types during the following baseline probe session. During a generalization probe session following mastery of bid type one, John responded to his mother's bids for attention by looking toward the stimulus in 100% of opportunities for bid types one and four and 50% for bid types two and three. John's responding by following eye gaze to the stimulus remained high at the introduction of training sessions for bid type three, at 90-100%. John continued to follow the instructor's gaze shift in 100% of opportunities during the following baseline probe session, as well as for bid types one, two, and three when presented by his mother in a generalization probe session. Responding to bid type four was 50% in the third generalization probe. During

intervention for bid type four and two, responding remained high in 80% and 100% of opportunities, respectively.

Shifting Gaze back to Adult

The terminal response to joint attention bids required the participant to shift their gaze back to the adult, within five seconds of attending to the stimulus or making a comment. The percentage of opportunities that participants shifted their gaze back to the adult is represented in figures 10-12, for Brooks, Noel, and John, respectively.

Brooks. At baseline, the percentage of opportunities that Brooks shifted his gaze back to the adult was 8.3% of all baseline trials. During intervention, Brooks' gaze shift toward the instructor increased to 100% after six sessions. Brooks continued to shift his gaze back to the instructor after attending to the stimulus in 100% of opportunities in all the following baseline probe sessions for all bid types, except for one probe for bid type two at 90%. During the initial generalization probe session with his mother, Brooks shifted his gaze back to her in 50% of opportunities for bid type three and 0% of opportunities for all other bid types. Following mastery of responding to bid type one, Brooks shifted his gaze back to his mother during a generalization probe session in 100% of opportunities for bid types one, two, and three, and 50% for bid type four. Following mastery of responding in training sessions for bid types three, four, and two, Brooks responded to his mother's bids by shifting his gaze back to her in 100% of opportunities for bid types three and four, and 50% for bid types one and two.

Noel. At baseline, the percentage of opportunities that Noel shifted his gaze back to the adult was 4.2% of all baseline trials. During intervention, Noel's gaze shift toward the instructor gradually increased from 20% in the first training session to 90% after eight sessions. During a baseline probe session following mastery of responding to bid type four, Noel shifted his gaze

back to the instructor after attending to the stimulus in 100% of opportunities for bid type four and one, and 0% of opportunities for bid types two and three. During the initial generalization probe session with his mother, Noel shifted his gaze back to her in 0% of opportunities for all bid types. Following mastery of responding to bid type four, Noel shifted his gaze back to his mother during a generalization probe session in 50% of opportunities for bid types one, two, and four, and 0% for bid type three. During training sessions for bid type one, Noel's percentage of opportunities that he responded by shifting his gaze back to the instructor increased from 20% in the first session to 90% after five training sessions. Following mastery of responding to bid type one, Noel responded correctly during a baseline probe session in 100% of opportunities for bid types four, one and three, and 50% for bid type two. In the following generalization session with his mother, Noel's responding increased to 100% for bid types four and three and maintained at 50% for bid types one and two. At the beginning of training sessions for bid type three, Noel looked back to the instructor in 40% of opportunities in the first two sessions and increased to 70% in the third session. Mastery was not yet achieved for bid type three and two, due to an interruption in session scheduling.

John. At baseline, the percentage of opportunities that John shifted his gaze back to the adult was 8.3% of all baseline trials. During training of responding to bid type one, John's gaze shift back to the instructor remained low (range 0-10%) for the first eight training sessions and became more variable across the following fourteen training sessions (range 40-80%). John met mastery for responding to bid type one by shifting his gaze back to the instructor after twenty-four sessions. During a baseline probe session following mastery of responding to bid type one, John shifted his gaze back to the instructor after attending to the stimulus in 100% of opportunities for bid types two, three, and four, and 50% of opportunities for bid type one.

During the baseline generalization probe session with his mother, John shifted his gaze back to her in 0% of opportunities for all bid types. Following mastery of responding to bid type one, John shifted his gaze back to his mother during a generalization probe session in 50% of opportunities for bid types one and three, and in 100% of opportunities for bid types two and four. During training sessions for bid type three, the percentage of opportunities that John responded by shifting his gaze back to the instructor increased from 40% in the first training session to 80% in the second session. Following mastery of responding to bid type three, John responded correctly during a baseline probe session in 100% of opportunities for all bid types. In the following generalization session with his mother, John's responding increased to 100% for bid types one and three, maintained at 100% for bid type two, and decreased to 50% for bid type four. During the one intervention session for bid type four, John looked back to the instructor following shifting his gaze toward the stimulus in 90% of opportunities. John looked back to the instructor in 60% of opportunities in the first session of training bid type two and increased his responding to 90% by the second training session. Further training sessions have not yet been conducted to check mastery of responding to bid type two.

Chapter IV: Discussion

The purpose of this study was to evaluate the effectiveness of prompting and social reinforcement to increase responding to various joint attention bids presented with a gaze shift, rather than a pointing gesture. Additionally, this study aimed to assess generalization of responding across different bid types and people. All three participants met mastery criterion for RJA across at least two different bid type presentations. Those participants that did not meet mastery criterion for all bid types demonstrated improvement during baseline probe sessions and generalization probe sessions that followed training of other bid types. All participants showed improved and generalized responding to bids presented by their parent. Thus, the results showed that behavioural intervention, including solely social reinforcement was successful in improving pivotal joint attention responses for individuals diagnosed with ASD.

This study expanded on research by Taylor and Hoch (2008) that effectively taught joint attention skills with prompting and social reinforcement. Taylor and Hoch based their study on the argument that previous studies that evaluated training of joint attention skills by providing access to tangible reinforcement may not have taught “true” joint attention. Responses to joint attention bids are likely maintained by generalized reinforcers (e.g., social attention) (Dube et al., 2004). One difference in social consequences that followed correct responding in this study is that instructors made comments about preferred stimuli or topics, as determined in a preference assessment. Example: when training Noel to respond to bids for joint attention without a specific stimulus, the instructor provided the social consequence to correct responding by making comments such as, “Woah! I thought I saw Lightning McQueen zoom under the table!”. Although not all stimuli and social comments provided by instructors were based on the highest

rated topics/interests of the child, future research should consider how to choose, vary, and evaluate the effectiveness of different social comments in teaching joint attention skills.

An important implication from this study for clinicians and researchers working with children diagnosed with ASD is the necessary considerations for promoting generalization of responding to joint attention bids. Similar to Martins and Harris (2006), training in this study occurred while the participant was engaged in a typical play activity (e.g., colouring, doing a puzzle, playing with cars) either on the floor or at the table, or while walking to another room or area of the house or clinic (i.e., bid type 3). Although some children, like John, may initially require a more structured setting to establish the response (i.e., at the table with stimuli within 3 feet), systematically moving towards training in a more natural set-up and with a variety of stimuli or bid types may play an important role in response generalization and maintenance.

In addition to the varied setting, this study demonstrated that successful responding could be trained with different joint attention bids or presentations. Although similar stimuli (i.e., novel or out of place items or pictures) were used for bid types one, two, and three, the presentation or set-up varied and challenged the participant to respond to bids presented in different ways (i.e., whether sitting and playing on the floor or table, whether a third person presents or is paired with the stimulus in reference, or whether they are walking while they respond). While Brooks and John successfully learned to respond to bids for joint attention with salient stimuli, such as novel pictures and items, Noel met criterion for responding to bids for joint attention with no stimulus in reference. Although only Noel was trained to respond to bids with no stimulus, both Brooks and John demonstrated generalization of their responding to previously trained bid types to bids with no stimulus. All participants demonstrated a reduction in the number of training sessions required to reach mastery criterion with each subsequent bid type introduced.

One difficult aspect of intervention for RJA is the need for repetition, as well as novel or salient stimuli from trial to trial. When training RJA, it is important to choose stimuli that are novel so related social comments are more likely to have a reinforcing effect on responding. Contrarily, stimuli must not be more salient than the instructor's vocal cue and gaze shift (e.g., toy making a loud noise) as the participant would be more likely to turn their attention to the stimulus independent of the instructor's bid. As this study showed promising effects of intervention on responding to bids for joint attention with no stimulus in reference, future research and clinical programming may consider training RJA with no stimulus as the feasibility of the procedure may be greater than training with stimuli. Additionally, training RJA with no stimulus may help ensure that the individual is responding to the adult's bid for attention rather than the stimulus. Future researchers and clinicians should also evaluate the effectiveness of training responding to different bid types and determine whether initially training certain bid types leads to greater or more efficient response generalization across other bid types, people, and environments.

One of the most significant implications of this study is that it assessed the effects of intervention on training RJA bids presented with a gaze shift, rather than a more salient pointing gesture. Some previous studies trained RJA in phases that faded out the pointing gesture toward a stimulus, so that the participant was expected to respond to only a gaze shift (Whalen and Schriebman, 2003). Although, in Whalen and Schriebman's study it can be argued that "true" RJA was not trained as the response was maintained solely by access to tangible reinforcement, as opposed to social consequences. Additionally, if an individual does not require RJA skills to be broken down into phases (e.g., responding to a hand touch, tapping, proximal point, distal point, gaze shift), this study has shown promising effects for teaching RJA as a complete

response (i.e., gaze following and shifting gaze back to adult) with solely social consequences.

Future research should continue to determine both the experimental effects of behavioural intervention on training RJA with gaze following, as well as collateral effects, such as increased IJA, social interaction and communication. Future researchers may want to ask the question of whether training RJA by gaze following compared to training RJA by point following has greater effects on generalization and social impact.

With this study comes limitations that could be addressed in future studies. First, generalization of responding to parents or caregivers was only measured across two opportunities for each bid type, possibly skewing percentage of responding compared to the ten trials measured during training sessions. Although there were only two opportunities per bid type in generalization probe sessions, each participant's combined responding across all bid types still demonstrated an increase from generalization probes at baseline. Both Brooks' and Noel's responding to their mother's joint attention bids, across all bid types, increased from 0% to 75% of opportunities. For John, his responding in generalization probe sessions, across all bid types, increased from 0% to 88% of opportunities. Future research could evaluate generalization over more opportunities to ensure mastery with various people and/or settings.

Second, interobserver agreement was not measured for an adequate percentage of sessions due to technical difficulties. This is an important measure of internal validity that should be adequately evaluated in order for future researchers to confidently replicate intervention. Additionally, although parents were included in intervention and made anecdotal comments of improvement, no social validity or maintenance measures were used in this study. Just as important as response generalization, maintenance of skills should be measured to ensure that skills taught are meaningful for the individual long-term. This study did not acquire complete

data for mastery of all bid types for Noel and John and once complete, maintenance should be evaluated for all participants.

Third, this study did not use a multiple baseline between subjects design, as used in previous research. Instead, this study used a multiple baseline across bid types design to assess for generalization across bid types for each participant. Brooks only required training of one bid type which was then followed by successful responding to all other bid types without training. This suggests generalization of responding across bid types and may make the experimental effects of intervention on the last three bid types unclear. For Noel and John, data suggests that generalization also occurred following training of the first bid type, while still showing treatment effects on increasing responding to mastery criterion for the subsequent bid types. Due to this variation from past research, a control response (e.g., responding to conditional instructions) was measured to demonstrate no generalization to other responses throughout intervention for two of the participants, Brooks and John.

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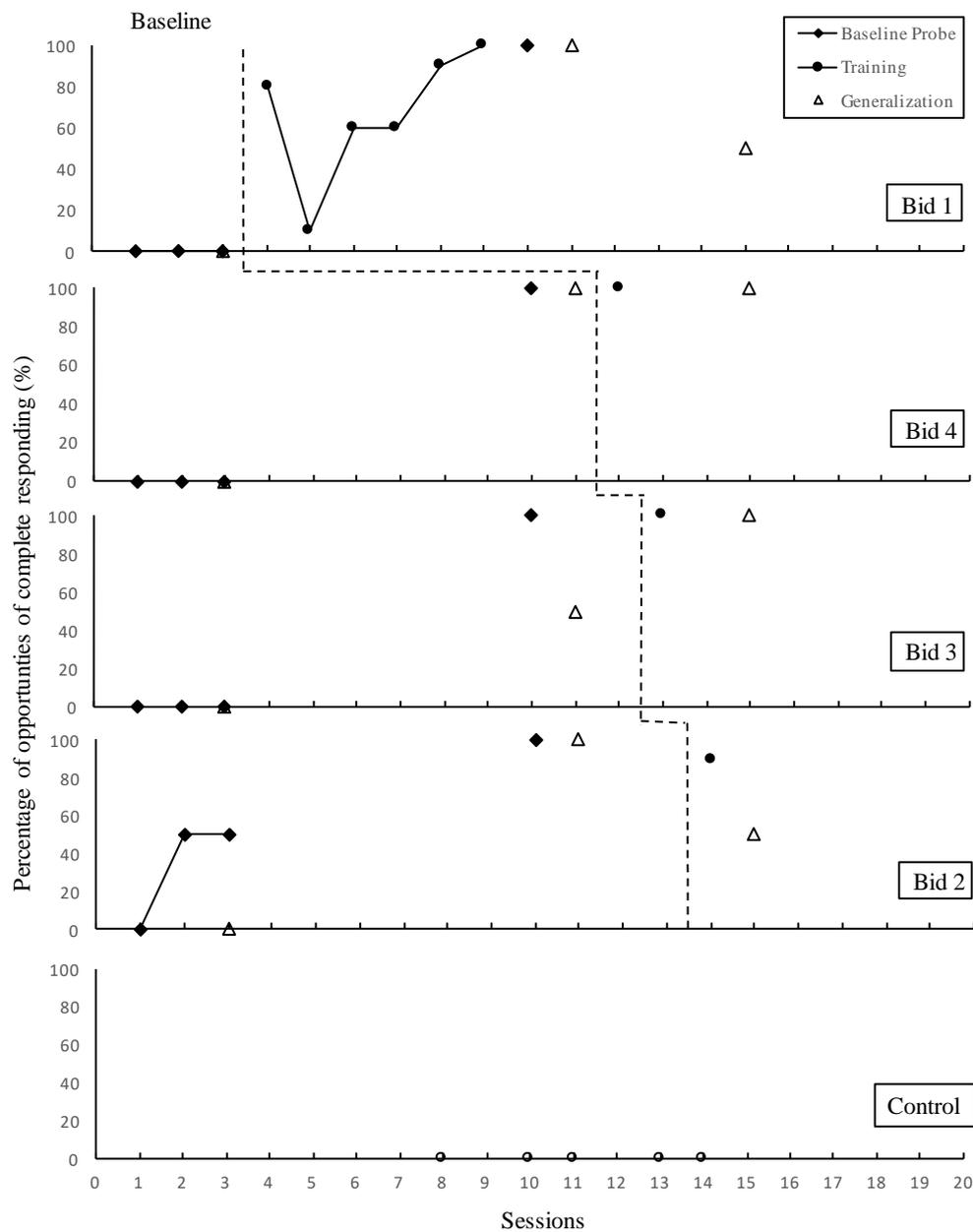
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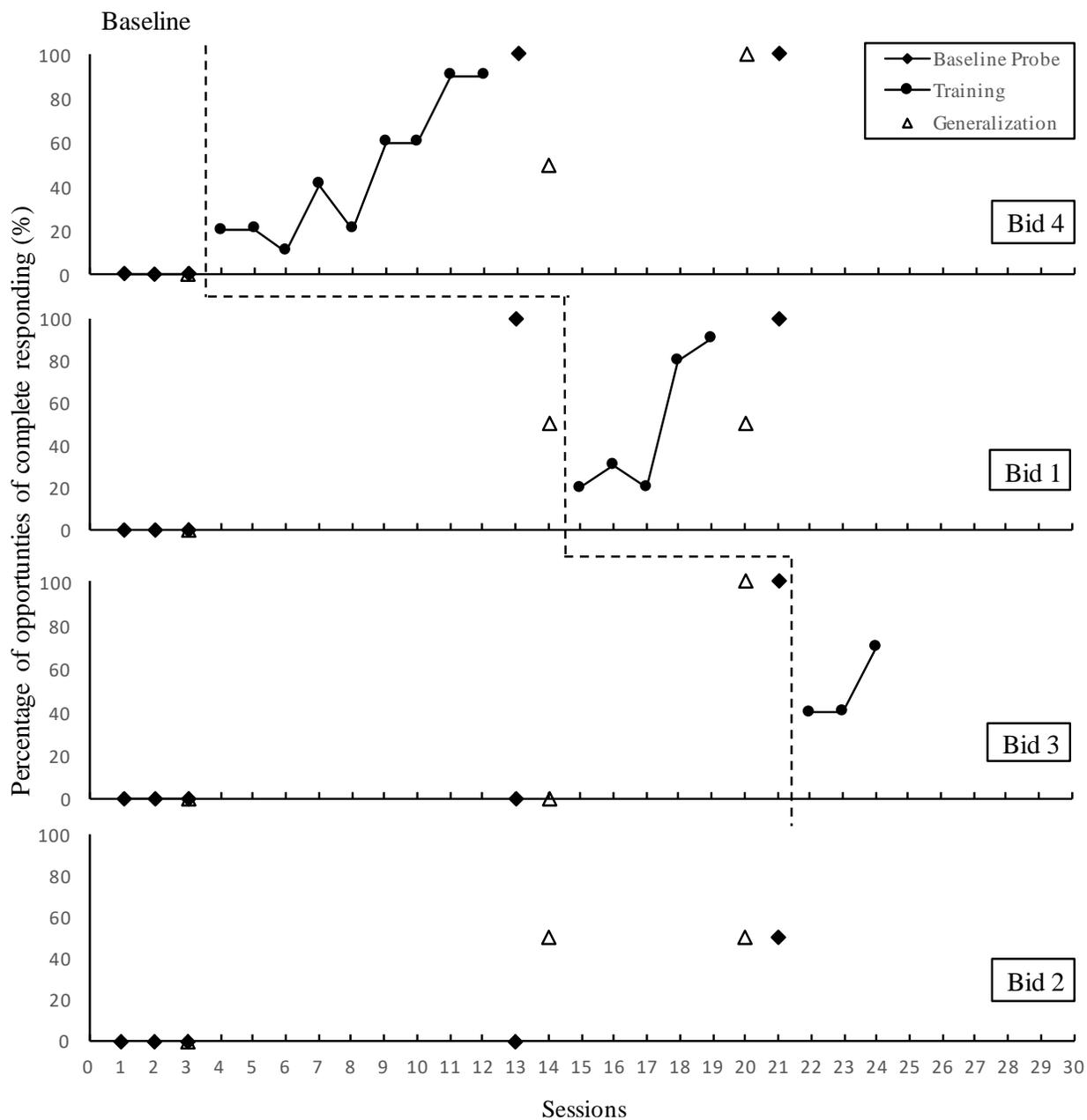
Appendix A: Figures

Figure 1

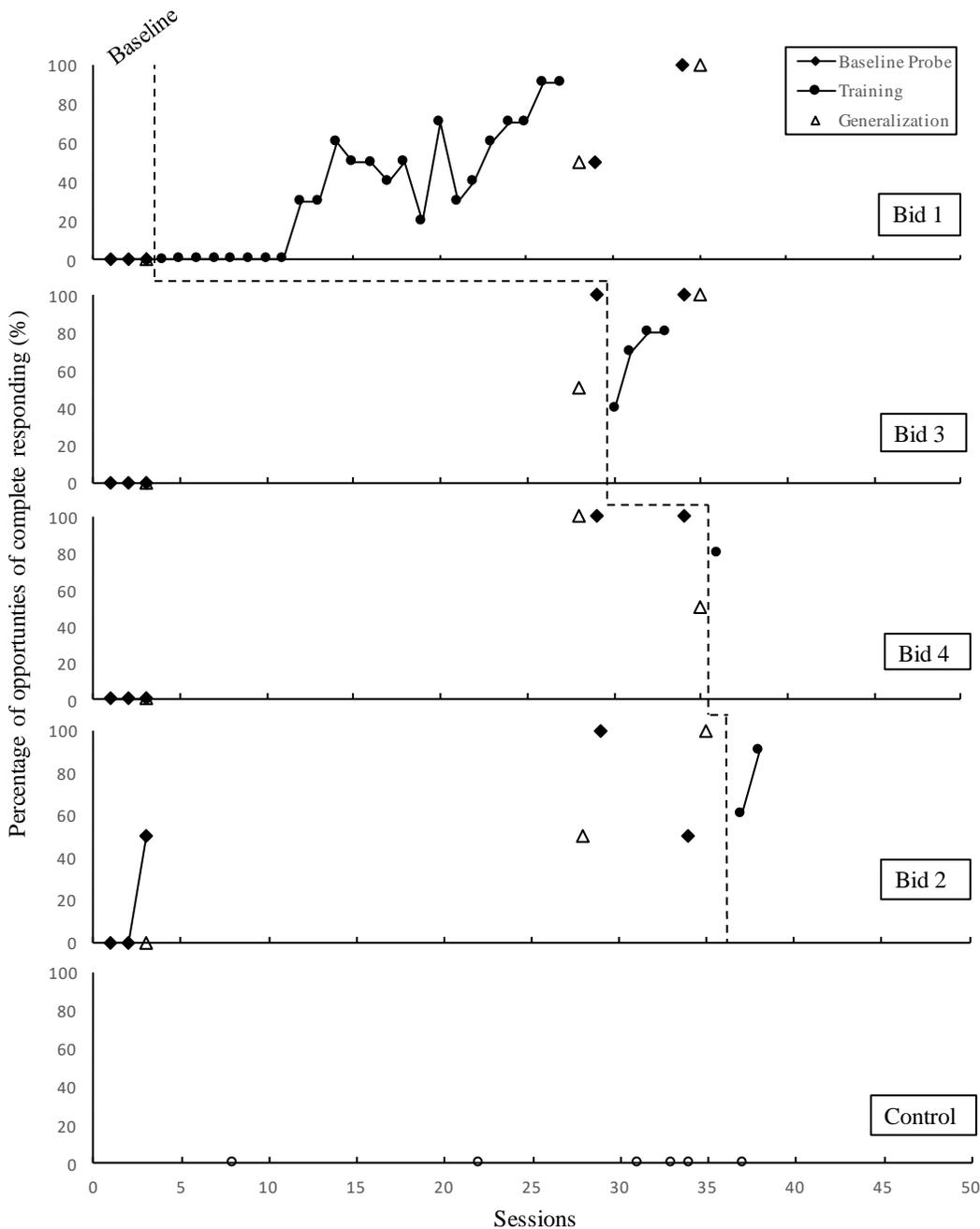
Brooks' Complete Responding to Joint Attention Bids



Note: Complete responding includes following gaze shift/looking toward stimulus and looking back to adult. Control measure used is the percentage of Brooks' responding to conditional instructions.

Figure 2*Noel's Complete Responding to Joint Attention Bids*

Note: Complete responding includes following gaze shift/looking toward stimulus and looking back to adult.

Figure 3*John's Complete Responding to Joint Attention Bids*

Note: Complete responding includes following gaze shift/looking toward stimulus and looking back to adult. Control measure used is the percentage of John's responding to conditional instructions.

Figure 4

Brooks' Responding by Shifting Gaze Toward Adult

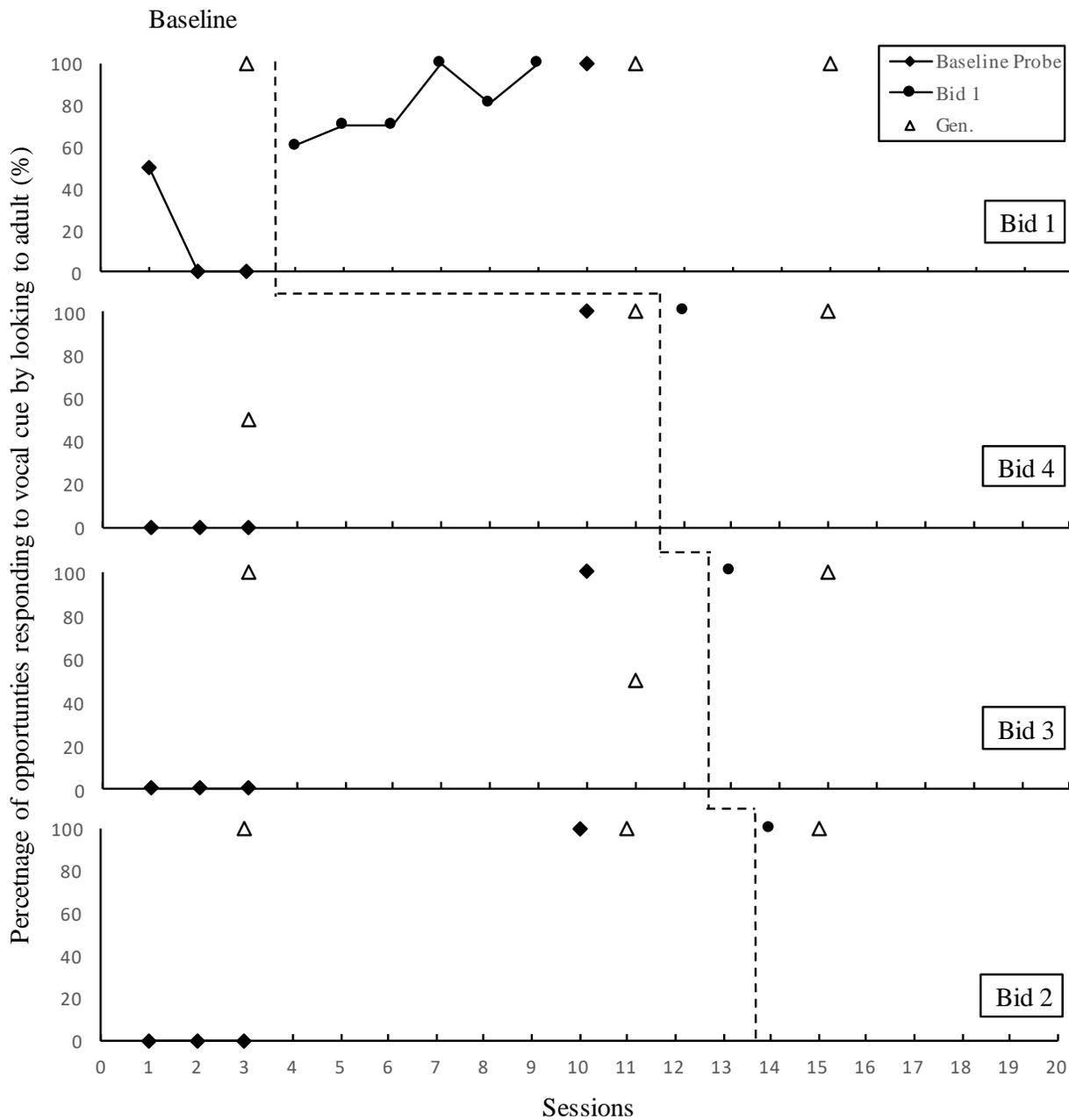


Figure 5

Noel's Responding by Shifting Gaze Toward Adult

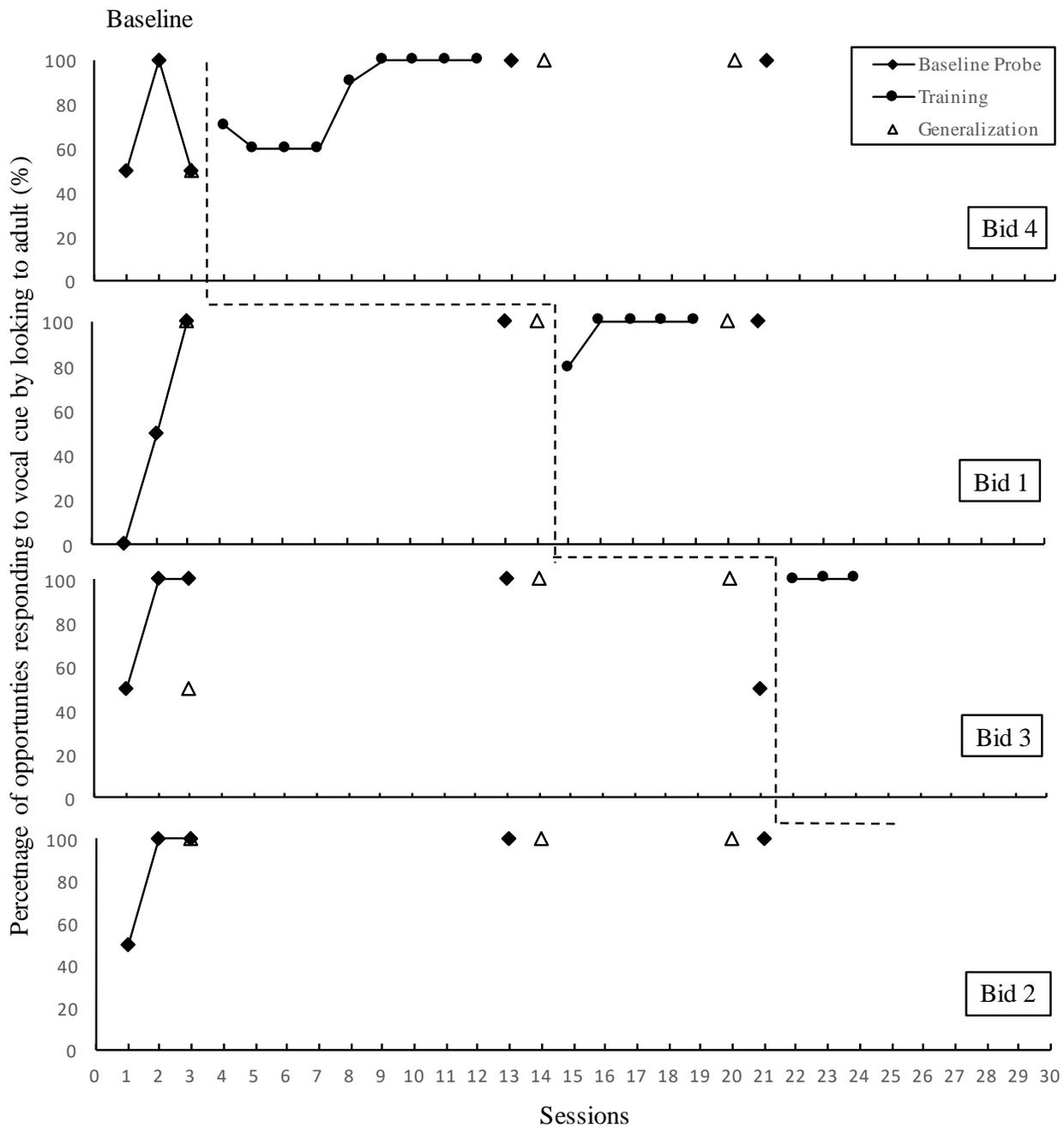


Figure 6

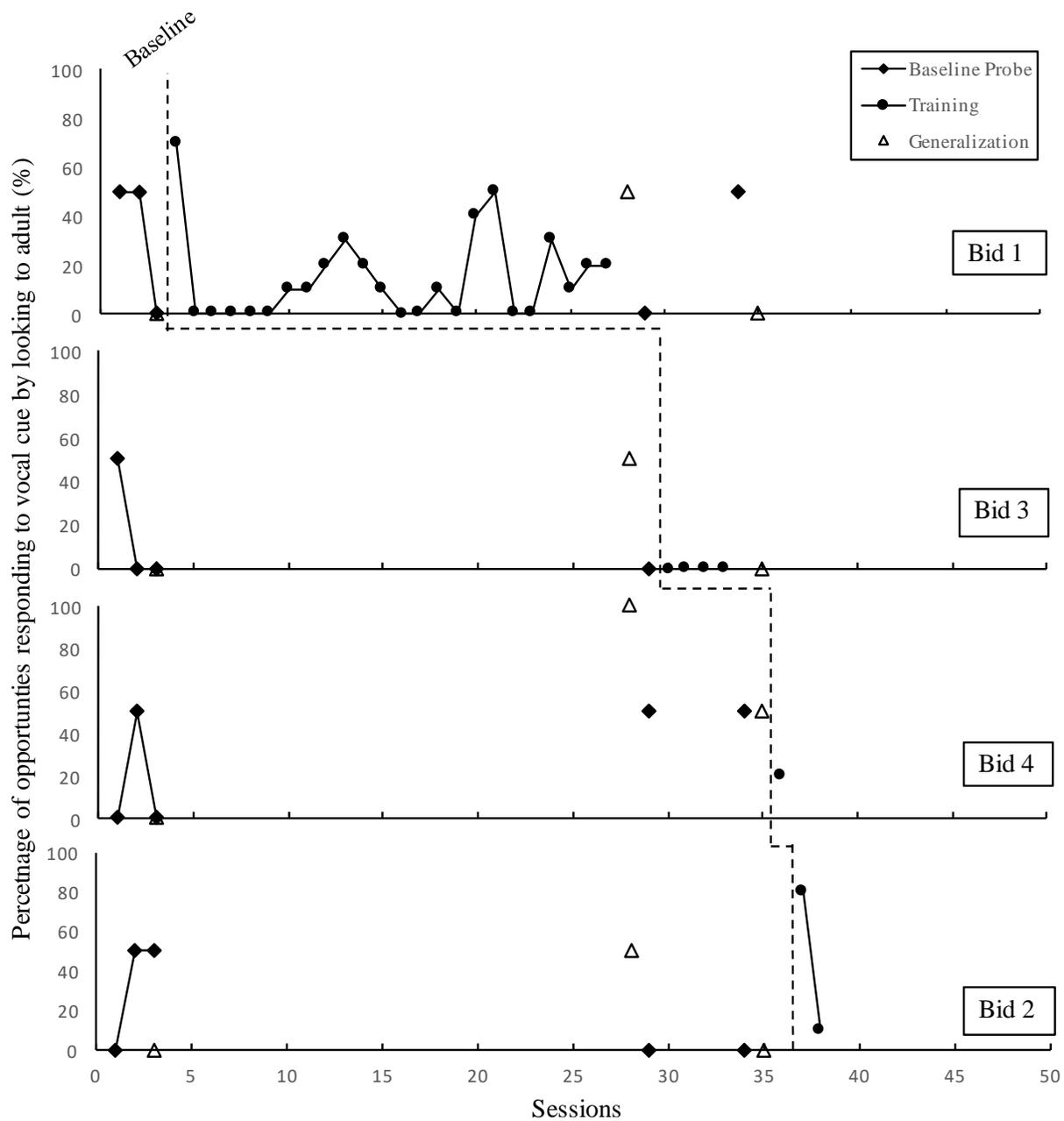
John's Responding by Shifting Gaze Toward Adult

Figure 7

Brooks' Responding by Shifting Gaze Toward Stimulus

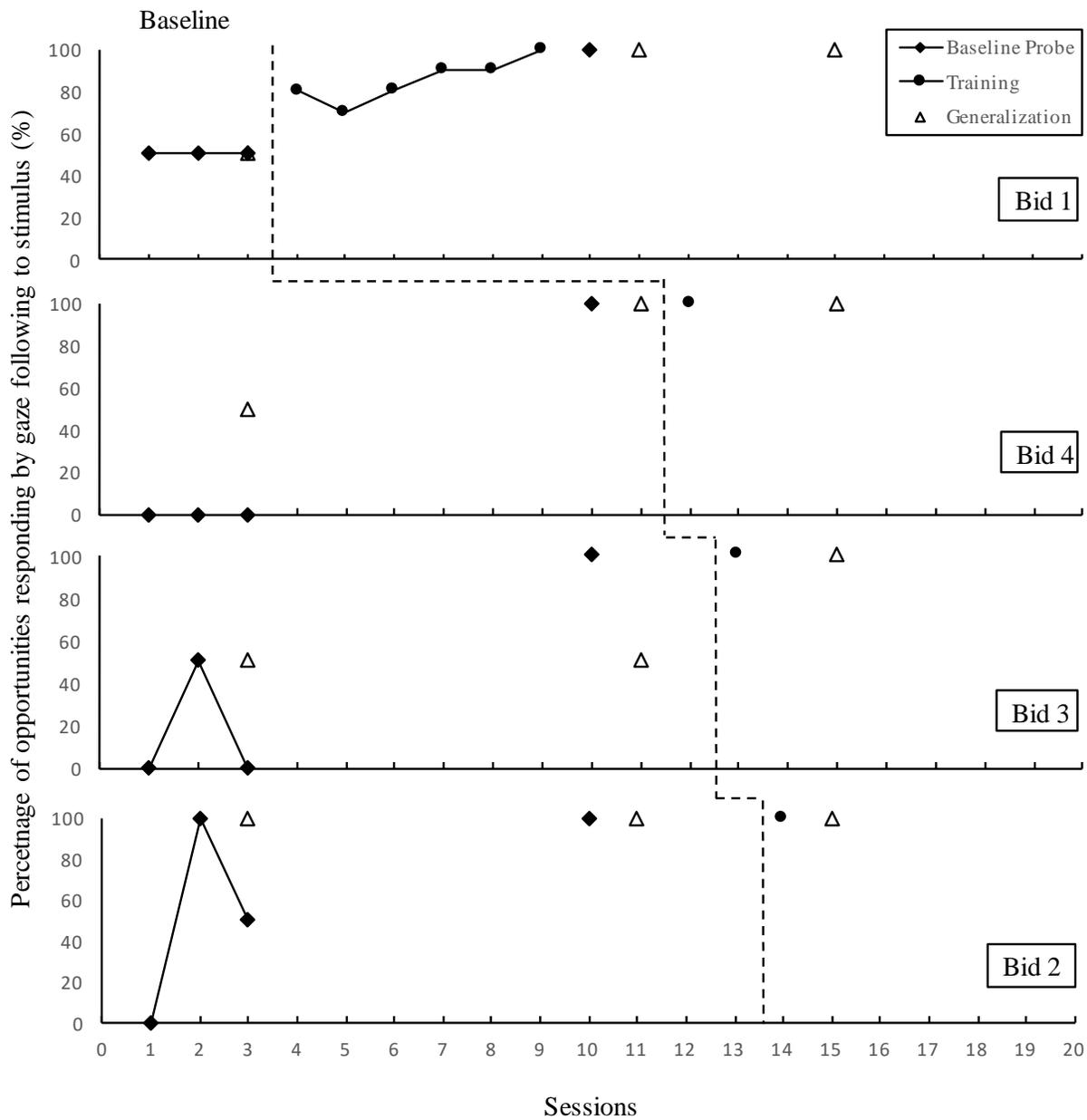


Figure 8

Noel's Responding by Shifting Gaze Toward Stimulus

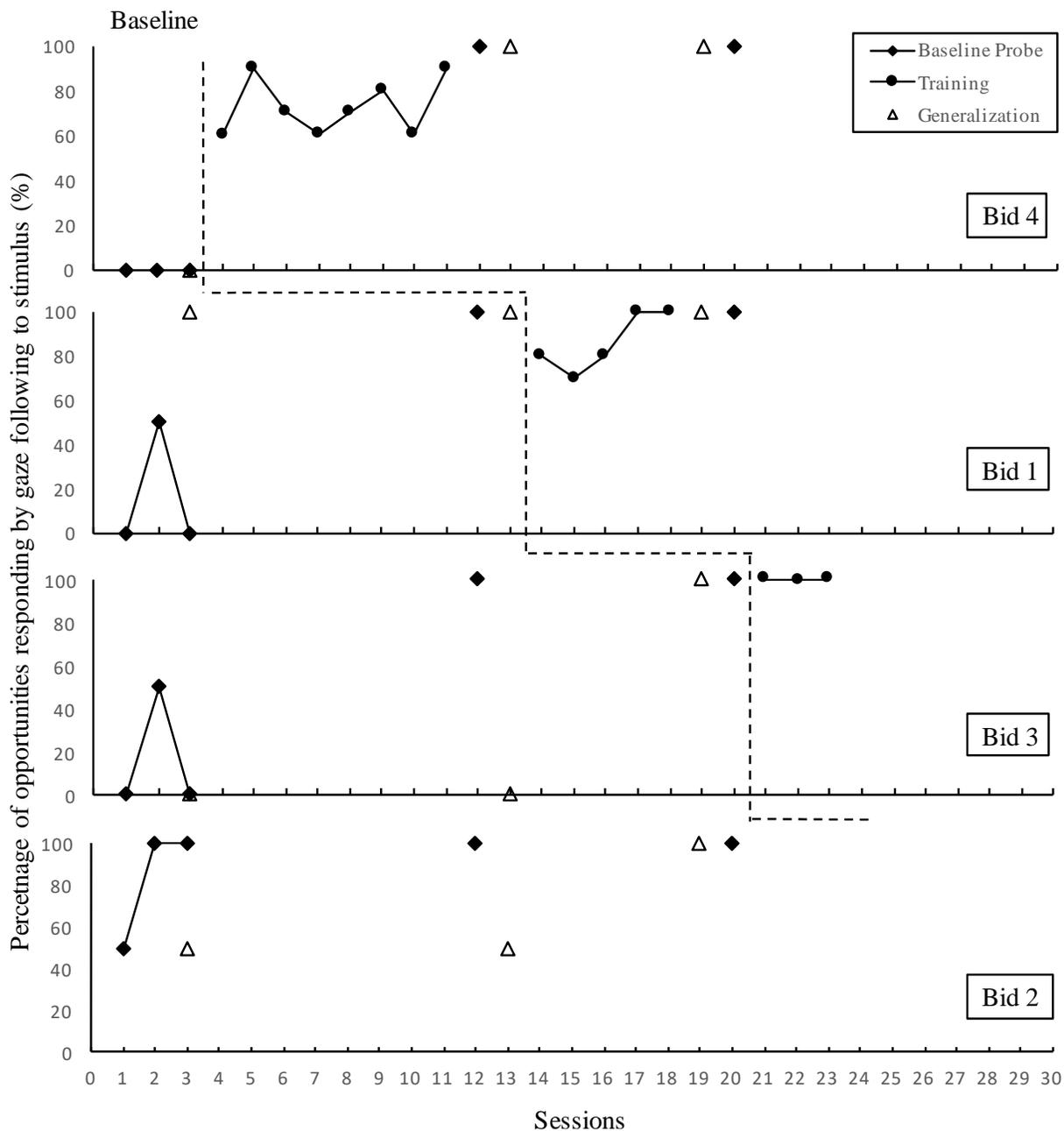


Figure 9

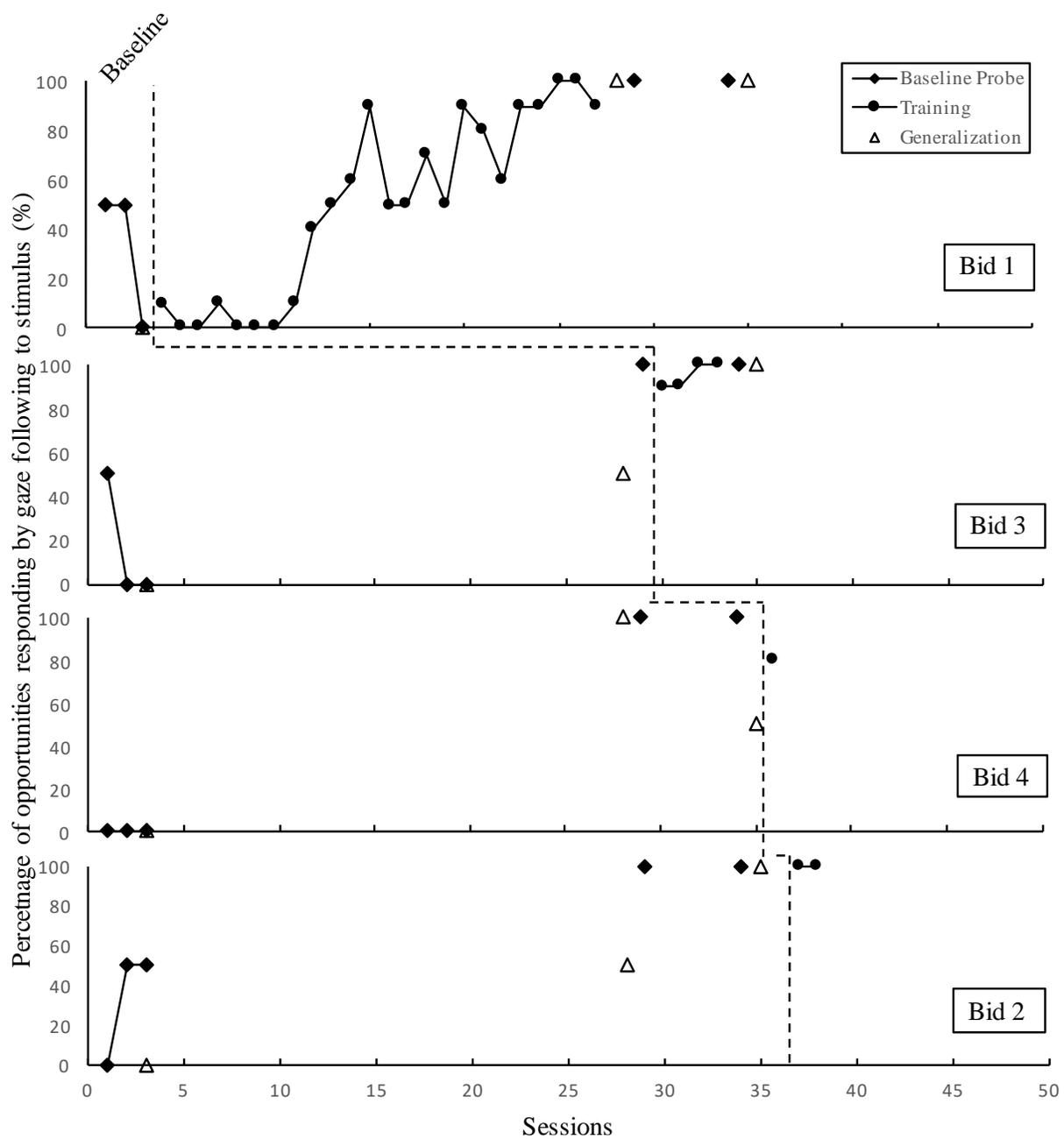
John's Responding by Shifting Gaze Toward Stimulus

Figure 10

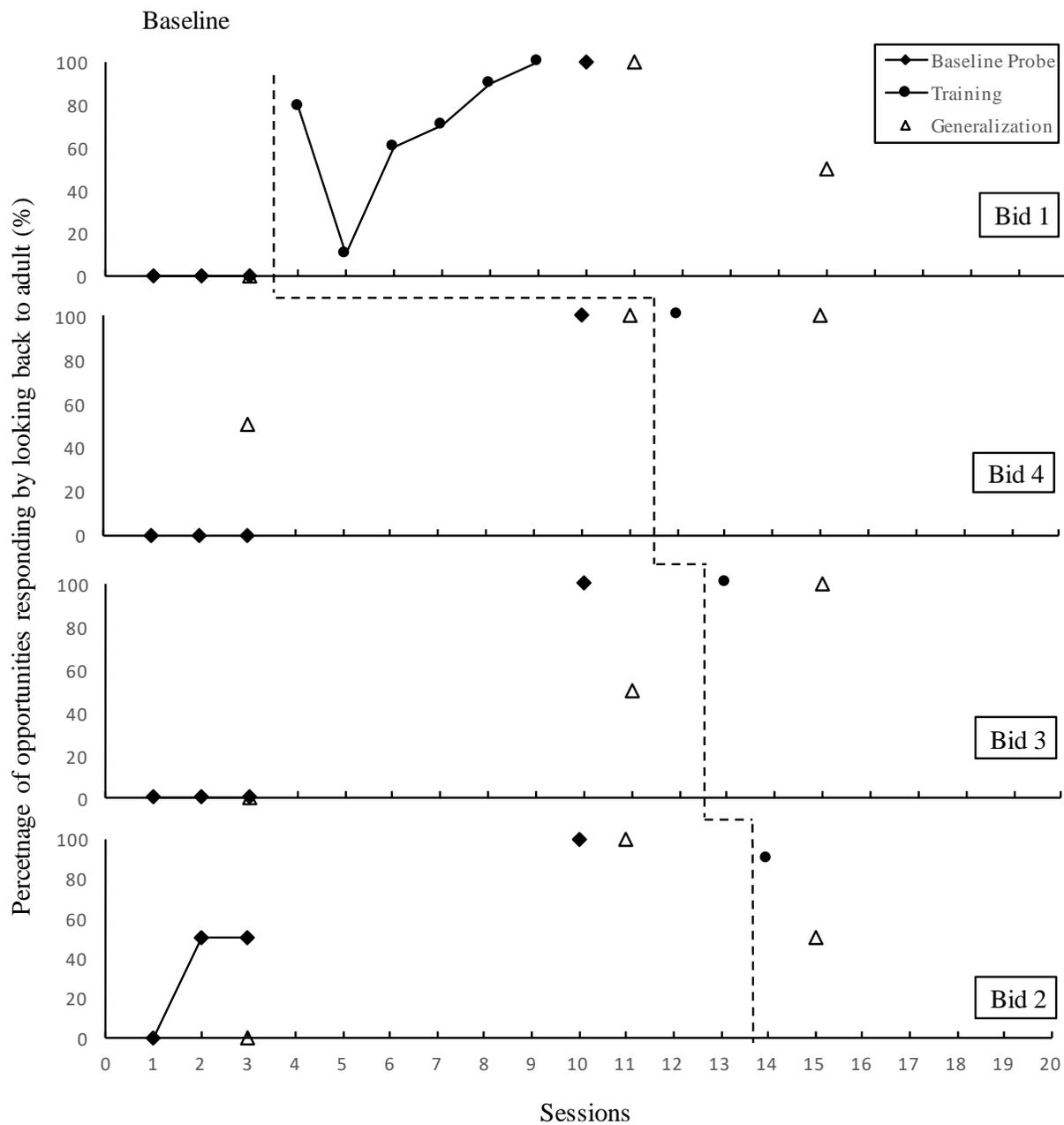
Brooks' Responding by Shifting Gaze Back to Adult

Figure 11

Noel's Responding by Shifting Gaze Back to Adult

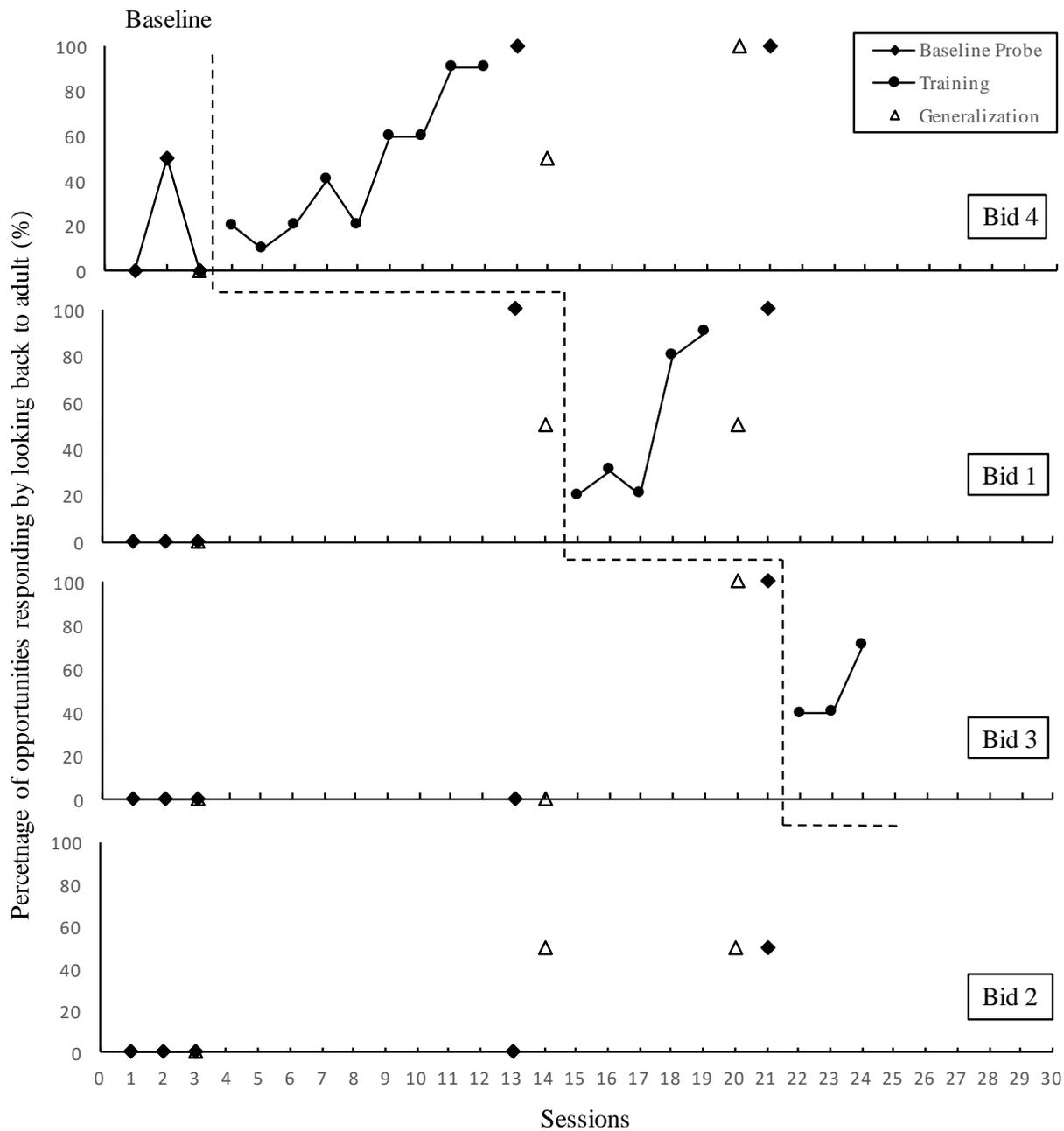
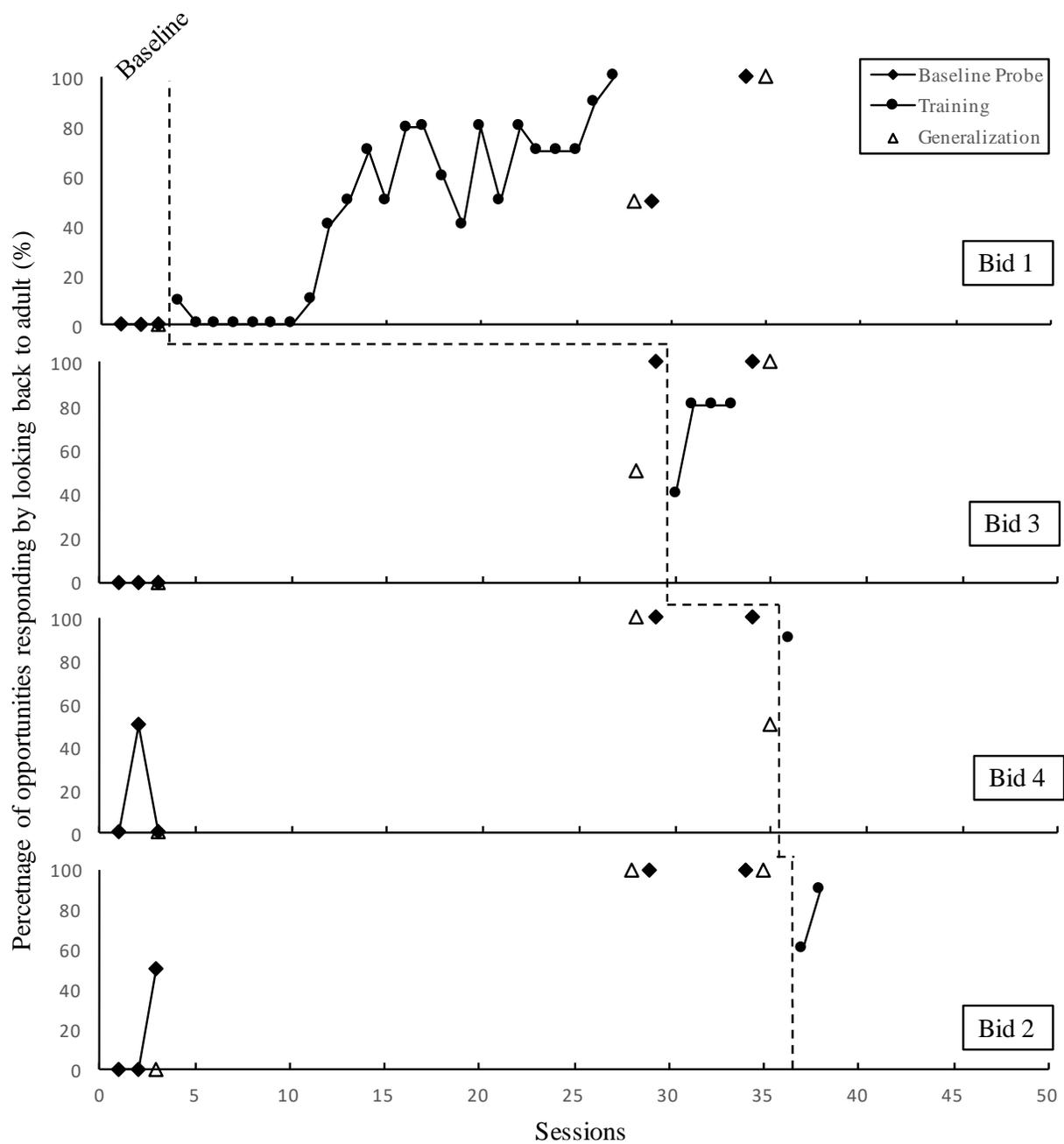


Figure 12

John's Responding by Shifting Gaze Back to Adult

Appendix B: Data Sheet

<p>Prompt legend- mark the most intrusive prompt used (X if prompt not effective for that trial)</p> <p>Response 1: VP = verbal feedback/description of response expected P = physical (i.e., gentle nudge of child's chin or cheek to direct their gaze) G = gesture (i.e., point used to draw line between stimulus and instructor's face or vice versa)</p> <p>Response 2: VP = verbal feedback/description of response expected D = delay (i.e., waits 3 seconds following vocal cue before turning head) R = repeat Sd (i.e. repeats vocal cue and head gaze up to 3 times in a row) P = physical (i.e., gentle nudge of child's chin or cheek to direct their gaze) G = gesture (i.e., point to instructor's face; or point used to draw line between stimulus and instructor's face or vice versa)</p> <p>Response 3: VP = verbal feedback/description of response expected P = physical (i.e., gentle nudge of child's chin or cheek to direct their gaze)</p>											
<p>Trial by Trial – Responding to joint attention – mark with ✓ or X for each trial or P (see above) prompt used for response</p>											
Date:			Instructor:			Bid type:			Session:		
<p>1= child responds within 5 s of vocal cue and instructor's head turn 2= child looks toward stimulus within 3 seconds of looking at instructor or 5 seconds of vocal cue 3 = child looks back to instructor's face within 5 seconds of looking at stimulus AR = all responses</p>											
1											/10 =
2											/10 =
3											/10 =
AR											/10 =
Comments:											

Appendix C: Treatment Integrity

Instructor:		Treatment Integrity Data	Student:									
Skill		Operational Definition	+ or – or N/A									
			1	2	3	4	5	6	7	8	9	10
Preparing environment	1	Prepared ten stimuli to be used.										
	2	Arranged environment and materials as per the current bid.										
	3	Fills in general information on data sheet.										
Antecedents/ Prompting	4	Sets up child at typical play or work activity for first trial or engages child in activity for appropriate inter-trial time. Adjusts inter-trial time based on previous trial(s).										
	5	Presents stimulus as per target bid or arranges for assistant to present stimulus.										
	6	Provides vocal cue + gaze shift toward stimulus										
	7	If child doesn't look to instructor or the stimulus within 5 seconds, provide appropriate prompt.										
	8	If child looks to adult but doesn't look to stimulus, provide appropriate prompt.										
	8	If child looks to stimulus within 3 seconds, wait 5 seconds for child to turn back to instructor.										
	9	If child doesn't turn back to instructor within 5 seconds, provide appropriate prompt.										
	9	If child looks back to instructor's face within 5 seconds or takes instructor's prompt, provide social comment and interaction for approximately 5-10 seconds.										
	10	If at any point the instructor's prompt was not sufficient, instructor ended trial by providing corrective feedback.										
	11	If more than 3 trials in a row were unsuccessful with prompting, instructor removes current activity prior to following trial.										
ITI/data collection	1	Score correctly on data sheet based on operational definitions.										
	2											
			Total number of + / Total steps required	/	/	/	/	/	/	/	/	/
			X 100	%	%	%	%	%	%	%	%	%

Appendix D: Preference Assessment

Preference assessment – verbal behaviour/social

Examples of topics/ideas: songs, characters, tv shows, social interactions (i.e. tickles, surprises, singing, actions)

Rating scale:

1 – mands frequently for item or social interaction or continuously sustains attention with positive affect

2 – mands occasionally for item or social interaction or attends periodically with positive affect,

3 – does not mand for or attend to item or social interaction, but tolerates (i.e., remains in area or with adult)

4 – does not mand for or attend to item or social interaction, refuses and/ or shows negative affect

Pictures used/Items	Rating:	Verbal behaviour/Social R+:

Appendix E: Institutional Review Board Approval



Institutional Review Board (IRB)

720 4th Avenue South AS 210, St. Cloud, MN 56301-4498

Name: Randi Wickstrom
Email: rkwickstrom@go.stcloudstate.edu

IRB PROTOCOL DETERMINATION: Expedited Review-1

Project Title: Training Responding to Joint Attention Bids Using Gaze Following and Multiple Bid Type

Advisor: Benjamin Witts

The Institutional Review Board has reviewed your protocol to conduct research involving human subjects. Your project has been: **APPROVED**

Please note the following important information concerning IRB projects:

- The principal investigator assumes the responsibilities for the protection of participants in this project. Any adverse events must be reported to the IRB as soon as possible (ex. research related injuries, harmful outcomes, significant withdrawal of subject population, etc.).

- For expedited or full board review, the principal investigator must submit a Continuing Review/Final Report form in advance of the expiration date indicated on this letter to report conclusion of the research or request an extension.

- Exempt review only requires the submission of a Continuing Review/Final Report form in advance of the expiration date indicated in this letter if an extension of time is needed.

- Approved consent forms display the official IRB stamp which documents approval and expiration dates. If a renewal is requested and approved, new consent forms will be officially stamped and reflect the new approval and expiration dates.

- The principal investigator must seek approval for any changes to the study (ex. research design, consent process, survey/interview instruments, funding source, etc.). The IRB reserves the right to review the research at any time.

If we can be of further assistance, feel free to contact the IRB at 320-308-4932 or email ResearchNow@stcloudstate.edu and please reference the SCSU IRB number when corresponding.

IRB Chair:

Dr. Benjamin Witts
 Associate Professor- Applied Behavior Analysis
 Department of Community Psychology, Counseling, and Family Therapy

IRB Institutional Official:

Dr. Latha Ramakrishnan
 Interim Associate Provost for Research
 Dean of Graduate Studies

OFFICE USE ONLY

SCSU IRB# 1946 - 2510

1st Year Approval Date: 2/10/2020

1st Year Expiration Date: 2/9/2021

Type: Expedited Review-1

2nd Year Approval Date:

2nd Year Expiration Date:

Today's Date: 2/10/2020

3rd Year Approval Date:

3rd Year Expiration Date: