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The Effect of Familiarity on Joint Attention in Children with ASD

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THE EFFECT OF FAMILIARITY ON JOINT ATTENTION IN CHILDREN WITH ASD

by

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DEDICATION

This thesis is dedicated to Dr. Kara Hawthorne, who initially sparked my passion for research and this project, and Dr. Susan Loveall, who grew my research interests and helped this project become a completed work.

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Throughout this journey, I have had countless supporters and encouragers. I would like to thank everyone who has put even the smallest amount of effort into this project. To my friends and family, thank you for standing by my side and listening to me through the highs and lows throughout the past two years. To Rebekah Bosley and Sarah Grace Davis, thank you for investing time and energy into this research. It would have never come to fruition without you both. To Dr. Hawthorne, thank you for inspiring me to begin this research and your continued support despite moving to Washington, D.C. Without you, this thesis would not be a reality. To Dr. Loveall, thank you not only for taking on this project when Dr. Hawthorne left, but also for guiding me through every aspect of it. Despite the seemingly endless setbacks we encountered, you have been a continuous source of encouragement and support.

ABSTRACT

Joint attention is the ability to share focus on an object with a conversational partner and the awareness that this attention is shared (Moore, Dunham, & Dunham, 2014). Joint attention is an important building block for learning, language, and social development (Mundy & Newell, 2007; Thurm, Lord, Lee, & Newschaffer, 2007). However, previous research has documented that children with autism spectrum disorder (ASD) often have significant deficits and delays in the acquisition of joint attention when compared to typically developing peers of similar chronological ages (Mundy, Sigman, & Kasari, 1994; Osterling & Dawson, 1994; Chiang, Soong, Lin, & Rogers, 2008). Other lines of research suggest that familiarity between individuals with ASD and another person can positively impact behaviors such as reward anticipation, eye tracking, and empathy (Hudry & Slaughter, 2009; Stavropoulos & Carver, 2014; Sterling et al., 2008). Therefore, the following research questions were posed: 1.) Does familiarity with a conversational partner impact total time spent in joint attention in children with ASD? 2.) Will interacting with a familiar conversational partner increase time spent initiating joint attention in children with ASD? To answer these questions, therapy videos were coded from six males between the ages of 3;6 and 5;5. Of these six males, all were enrolled in the HILL program at the University of Mississippi. Five of them had an official ASD diagnosis while one was strongly suspected of ASD. Videos of the child's therapy sessions were recorded across three to four semesters. One video was recorded at the start of the semester when the child and graduate clinician were still unfamiliar with each other. A second video was recorded at the end of the semester when the child and clinician were familiar with each other. To measure joint attention, videos were coded

using a modified Early Social Communication Scale scheme (Mundy et al., 2003). Results of the study support that familiarity positively impacts total time spent in joint attention in children with ASD, but it does support that children will initiate joint attention more in familiar conditions. This research implies the importance of the clinician-client relationship for improvements in joint attention, and it allows for future research on how joint attention can be improved with unfamiliar conversational partners.

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A. Introduction

Joint attention plays a significant role in the development of children's language and social skills (Thurm, Lord, Lee, & Newschaffer, 2007). However, previous research has suggested that several clinical populations, including children with autism spectrum disorder (ASD), are at-risk for deficits and/or delays in joint attention (Mundy & Gomes, 1998; Tomasello & Todd, 1983). These delays, in turn, have been linked to the language and social difficulties that are commonly observed in ASD (Mundy, Sigman, & Kasari, 1994). While a multitude of research has studied the efficacy of various therapy strategies aimed at improving joint attention in children with ASD, little is known about natural factors that may impact these abilities. One such factor is familiarity between communication partners. Previous research has suggested that familiarity impacts a wide array of outcomes, including reward anticipation, empathy, obsessive-compulsive behaviors, and processing of novel objects (Hudry & Slaughter, 2009; Stavropoulos & Carver, 2014; Oberwellend et al., 2017). No research to-date, though, has examined familiarity's impact on joint attention. The purpose of the present study, therefore, was to explore the impact of familiarity on joint attention behaviors in children with ASD.

A.1 Autism Spectrum Disorder

Autism spectrum disorder is a developmental disability characterized by deficits in social communication and social interactions and restricted, repetitive patterns of behaviors, interests, or activities that are present in early development, cause significant impairments in functioning, and are not better explained by intellectual disability or

global developmental delay (DSM-IV; American Psychiatric Association, 1952). Individuals with ASD may exhibit inappropriate responses in conversations, misread nonverbal interactions, and have difficulty building and maintaining age-appropriate relationships (DSM-5; American Psychiatric Association, 2013). Current rates of ASD in the US are 1 in every 59 children (Baio et al., 2018), making it one of the most common developmental disabilities. However, as indicated by the spectrum diagnosis, there is wide variability across individuals with ASD, both in terms of IQ and autism symptomatology. For example, some individuals with ASD may have great difficulty communicating even basic wants and needs, while others may exhibit more mild symptoms, such as difficulty maintaining eye contact while communicating (DSM-5; American Psychiatric Association, 2013). IQ also varies widely across individuals with ASD. Further, severe autism symptomatology does not necessarily equate to low IQ, and mild symptomatology does not necessarily equate with high IQ. Individuals can vary along both continuums.

A.2 Joint Attention

Joint attention is a two-fold skill that includes sharing attention with a communication partner and an object or event of interest and the awareness by both partners that their attention is shared (Bakeman & Adamson, 1984; Baldwin, 1995). Joint attention is fundamental to learning, language, and social competency (Mundy & Newell, 2007). For example, the ability to share attention with a communication partner can help children learn new vocabulary words (e.g., a parent can say to a child, “Look at the butterfly!”) and learn about the emotions of social partners (e.g. that the parent is excited to see a butterfly) (Meltzoff & Moore, 1998; Morales et al., 2000; Mundy et al., 2007;

Trevarthen & Aitken, 2001). In fact, more highly developed joint attention abilities during infancy have been linked to greater success in language development from twelve months into the preschool years (Thurm, Lord, Lee, & Newschaffer, 2007), as well as greater social cognition (Mundy & Newell, 2007) and improved social/emotional skills (Vaughan Van Hecke, et al., 2007).

In typically developing children, joint attention begins to develop between 3 to 6 months of age (Kaplan & Hafner, 2006). During this time, joint attention is primarily categorized as "responding," in which a child is simply following the attention-directed behaviors of another communication partner to an object or event of interest (Mundy et al., 2007; Paparella, Goods, Freeman, & Kasari, 2011). Joint attention at this age is typically demonstrated by a child's eye gaze (Mundy & Newell, 2007). Because responding joint attention is the first form of joint attention to develop, it is considered a cornerstone for the development of more complex joint attention abilities.

By 18 months of age, joint attention in typically developing children will be fully developed, which includes the ability to "initiate" joint attention via eye gaze, vocalizations, and/or pointing (Corkum & Moore, 1998; Kaplan & Hafner, 2006). Initiating joint attention is the child's ability to create a joint attention bid by him/herself rather than simply responding to a bid from a communication partner. As initiating joint attention abilities emerge, children learn to use these skills to request objects and begin conversations about items they are interested in (Paparella, Goods, Freeman, & Kasari, 2011). Initiating joint attention is an important skill to appropriately communicate wants, needs, and ideas as children get older. Initiating and responding joint attention are also often combined into an overall joint attention composite to describe the total amount of

time children are engaged in joint attention with a communication partner (Mundy et al., 2003).

Across different research studies, joint attention has been measured using a variety of strategies. Frequently, joint attention is measured by calculating the "total time" (i.e., the number of seconds/minutes) participants spend in joint attention. Total time is also often reported as a proportion or percentage score (Bakeman & Adamson, 1984; Depowski, Abaya, Oghalai, & Bortfeld, 2015; Prezbindowski, Adamson, & Lederberg, 1998; Redcay, et al., 2013). Previous research has also used frequency counts, which tally the number of joint attention episodes that occur during a set period of time, (Mundy et al., 2003, Kryzak, Bauer, Jones, & Sturmey, 2013; Osterling, & Dawson, 1994) or rates of joint attention episodes during a set time period (Fidler, Philofsky, Hepburn, & Rogers, 2005; Hahn, Fidler, Hepburn, & Rogers 2013). Some research has also rated the quality of joint attention and focused less on the quantity of joint attention time or episodes (Adamson, Bakeman, Suma, & Robins, 2019; Kasari, Freeman, & Paparella, 2006).

A.3 Joint Attention in Autism Spectrum Disorders (ASD)

Children with ASD often exhibit delays in the development of joint attention, documented as early as three months old, as well as overall deficits in these abilities as they grow older (Mundy, Sigman, & Kasari, 1994). In fact, difficulties with joint attention are considered a hallmark feature of ASD (Kasari, Freeman, & Paparella, 2006). Children with ASD are significantly less likely to engage in both responding and initiating joint attention than typically developing peers at any age, even when controlling for language level, mental age, and IQ (Chiang, Soong, Lin, & Rogers, 2008; Adamson,

Bakeman, Suma, & Robins, 2019). Further, the absence of initiating joint attention in a child's first year distinguishes children with ASD from typically developing children (Osterling & Dawson, 1994).

Joint attention has been linked to language outcomes in children with ASD. The delays in joint attention that are common for this population hinder the ability of young children with ASD to communicate with an interlocuter (Rossmanith, Costall, Reichelt, Lapez, & Reddy, 2014), and the impact of these delays on language become more noticeable as the child grows older and is expected to use more sophisticated language (Thurm, Lord, Lee, & Newschaffer, 2007).

Joint attention is also fundamental to developing and sharing knowledge, experiences, and emotions with others, which, in turn, promotes the development of social relationships (MacPherson & Moore, 2017; Parlade, et al., 2009). Because joint attention results in shared experiences and requires emotional understanding, it prepares children for more complex social and emotional contexts as they grow older (Parlade, et al., 2009). Therefore, since children with ASD are likely to have impaired joint attention abilities, they are also likely to have impairments in social cognition. Such social cognition impairments have been well-documented in this population (David et al., 2008), and some research has made connections between this social cognition impairment and joint attention abilities (Mundy & Newell, 2007).

There has been a plethora of research documenting delays in joint attention in ASD relative to peers and examining various therapy techniques aimed at improving joint attention outcomes. Overall, this research has highlighted the need for explicit training in joint attention for children with ASD. For example, Korkiakangas and Rae (2013) found

that teachers could increase joint attention in students with ASD by using gestures or object adjustments when transitioning between activities. Similarly, Taylor and Hoch (2018) reported that children with ASD increased spontaneous responsive joint attention when therapists explicitly taught them to respond to joint attention bids by looking at an object the adult pointed at, making a comment about the object, then looking back at the adult.

A.4 Impact of Familiarity on Joint Attention

While previous research has been beneficial in documenting the joint attention delays that are common ASD, as well as beginning to examine strategies for improving joint attention in ASD, there is a paucity of research on what factors may naturally cause fluctuations of joint attention behaviors in children with ASD. However, natural factors are likely to impact these outcomes. For example, a study by Kryzak, Bauer, Jones, and Sturmey (2013) found that when children with ASD were completing an activity of interest (versus disinterest), they were more likely to engage in both responding and initiating joint attention.

Familiarity between communication partners is one such natural factor that may impact joint attention outcomes in ASD. Familiarity refers to how acquainted someone is with a communication partner, and previous research has indicated that familiarity can positively impact children's learning and behaviors. For example, typically developing infants' abilities to process novel objects (Hoehl, Wahl, Michel, & Striano, 2012), learn new words (Hoehl, Wahl, Michel, & Striano, 2012), and follow eye gaze (Barry-Anwar, et al., 2017) increase when the conversational partner is familiar. Further, children with

Obsessive Compulsive Disorder (OCD) are able to more easily control compulsions if a familiar person is with them throughout their day (Neal, & Radomsky, 2015).

Familiarity between communication partners also impacts the behaviors of children with ASD. For example, Hudry and Slaughter (2009) reported that children with ASD were more empathetic to familiar communication partners' emotions than that of unfamiliar agents, and Stavropoulos and Carver (2014) documented that familiarity had a positive effect on reward anticipation in children with ASD. Further, a recent study by Oberwelland et al. (2017) found that different parts of the brain are active when a child with ASD is participating in joint attention with a stranger versus a familiar adult, suggesting that familiarity likely plays a role in joint attention behaviors as well. However, no behavioral research has examined the impact of familiarity on joint attention behaviors, including time spent in joint attention, for children with ASD.

A.5 Current Study

Previous research has documented the importance of joint attention on language development (Thurm, Lord, Lee, & Newschaffer, 2007) and that difficulties with joint attention are common in ASD and linked to poor language outcomes (Mundy, Sigman, & Kasari, 1994). However, no research has examined the possible impact of familiarity on joint attention behaviors in children with ASD, despite its links to these skills in typically developing children (Hoehl, Wahl, Michel, & Striano, 2012). Thus, the present study addressed the following research questions: 1.) Does familiarity with a conversational partner impact total time spent in joint attention in children with ASD? 2.) Will interacting with a familiar conversational partner increase time spent initiating joint attention in children with ASD? Examining multiple semesters worth of speech and

language therapy videos from children with ASD attending a preschool laboratory program, we hypothesized that there would be an increase in a child's joint attention over the course of a semester (as the child becomes more familiar with his clinician), that joint attention would decrease at the beginning of a new semester (when a new clinician is introduced to the child), and that joint attention would increase again (as the child becomes familiar with the new clinician). We further hypothesized that the child would initiate joint attention more frequently during familiar time points, which were the videos coded at the end of each semester for each participant.

B. Methods

B.1 Design

This study utilized a descriptive, longitudinal design in which children's joint attention behaviors were measured during speech and language therapy across 3-4 academic semesters. The independent variable was the child's familiarity with his/her clinician (unfamiliar at the beginning of each semester vs. familiar at the end of each semester). To account for familiarity, two videos of speech-language therapy were coded for each child per semester. One video was recorded at the start of the semester when the child and his/her graduate clinician were unfamiliar with each other. A second video was recorded at the end of the semester, when the child and his/her graduate clinician were familiar with each other. The dependent variables were the total time spent in joint attention during each time point and whether the child was responding to or initiating a joint attention bid. To measure joint attention, videos will be coded using the Early Social Communication Scale scheme that has been modified by the authors to best fit the purposes of this study (Mundy et al., 2003).

B.2 Participants

B.2.a Children

Participants included six children (*n*=5 with a formal diagnosis of ASD; *n*=1 diagnosed with moderate-to-severe language delay and suspected of having ASD). Participants were all attending the HILL Program in the Communication Sciences and Disorders Department at the University of Mississippi, which provides intensive

language therapy. Each child in the HILL Program is paired 1:1 with a new graduate clinician working on their masters in speech language pathology each semester. The participants were in a classroom setting for approximately eight hours per week and received 1:1 therapy for 30 minutes per day two to four times per weeks, resulting in one to two hours of 1:1 therapy per week. Videos of the 1:1 therapy were recorded regularly (see below).

Participant ages ranged from 3;6 to 5;5 years old at the first coded timepoint in the study, and all participants were male. In order to be included in the study, the child had to have or be suspected of having ASD, have been in the HILL Program for at least two semesters, and have at least two 1:1 therapy videos per semester (one unfamiliar at the start of the semester and one familiar at the end of the semester) for at least two consecutive semesters. Data were collected across three semesters for participants 1, 2, 3, and 6. Data were collected across four semesters for participants 4 and 5. See Table 1 for participant characteristics.

Table 1

Participant Characteristics

ID	Age	Dx	PLS-5 Total Language	PLS-5 Auditory Comprehension	PLS-5 Expressive Comprehension	Clinician SRS-2	Parent SRS-2
1	4:7	ASD	50	51	54	79	65
2	4:10	ASD	50	52	50	74	77
3	3:6	ASD	50	55	50	92	79
4	3:7	ASD	60	53	72	81	74
5	5:5	ASD	51	52	57	75	76
6	3:9	Language Delay**	50	50	50	81	48

Note: **Age is calculated from the first coded video of study*
***all Pre-school Language Scale (PLS) scores are standard scores*
***all Social Responsiveness Scale (SRS) scores are overall T-scores*
***Both tests are from the same semester as first coded video of study*
****Child with language delay is suspected of having ASD*

B.2.b Clinicians

Clinician participants were graduate students in the Speech Language Pathology master's program at the University of Mississippi. Videos recorded in fall semesters included first-semester graduate students; videos recorded in spring semesters included second-semester graduate students, and videos recorded in summer semesters included third-semester graduate students. The child received therapy from the same graduate clinician throughout the semester, and a new clinician was assigned at the beginning of each new semester. Graduate clinicians were supervised by licensed speech-language pathologists.

B.3 Materials

B.3.a Video Recordings

In order to examine the relationship between joint attention and familiarity, therapy videos that had been previously recorded by the HILL Program were coded according to the protocol in the coding section of this paper. The videos were recorded from an observation area behind a two-way mirror so the participants were not distracted by the recording process. Each video included ten to thirty minutes of each participant's speech and language therapy sessions with a graduate clinician, from which the first usable seven-minutes were selected for coding (see Section B.4). One video per timepoint per participant was used.

Some videos or portions of videos were excluded from the research because they were not useful to the study. Exclusion criteria include:

- the child having a different clinician than his/her usual clinician throughout the semester,

- multiple children in the therapy room with the clinician,
- the child watching a video during the therapy session,
- the child/clinician not in the frame,
- the clinician blocking the view of the child, or
- any other hindrance to the coders' ability to see the child/clinician dyad to record joint attention episodes.

B.3.b Testing

All participants were tested for receptive and expressive language abilities and social impairments through the Pre-school Language Scale-5 (PLS-5) and the Social Communication Scale-2 (SRS-2) respectively. The scores reported in Table 1 are from the same semester as each child's first coded video.

Social Responsiveness Scale, Second Edition (SRS-2; 15-20mins). The SRS-2 (SRS-2, 2012) was used to measure autism symptomatology via parent and clinician preschool and school-aged reports (depending on the child's age). This standardized assessment uses a Likert scale to assess behaviors exhibited by the child in the last six months. T-scores, raw scores weighted for chronological age and sex, were used to describe participants. Higher scores indicate greater difficulty with autism symptomatology. A score of 59 or lower indicates that the child is within normal limits, 60-65 indicates mild symptomatology, 66 to 75 indicates moderate symptomatology, and 76 or higher indicates severe autism symptomatology. The SRS-2 has good internal validity (α=95) and validity (when compared with Social Communication Questionnaire in studies with mixed samples, r=.68).

Pre-school Language Scale, Fifth Edition (PLS-5; 45-60mins). The PLS-5 (PLS-5, 2011) was used to measure receptive and expressive language abilities via a test administered by the clinician from the first semester videos. The PLS-5 contains two standardized scales: Auditory Comprehension (AC), which measures the range of language comprehension, and Expressive Communication (EC), which measures the ability to communicate with others. Norm-referenced standard scores were used to describe participants. A score above 85 indicates average or above average language development, 79-84 indicates mild language delay, 65-78 indicates a moderate language delay, 64 or less indicates a severe language delay. The PLS-5 has good internal validity (r =.91) and validity.

B.4 Procedures

B.4.a Coding Procedures

Videos were coded for joint attention according to a coding scheme that was adapted from the Early Social Communication Scale to be used in a naturalistic setting (Mundy et al., 2003). The Early Social Communication Scale (Mundy et al., 2003) was developed to be used in a controlled setting with specific probes for joint attention behaviors. The scale for the current study was adapted to be used in a setting that did not specifically probe for joint attention. Each video was coded for the following: joint attention start time, joint attention stop time, whether the joint attention was responding or initiating, whether the child attended to an object (if an object, the object will be named) or the clinician, and how the attention was directed (point, gaze, showing, or verbal). Joint attention was considered present when the child alternated eye gaze,

showed, pointed, or used verbal cues to share attention on an object or event with the clinician.

Seven minutes were coded per video per participant. In some cases, these seven minutes were not consecutive. This only occurred if part of the seven minutes was unusable (see section B.2 above). At least one consecutive minute (all usable) was coded at a time. See appendix for full coding scheme.

B43.b Inter-rater Reliability

Each video was coded by the author, and twenty percent were double-coded by a trained research assistant for inter-rater reliability. The researcher was not blind to the hypothesis of the study or to the time-point in the semester that each video was recorded. The research assistant was also not blind to the hypothesis of the study; however she was blind to the time-point in the semester that each video was recorded. Intraclass correlation coefficients (ICC) were used to measure inter-rater reliability of total time spent in joint attention. An ICC of .89 (good; Koo & Li, 2016) was reached for total time spent in joint attention. Cohen's kappa coefficient was used to measure inter-rater reliability of responding vs. initiating joint attention. The researchers obtained a .91 (i.e., near perfect agreement) kappa coefficient.

C. Results

C.1 Data analysis plan

Due to the small sample size, data analysis was descriptive and conducted through visual inspection of plotted data. For each dependent variable, participant data were analyzed individually and as an average.

To examine the relationship between familiarity and amount of joint attention, the total time spent in joint attention, number of joint attention episodes, and time spent per joint attention episode were calculated during both unfamiliar and familiar time points in each semester. We examined these factors from unfamiliar to familiar time points, as well as across all semesters. To examine the relationship between familiarity and responding versus initiating joint attention, the average times for each time point were split into average time spent responding versus initiating joint attention.

C.2 Total Joint Attention

Each semester, participants' time in joint attention increased from unfamiliar to familiar conditions. When participants were given a new clinician at the beginning of each semester, joint attention again decreased. However, from the beginning to the end of the study, across all semesters, participants increased in their total time spent in joint attention. Figure 1 shows each participant's individual data across semesters. Figure 2 shows the average time spent in joint attention when all six participants' data was averaged together.

When examining number of joint attention episodes, each participant had a lower mean for familiar versus unfamiliar conditions, as detailed in Figure 3. However, each participant also spent more time, on average, in each joint attention episode during familiar conditions, as detailed in Figure 4. When these scores were averaged together across participants, the mean number of joint attention episodes was also lower for familiar (M = 26) versus unfamiliar (M = 45) conditions (see Figure 5). However, the average length of time for each joint attention episode was again longer in familiar conditions (M = 8 seconds) than in unfamiliar (M = 5 seconds; see Figure 6).

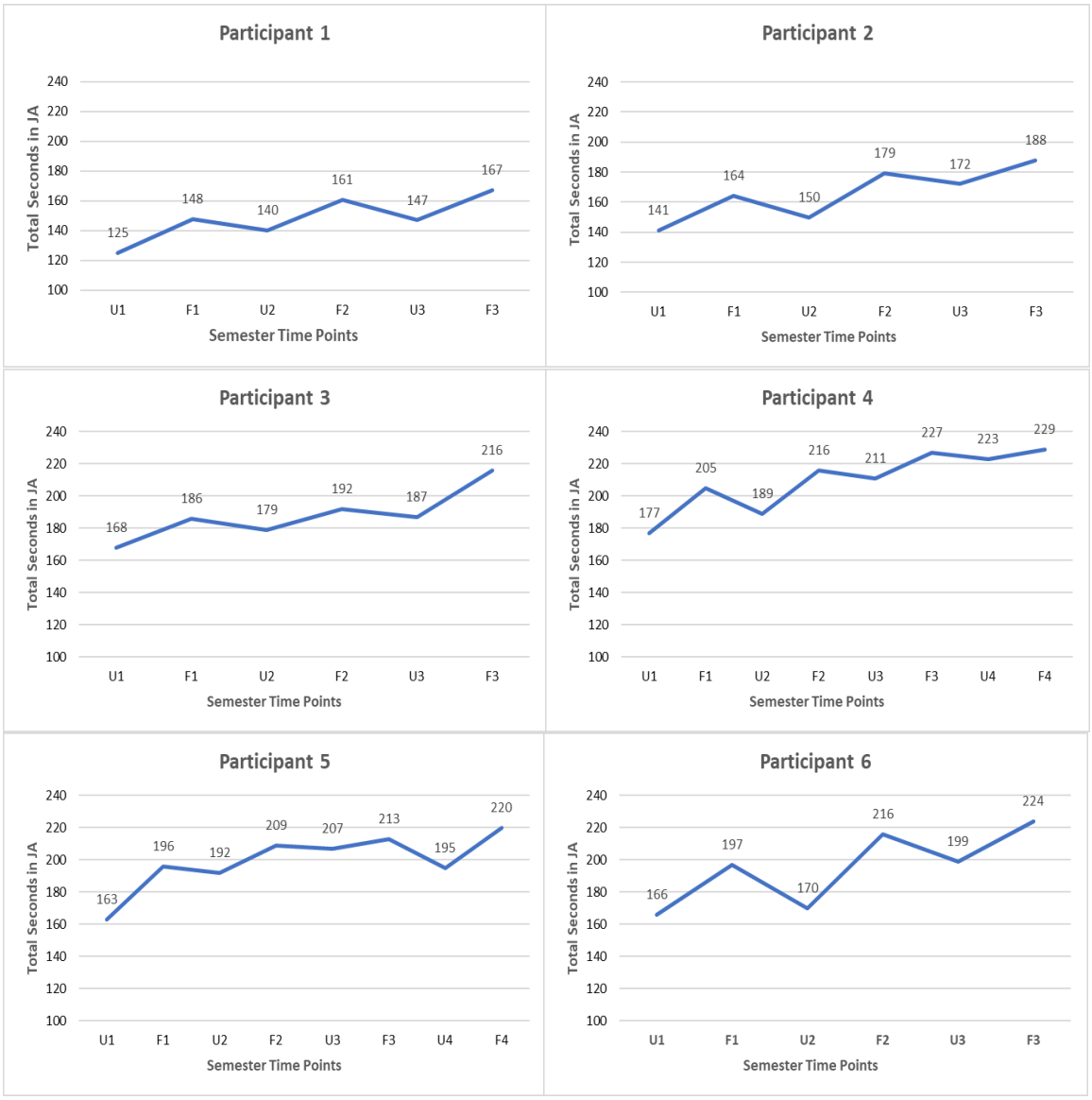

Figure 1. Total time, in seconds, spent in joint attention for individual participants

U1=Unfamiliar timepoint 1, F1=Familiar timepoint 1, etc.

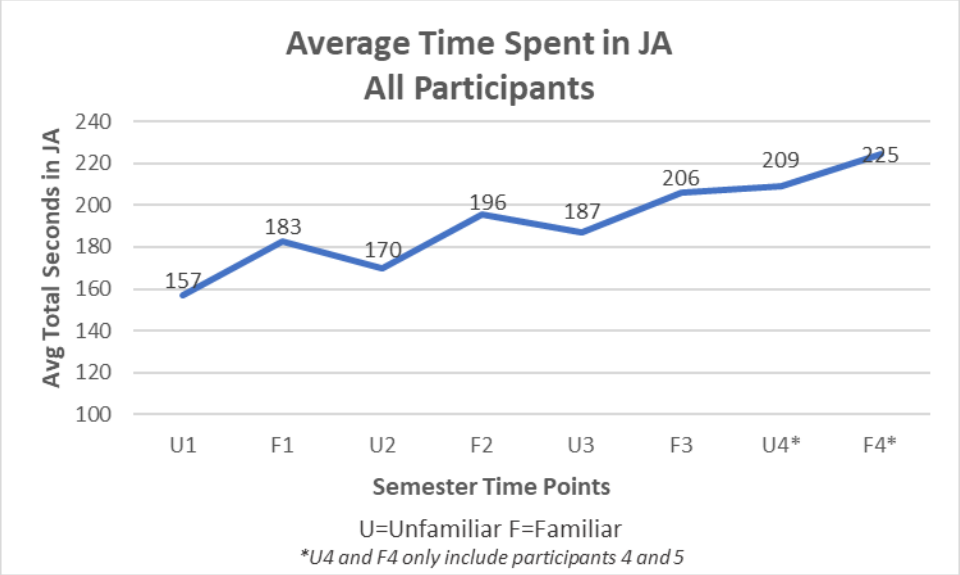

Figure 2. Mean total time, in seconds, spent in joint attention for all participants

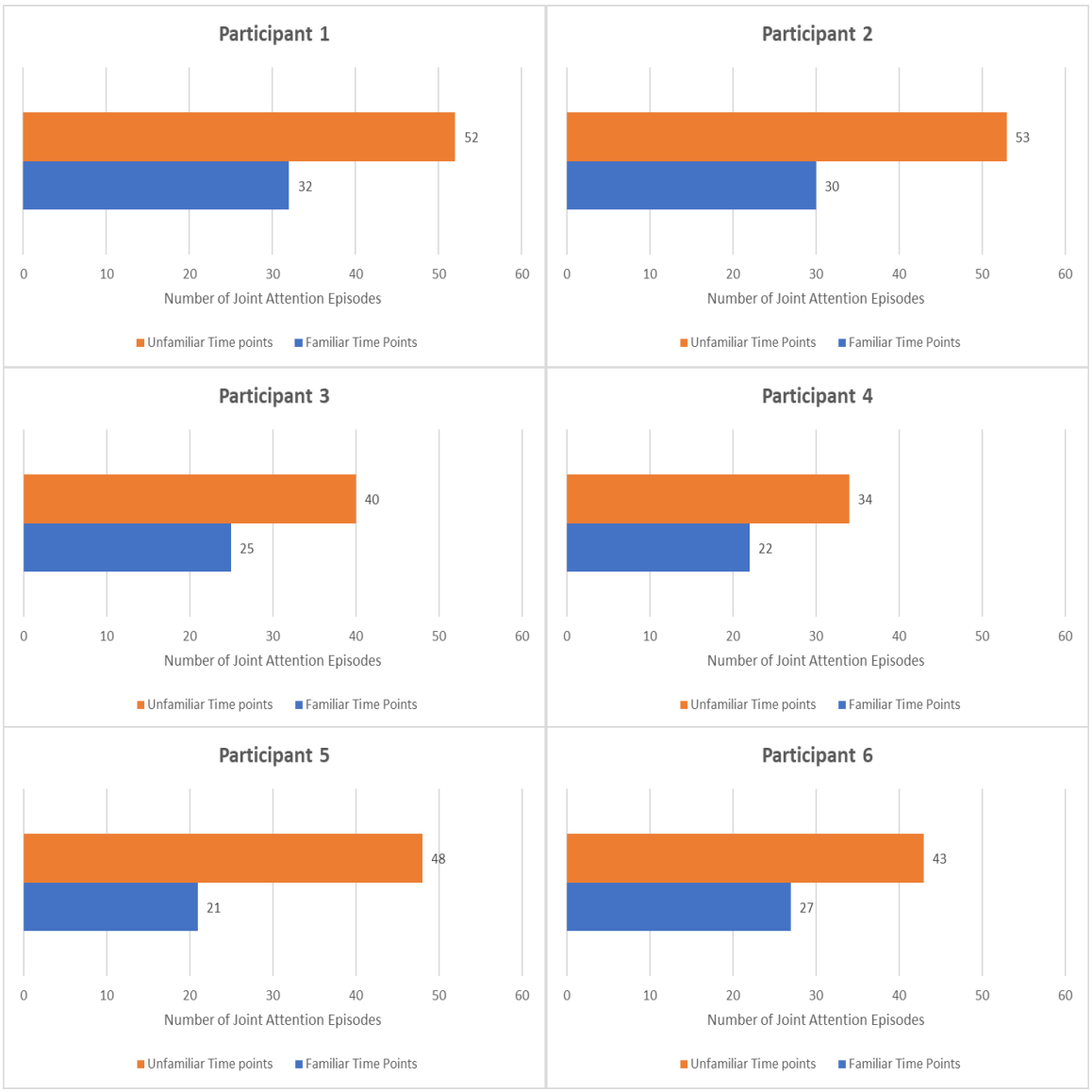

Figure 3. Mean number of joint attention episodes for individual participants

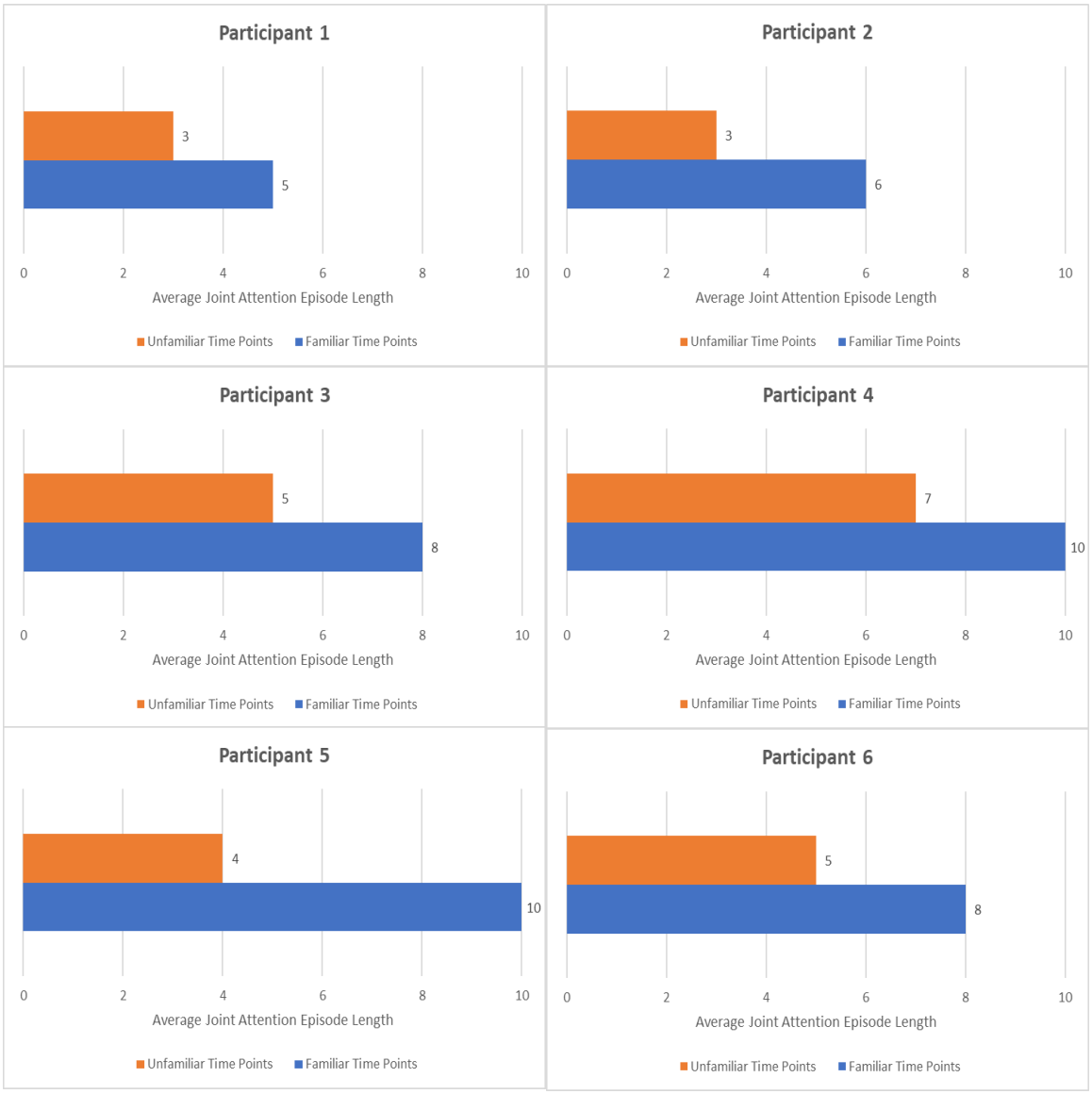

Figure 4. Mean joint attention episode length, in seconds, for individual participants

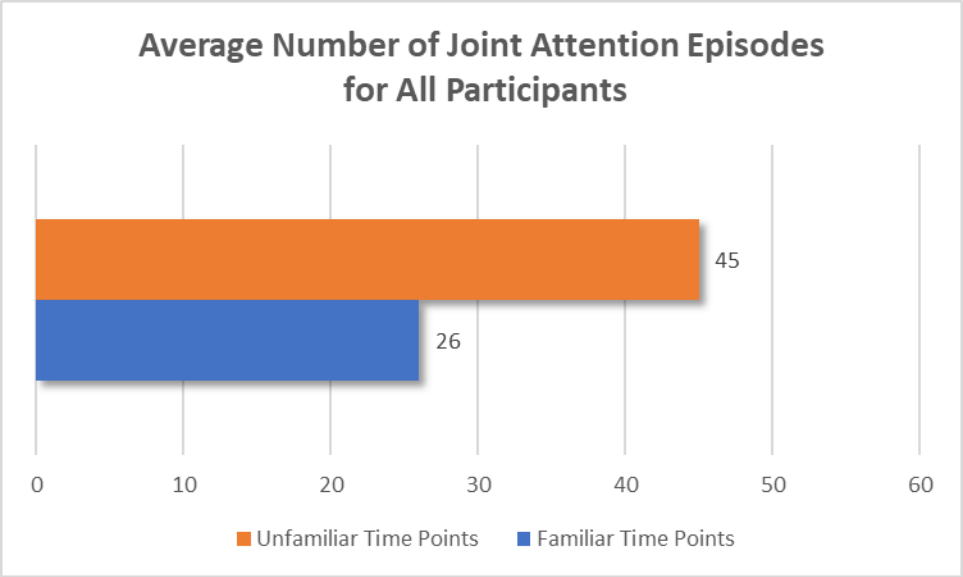

Figure 5. Mean number of joint attention episodes for all participants

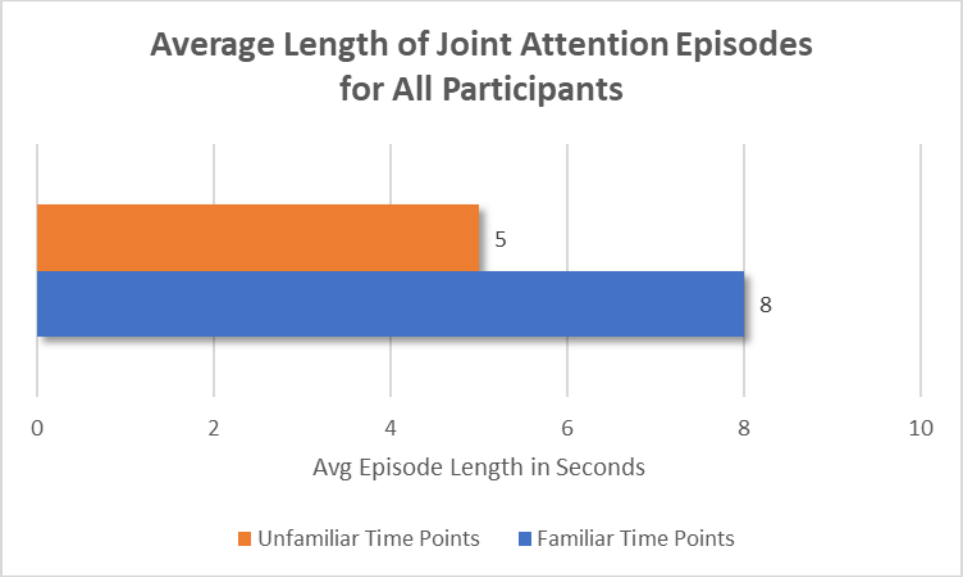

Figure 6. Mean length of joint attention episodes, in seconds, for all participants

C.3 Responding vs. Initiating Joint Attention

Familiarity appeared to increase time spent in joint attention when children were responding to bids by their clinicians. However, children did not appear to initiate joint attention any more in familiar versus unfamiliar conditions. See Figure 7. Though participants increased time spent in joint attention in familiar conditions, the results indicate that this increase occurred in the responding category. See Figure 8.

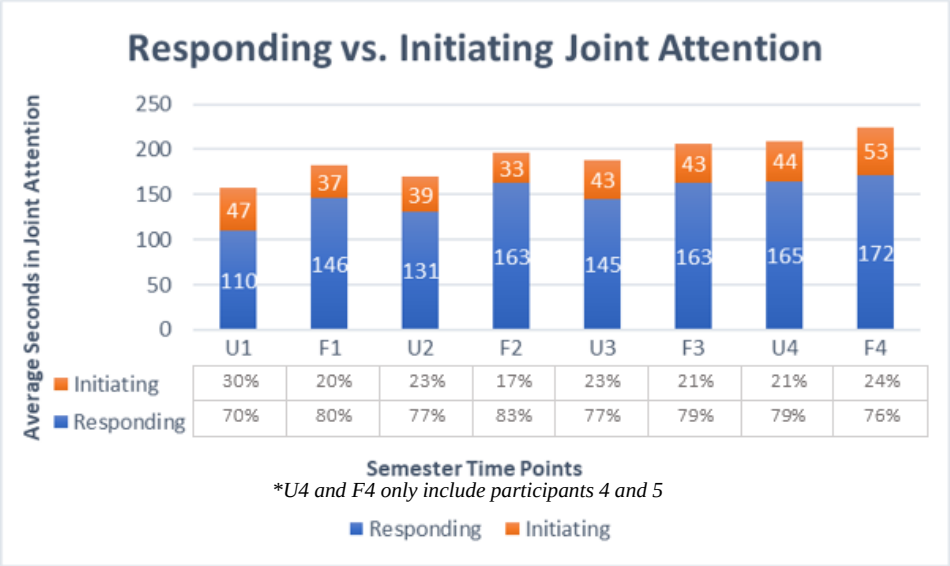

Figure 7. Responding versus initiating joint attention averages, in seconds, for all participants per semester

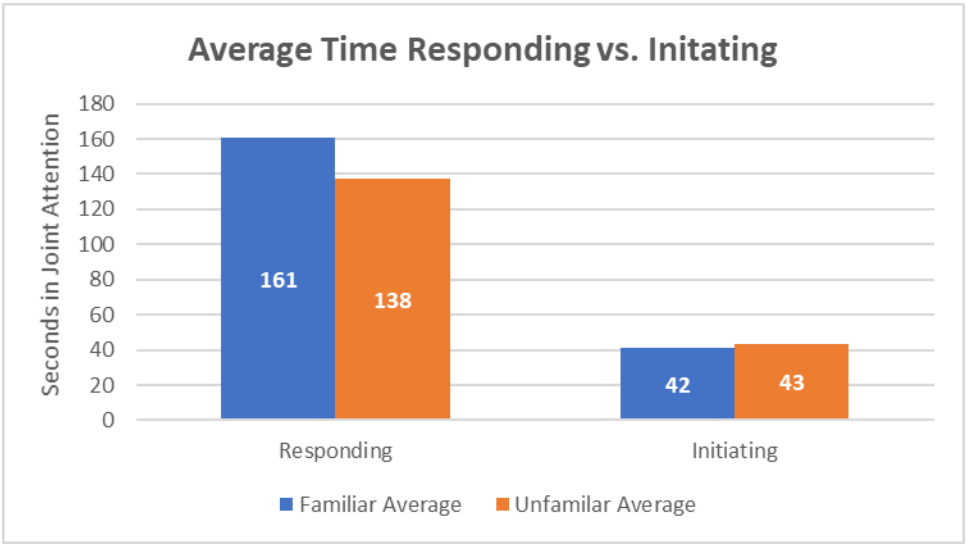

Figure 8. Responding versus initiating averages, in seconds, for all participants across all unfamiliar versus all familiar timepoints

D. Discussion

The current study explored the impact of familiarity on total time spent in joint attention and responding versus initiating joint attention. The following research questions were posed: 1.) Does familiarity with a conversational partner impact total time spent in joint attention in children with ASD? 2.) Will interacting with a familiar conversational partner increase time spent initiating joint attention in children with ASD? To answer these questions, therapy videos from six male children in the HILL Program, ages 3 to 5 years, were coded for joint attention start and stop times (resulting in a total time spent in joint attention) and whether the joint attention was responding to a bid by the clinician or initiated by the child. We also examined total number of joint attention episodes. The coding scheme was adapted from the Early Social Communication Scale (Mundy et al., 2003) to better accommodate the naturalistic therapy setting in which the videos of the current study were recorded.

The results suggest a relationship between familiarity and joint attention behaviors, in that when the children were more familiar with their clinicians, they spent more time engaged in joint attention and had increased joint attention episode lengths. Though the results showed fewer number of joint attention episodes in familiar conditions, this is likely due to the increased time spent in each joint attention episode. Since the researchers consistently coded seven minutes of video, increased time in each episode would result in fewer episodes fitting into that time period. This supported our hypothesis and is consistent with previous research that has documented that familiarity between communication partners positively impacts a range of behaviors in children with typical development, OCD, and ASD (Hoehl, Wahl, Michel, & Striano, 2012; Barry-

Anwar, et al., 2017; Neal, & Radomsky, 2015; Hudry & Slaughter, 2009; Stavropoulos & Carver, 2014). This is also consistent with Oberwellend, et al.'s (2017) findings that different brain regions are active when a child with ASD is participating in joint attention with an unfamiliar versus a familiar adult.

Further, participants increased in total time spent in joint attention across all semesters. This suggests that though familiarity does impact joint attention, an unfamiliar clinician does not completely negate progress made in therapy. Changes in clinicians may even ultimately be beneficial for the client, allowing him/her to generalize skills to a new clinician. None of the participants returned to their first and lowest joint attention times, indicating that there is some ability for the child to generalize the skill to an unfamiliar communication partner. However, unfamiliar joint attention times in second and third semesters did not exceed joint attention times reached in familiar conditions. Thus, individuals with ASD may need explicit training in generalizing joint attention to new clinicians.

Inconsistent with our second hypothesis, familiarity did not increase the amount of time spent in joint attention when initiated by the participants. The participants were much more likely to respond to joint attention bids initiated by the clinicians than to initiate joint attention themselves. Thus, the increase in total time spent in joint attention in familiar conditions appears to be driven by more time spent in responding to joint attention bids. However, initiating joint attention is developmentally a later skill to emerge and thus, a more difficult skill to master. If given a longer period of time to develop the skill with the familiar clinician, initiating joint attention bids may have increased.

D.1 Applications

There are several clinical applications from the findings of this study. First and foremost, this data suggests there may be a need for explicit training in generalizing joint attention skills to unfamiliar communication partners for children with ASD. This research also suggests that speech-language therapy may be more efficient if clients with ASD are able to remain with a familiar clinician throughout the duration of their speech-language therapy services. However, though this may increase responding joint attention bids with the clinician, the client may not learn to generalize this skill across individuals or across settings. Though the client may show more success in therapy, spontaneous joint attention may be hindered if explicit joint attention training is not implemented with unfamiliar partners.

This research also highlights the importance of identifying and setting goals specific to initiating joint attention for children with ASD. Though the participants improved total time in joint attention, much of the improvement was exhibited in the responding category. While children who respond to joint attention do have increased participation in social interactions, children who initiate joint attention have the ability to communicate their interests. By initiating joint attention bids, children have the opportunity to engage others in the objects that appeal to them, which will likely result in positive social experiences.

D.2 Limitations and Future Directions

This study was not without limitations, and as such, the results should be interpreted with some caution. First, the sample was small, all male, and included children from one program. Thus, it is unknown how well these results generalize to the

larger population of ASD. Further, participant 6, the child without a formal ASD diagnosis, did not score in the elevated range for the SRS-2 that was completed by his parent. However, he did score in the elevated range for the SRS-2 that was completed by his clinician. This discrepancy may be better understood when considering that the parents of participant 6 have another child with ASD who has severe ASD symptomatology. This may have resulted in a skewed perspective of "normal" for the parent, leading to a lower score on the parent-completed SRS-2. Regardless, this participant did not have a formal diagnosis of ASD, further limiting generalizability to the larger population of children with ASD.

Second, this research is retrospective. The videos were not specifically recorded to assess joint attention behaviors. We were not able to control or stipulate whether any of the participants had joint attention goals, nor were we able to control the number of bids initiated by clinicians. Further, some recorded videos were unusable; thus, some participants have more data than others (two participants had data for four semesters, while the other four had data for three semesters). There were also portions of some of the included videos that were not usable. These portions were not included in the study, but they resulted in an interruption of the seven minutes of coding (see section B.3.a). Further, there were breaks in therapy after each semester (e.g. summer and winter breaks). These breaks may be an alternative explanation for the findings.

Finally, throughout the study, the children became older, and thus their joint attention abilities may have improved due to maturation. However, although the children grew older from the end of one semester to the beginning of the next, there was still a decrease in the time spent in joint attention at the beginning of the new semester. Since

there was a growth in joint attention from the first to the final timepoint for all participants, it is useful to note that there was a 1-2 year increase in age.

Future research may wish to replicate the study using more controlled laboratory settings with a larger sample of participants. Additionally, future research should more fully explore the relationship between familiarity and initiating joint attention specifically, as well as if and how to best help individuals with ASD generalize joint attention skills to unfamiliar conversational partners. More fully understanding how familiarity impacts joint attention in children with ASD will better equip clinicians to provide effective therapy targeting language and social interactions outcomes for these clients.

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APPENDIX

Coding Scheme

General Guidelines

- The following guidelines have been adapted from Peter Mundy's Early Social Communication Scale (2003)
- Joint attention (JA) will be considered present when the child responds to or initiates a point, gaze, verbal cue, showing, or any combination of these four for at least three seconds. Each is defined below.
- If it is unclear whether an action is a JA bid, do not code it.
- Failed attempts at JA may occur. Coding for such attempts will be outlined below.

Episode # (column A)

- Each joint attention episode should be counted for each participant
- Episode number will begin at one and end with the last episode of JA
- It does not matter who initiated the JA, what type of JA, or how the JA was directed in this column. Each new episode is a new episode number independent of these matters

JA Start and Stop Times (columns B-C)

- Start and Stop times should be coded for each episode of JA
- Start time should be marked as minute:second in the video that the JA episode begins
- Stop time should be marked as minute:second in the video that the JA episode ends
- For failed bids, start time should be the minute:second the JA bid begins (See *Failed Bids)*

- For failed bids, stop time should be the minute:second the child relinquishes the JA bid (See *Failed Bids)*

Types of JA (column D)

Initiating Joint Attention (I) (Child initiates JA)

- The child is considered to initiate JA when he/she begins the JA bid with one of or a combination of the actions listed above.

Responding to Joint Attention (R) (Clinician initiates JA)

- The child is considered to respond to JA when he/she looks at the clinician or object with which the clinician is initiating a bid using one of or a combination of the actions listed above.

Attended to (columns E-F)

- For each episode, the researcher should mark what the child attended to in column E.

Attended to Clinician (C)

- The child is considered to be attending to the clinician if he/she is alternating eye gaze with the clinician. Such instances should be marked "C"
- Column F does not need to be completed for episodes marked "C" in Column E

Attended to Object (O)

- The child is considered to be attending to an object if he/she is looking at, pointing to, gazing at, showing, or any combination thereof an object that is not the clinician. Such instances should be marked "O"

- For episodes marked “O” in column E, the researcher should complete Column F (if object, what was it?) to clarify the object being attended to (e.g. toy, book, iPad)

Attention Directed By (column G): ACTIONS

Point (P)

- Participant points at an object (flashcard, book, etc.) or, in the case of a book, a picture in the book
- The index finger must be used to point; do not code reaching for an object as a point (this is a request, not JA)
- Playing with or pushing the object should not be considered a point

Gaze (G)

- Participant looks at object, and the other’s attention follows
- Occurs when the participant observing an averted gaze aligns his/her attention with the direction of the averted gaze (ex. Clinician is looking at clipboard, so the child follows gaze to clipboard)

Verbal Cue (V)

- Participant says an intelligible word to direct attention (ex: Look, here, etc.)
- Word must be intelligible and should not be mumbles, groans, etc.
- Word should be an obvious cue to participate in JA and should not be a request. If the participant uses the word for an object, the object must be in sight (ex: If the child says “toy!” to encourage the clinician to look at the toy, this should be considered JA. If the child says “toy!” and the toy is not in sight, he/she is likely requesting the toy. This should not be considered JA).

Showing (S)

- Participant puts object in front of the other's face while making eye contact momentarily
- Object is not given to other participant, it is a momentary "show", so it will not exchange hands (ex: Child holds toy to show clinician would be coded as a show JA; Child giving the clinician the toy because it is the end of playtime is not JA)

Combinations

- In order for there to be a combination of the above actions, all the requirements must be met for both actions
- Combinations should be pointed as the initials of each action with a "+" between (ex: point and verbal cue should be coded as "P+V")

Failed Bids (column H)

- Failed bids SHOULD be coded for the child, and SHOULD NOT be coded for the clinician
- Ex: If the child tries to show the clinician a toy but she is looking at her clipboard, this should be coded. If the clinician says, "look at this book!" while pointing and the child does not look, this should not be coded. This is because we are interested in the child's JA skills, not the clinician's
- Failed bids should be marked as "failed" in the "failed" column of scoring sheet
- Failed bids will start when the child begins the bid and stop when he/she gives up