SOCIAL INITIATION WITH SIBLINGS OF CHILDREN WITH AUTISM: AN ALTERNATING TREATMENT DESIGN WITH VIDEO MODELING AND VIDEO SELF-MODELING

A Thesis Presented to the Faculty
of
California State University, Stanislaus

In Partial Fulfillment
of the Requirements for the Degree
of Master of Arts in Psychology

By
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May 2016

CERTIFICATION OF APPROVAL

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Dr. Bruce E. Hesse Professor of Psychology	Date
Dr. William F. Potter Professor of Psychology	Date
Dr. Anita Pedersen-Pennock Assistant Professor of Psychology	Date

DEDICATION

This Thesis research is dedicated to families of children diagnosed with autism spectrum disorders (ASD), especially the siblings who eagerly want to connect with their brother or sister with autism. This research is for you.

ACKNOWLEDGEMENTS

In the pursuit of my Master Degree in Psychology, I have many people to thank and acknowledge. First and foremost, thank you God for your everlasting protection, guidance, and strength.

Dr. Bruce Hesse: You offered your expertise and guidance to my research even before I was your student. Thank you for your generosity. I appreciate being able to learn from you. You have such a wealth of information and expertise that you share freely. I am honored to have been your student. Drs. Potter and Pedersen-Pennock: Thank you both of offering such thought provoking insight and feedback during my Thesis proposal and defense. You both have helped to improve my research and I sincerely appreciate your contributions to this study.

My children: Nomathemba, Olabisi, Evilasio, Jr., and Emilio. All that I do is for you. My gift is to be an inspiration to all of you. My Wonderful Husband, Evilasio Da Paz, Sr.: You are my strength personified. You were always there as my confidant, my counselor, my cheerleader. Thank you for taking on so many roles in our family so that I could have the freedom to not only complete this Thesis, but also simultaneously complete my Ph.D. at a different school. You are the best!

This research was supported by a Travel grant from the Student Engagement in Research, Scholarship, and Creative Activity Program and a Thesis grant from the Department of Psychology and Child Development at California State University, Stanislaus.

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

ABSTRACT

Because children with Autism Spectrum Disorders (ASD) have difficulty with social interactions, they may not regularly engage in play activities with their siblings. Using an alternating treatment design, this study examined the efficacy of video-modeling (VM) and video self-modeling (VSM) to improve social initiations and duration of play between three children diagnosed with ASD, ages 6-7 years old, and their siblings. Dependent variables were (a) latency to initiate interaction; and (b) duration of time engaged together in play. In-home sessions of video instruction taught children to approach their sibling and say, "Let's play." Preference assessments identified toys used during intervention. Generalization exposed participants to novel toys without viewing a video model. Baseline results indicated two children did not initiate play at baseline nor did they engage in play with their sibling. One child initiated play in three baseline sessions but did not remain engaged throughout the entire session. After exposure to the intervention, all children more quickly initiated social play across VM, VSM, and Generalization. Upon acquiring this pivotal social skill, children diagnosed with ASD maintained social engagement with siblings across a variety of play activities. This research demonstrated that VM and VSM were equally effective in training the target skills.

Keywords: autism, video modeling, play engagement, sibling

INTRODUCTION

Siblings offer an important source of social engagement during childhood. High frequency interaction and numerous imitation opportunities between siblings influence the development of social skills in young children, particularly in the areas of cooperation, friendliness, empathy, and socio-cognitive capabilities (Dunn, 1988). Children with siblings have exhibited positive child outcomes such as lower levels of loneliness and depression (Gold, 1993), increased social competence, and enhanced social engagement with peers (Brody, 2004). Conversely, children without siblings demonstrate fewer gains in interpersonal skills than their counterparts with one or more siblings (Downey, Condron, & Yucel, 2015). Further, Downey et al. (2015) noted a statistically significant pattern, whereby, children with one or more siblings gained and maintained more friendships between kindergarten and fifth grade than children without siblings. While these findings are true for sibling relationships between typically developing children, a different dynamic exists when one of the siblings is diagnosed with autism spectrum disorders (ASD).

Symptomatic features of ASD offer certain social limitations that may affect the sibling relationship. According to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), criteria for ASD consists of a two-domain model: (1) social-communication deficits and (2) restricted and repetitive interests/behaviors (Grzadzinski, Huerta, & Lord, 2013). These characteristic challenges of ASD may negatively impact the sibling relationship (Rivers & Stoneman, 2003). For example,

Ferraioli and Harris (2009) note that children diagnosed with ASD may not respond to a sibling's bid for interaction or may respond in an atypical manner that might be confusing for the sibling. Typical children may experience frustration or rejection as a result of being ignored by their sibling diagnosed with ASD. The inability to achieve social reciprocity may reduce the likelihood that nondisabled siblings will persist in future attempts to socially engage their sibling diagnosed with ASD (Orsmond & Seltzer, 2007).

Additional investigations have illustrated unfavorable consequences that an ASD diagnosis has on sibling socialization. Kaminsky and Dewey (2001) evaluated sibling relationships and the influence of developmental disabilities on affection, companionship, intimacy, and prosocial behavior. The authors reported that both children with autism and their siblings were less likely to respond to each other's initiations. Results indicated that sibling relationships in families of children with autism were characterized by less intimacy, nurturing, and prosocial behavior than sibling relationships of children with Down's syndrome or nondisabled children. In addition, sibling dyads that include one child diagnosed with ASD experience shorter durations of interaction and play time than typically developing sibling dyads (Knott, Lewis, & Williams, 1995). Specifically, Knott et al. (1995) found that typical sibling pairs of ages 2 to 12 years spent an average of 40 minutes per hour engaged in a variety of activities. On the contrary, children diagnosed with ASD spent much less time actively engaged with their sibling.

In summary, sibling relationships have the potential to positively influence social development in children. However, social deficiencies characteristic of children diagnosed with ASD may interfere with sibling interactions, thereby preventing children diagnosed with ASD from accessing the benefit of sibling relationships. Thus, it is warranted to examine interventions aimed at improving social skills in children diagnosed with ASD. One such intervention that has demonstrated successful gains in social communication for children diagnosed with ASD is video modeling (Charlop & Milstein, 1989; Nikopoulos & Keenan, 2003). This evidence-based intervention method trains new behaviors by presenting video clips depicting a target behavior performed by adults or peers as the actors.

Numerous factors contribute to the success of the video-modeling intervention strategy. First, the visual stimuli are typically presented in a selective field of focus like a television screen or computer monitor. This is particularly salient to the child diagnosed with ASD who has a preference for visual stimuli (Corbett & Abdullah, 2005). Second, the method of video presentation provides precise and repeated exposure to the target behavior which serves as an active (moving) stimulus compatible with behavioral reproduction (Charlop-Christy, Le, & Freeman, 2000). Finally, for most children diagnosed with ASD, video-watching is a reinforcing activity (Corbett & Abdullah, 2005). Hence, the intervention alone has a built-in reinforcement feature.

Capitalizing on its effectiveness, researchers have utilized video-modeling procedures to teach children diagnosed with ASD a variety of socially appropriate

skills such as increasing conversational speech (Charlop & Milstein, 1989), giving complimentary statements (Apple, Billingsley, Schwartz, & Carr, 2005), and increasing reciprocal play skills (MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009). Nikopoulos and Keenan (2003) demonstrated an increase in the duration of play for seven children diagnosed with ASD ages 9 to 15 years as a result of exposure to a video modeling intervention. A 35-second video of a familiar adult, a peer, or an unfamiliar adult and the experimenter was presented to the participant. The video depicted the experimenter and the model in a room with a toy. The model approached the experimenter, took him by the hand and said "Let's play." Results indicated a decrease in the time to initiate play and an increase in the duration of the play engagement generalized across three play conditions, each featuring a different toy.

An extension of video modeling, also used with the ASD population, is video self-modeling that uses video clips of the participant with adults or peers as the model (Buggey, Toombs, Gardener, & Cervetti, 1999). The video self-modeling procedure involves three steps: (a) video-tape the participant's behaviors, (b) edit the video to only show the behavior as desired, and (c) show the participants their video. In some cases, the target edited clips are looped to play continuously, giving the appearance of seamless appropriate behavior. Thus, the participant sees themselves in the video, after extensive editing, appropriately performing with fluidity and engagement in the desired behavior.

Researchers have evaluated video self-modeling interventions aimed at improving communication outcomes for children diagnosed with ASD. For example, Buggey et al. (1999) conducted a multiple baseline design across participants utilizing video self-modeling to increase correct question-responding behavior in three children diagnosed with ASD, ages 8 to 11 years old. The video self-model was constructed to depict the participant correctly responding to questions of an academic nature, such as number, shape, color, sound, and object identification. The intervention was staggered one week apart across participants. During the intervention phase, the participant watched the video self-model prior to the question interaction. Results indicated that all participants showed an increase in correct responding after exposure to the video self-model intervention.

Similarly, Sherer et al. (2001) implemented a video self-modeling intervention to increase correct responding to questions in five children diagnosed with ASD, ages 4 to 11. This study, however, utilized a multiple baseline alternating treatment design to examine the effects of video self-modeling in comparison to video modeling. The video modeling tape depicted a typically developing child engaging in a conversation and answering questions with an adult. The video self-modeling tape depicted the participant with an adult appropriately answering the same questions in a reciprocal conversation exchange. While accuracy rate and skill acquisition was similar in both interventions, mixed results indicated that video modeling worked best for most (4 out of 5) participants, while video self-modeling only worked best for one participant. A potential confound might have occurred in the arrangement of the

alternating treatments. Rather than randomly introducing interventions across sessions, the experimenters simply alternated the days of each intervention. Quite possibly, interventions consistently implemented on Days 1 and 3 (e.g. Monday and Wednesday) may have had a different effect than those consistently implemented on Days 2 and 4 (e.g. Tuesday and Thursday). Nonetheless, the researchers demonstrated positive outcomes as a result of the intervention.

Recognizing the efficacy of video-modeling and the importance of siblings as potential playmates, conversational partners, and peer models, Taylor, Levin, and Jasper (1999) conducted a video-modeling intervention for children diagnosed with ASD while using their siblings as actors. The target dependent variable was an increase in the percentage of scripted and unscripted play statements emitted by the child diagnosed with ASD to their sibling. Scripted comments were provided during the creation of the videotaped model (e.g. “Let’s play with the trains.”). Contrarily, unscripted comments occurred spontaneously and were scored as correct utterances if they were contextually appropriate (e.g. “This car goes fast!”). The authors implemented a multiple baseline design across three play activities for two boys with autism, ages 6 and 9 years and siblings ages 8 and 6 years, respectively. The sibling was video-taped with an adult model acting out pretend play scenarios. During the intervention phase, participants were shown one video scenario per day prior to the designated play time. All intervention sessions occurred daily on week days in the participant’s home with a range of 6-22 sessions. Results indicated that participants

diagnosed with ASD increased both scripted and unscripted play-related comments directed toward their sibling after exposure to the video modeling intervention.

Reagon, Higbee, and Endicott (2006) extended Taylor et al. (1999) and used a sibling as an actor in a video modeling intervention to increase pretend play statements and play actions for one 4-year old boy diagnosed with autism. The study employed an ABC design across four play scenarios with baseline (A) and intervention (B) sessions that took place in a center setting and generalization (C) sessions that occurred in the child's home. The sibling was video-taped with a typical peer acting out pretend play scenarios (fire fighter scenario, cowboy scenario, teacher scenario, and doctor scenario). During the intervention phase, the participant was shown one video scenario per day prior to the designated play time. Intervention sessions occurred daily on week days with a range of 5-19 sessions. Unlike Taylor et al. (1999), all intervention sessions were center-based while only the generalization session was conducted in the child's home. In addition, Reagon et al. (2006) included play actions along with play-related statements as their targeted outcome. Study results indicated that the participant increased language production toward his sibling and play interactions in all play scenarios. Anecdotal reports from the parent and other siblings suggested that the intervention generalized to other family members in the household.

The aforementioned studies have demonstrated improvements in social communication for children diagnosed with ASD using either video modeling or video self-modeling methods. Researchers have utilized adults, peers, participants (in

self-modeling), and siblings as video models. However, existing literature has not determined which method proves most efficacious at increasing social initiation and play interactions in children diagnosed with ASD, video modeling or video self-modeling. Moreover, none have evaluated the acquisition of these social skills in the context of children diagnosed with ASD and their nondisabled siblings. As evidenced in the literature, sibling interactions offer valuable influences on child development, particularly in areas of social competence (Brody, 2004; Downey et al., 2015; Dunn, 1988). Impairments in social communication and the low probability of social initiation are key issues that negatively affect sibling relationships in the ASD-nondisabled dyad. Improvements to these social skills have the potential to enhance engagement between siblings, thereby allowing the child diagnosed with ASD to benefit from sibling relationships.

This investigation addresses these socially relevant issues by targeting improvements in social engagement for children diagnosed with ASD and their siblings. Previous research by Nikopoulos and Keenan (2003) presented promising findings toward the development of an effective social skills intervention for children meeting the diagnostic criteria for ASD. This study extends their research with several modifications to the study design. Similar to Nikopoulos and colleague, the dependent variable of social engagement is operationally defined as a decrease in latency to initiate play and an increase in time engaged in play. Although the current study shares this similarity, it has fundamental differences. First, Nikopoulos and Keenan (2003) only assessed the effect of one intervention, video modeling, on social

engagement. Using an alternating treatment design, we evaluated the efficacy of two interventions, video modeling and video self-modeling. Second, the actors of the previous study were adults and peers. This study's actors were either a sibling and the experimenter (video modeling) or a sibling and the participant (video self-modeling). Third, rather than conducting sessions in a treatment center or school, all sessions were implemented in the participants' homes. For the protection of human subjects, the research protocol was approved by the Psychology Department Institutional Review Board of California State University Stanislaus.

The specific aim of this investigation compared the effectiveness of video modeling and video self-modeling on social engagement between a child diagnosed with ASD and their typically developing sibling. We hypothesized the following:

Hypothesis 1: After exposure to either video modeling or video self-modeling, children diagnosed with ASD will increase social initiations with their typically developing sibling by reducing the amount of time it takes to initiate a social play interaction.

Hypothesis 2: After exposure to either video modeling or video self-modeling, children diagnosed with ASD will increase social interaction with their typically developing sibling by increasing the amount of time engaged in play.

Hypothesis 3: In comparison to video modeling, video self-modeling will lead to faster acquisition of social initiation and engagement for children diagnosed with ASD.

METHODOLOGY

Participants

Three boys (including one set of twins) between the ages of six and seven years (M = 6.8 years) were recruited from schools and community organizations that served children on the autism spectrum in Merced County. Each child received a diagnosis of Autism Spectrum Disorder (ASD) from an outside agency. Children who exhibited verbal ability to imitate a two-word phrase were included in the study. Additionally, families were included if they had both a child diagnosed with ASD and a neurotypical sibling willing to participate. Per parent report, participants spent a majority of time engaged in solitary play and did not often initiate appropriate social interaction with their sibling(s). Two additional children were screened, but did not complete intervention sessions due to parent scheduling conflicts. Data analysis excluded these participants. The resultant data represents the three participants who completed all intervention sessions. Due to cognition impairments, participants diagnosed with ASD were incapable of assenting. Informed parental consent and assent of each sibling was obtained for all participants.

At the time of the study, Teddy was 7 years 1 month old and the youngest of five siblings. He was previously enrolled in a special education class in the local school district. Dissatisfied with his school placement, his mother began homeschooling. Teddy had been outside of public school for one year. In terms of language development, Teddy had vocal speech with slight impairments in

pronunciation. He spoke in full sentences and most of his speech was easily understood. Per parent report, Teddy liked playing with puzzles, action figures, cars, and teddy bears. Teddys's sibling, Melissa, was a 9-year old girl who was the closest in age to Teddy and his twin brother. When considering social engagement, Melissa reported that Teddy did not ask her to play and often played with his toys alone.

Fred, the twin brother of Teddy, was a 7-year 1-month old boy. Like his brother, Fred was previously in a special education school placement, but now was homeschooled. Fred's vocal speech was limited and his pronunciation was often difficult to understand. He spoke in two to three word phrases accompanied with gestures or pointing. His parent indicated that he liked to play with Play-Doh®, action figures, puzzles, vehicles, and Lego® blocks. However, he seldom engaged in reciprocal play with his siblings. Melissa also participated as the sibling for Fred. She reported that Fred spent most of the time playing by himself.

Sam was 6 years 1 month old and the older of two children. He was enrolled in a public elementary school and placed into a special education classroom. He also received in-home Applied Behavior Analysis intervention services for 20 hours per week. Sam was vocally proficient and easily understood. However, Sam was inflexible and resistant to change in routine. At times, it was difficult to conduct research sessions because Sam insisted upon doing the same activities as the day before. The experimenter ignored the behavior, placing it on extinction. After baseline phase, Sam no longer exhibited this behavior and was compliant to all research activities. Per parent report, Sam primarily engaged in solitary play with

blocks, cars, video games, and action figures. Sam's younger sibling, Alex, was a 3-year 8-month old boy. He participated as Sam's play partner in the study.

Setting

The study took place in the participants' homes during the weekday. The experimenter established a consistent area inside the home (living room and dining room) to conduct research sessions. The research workspace consisted of two areas, one for viewing the video model and one for participating in the play activity. For all three participants, video viewing was conducted on the dining room table. Children viewed videos on the 15.6 inch screen of a laptop computer. For all participants, the play area was located in the living room. A carpet square (4 x 6 feet) was placed on the living room floor to designate the play area. The sibling sat in a chair on the right side of the carpet while holding the target play item. To standardize reaction times across all participants, the toy was covered with a cloth. Response measurements began when the toy was in full view after removal of the cloth.

Stimulus Materials

Play Activities

Based on parent interview, six of the child's highly preferred toys were selected for a multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996). According to the MSWO procedure, the six toys were placed in an array before being presented to the participant. Upon presentation, the child selected one toy, which was then unavailable in successive presentations. The child was given one minute to play with the toy. The experimenter rearranged the

array prior to the next presentation. This procedure was repeated until all toys were chosen. The first three toys that the child selected were used as their three target play activities. Teddy's preferred toys were Lego® action figures, stuffed panda bears, and action figures. Fred's toys were Lego® action figures, stuffed panda bears, and Lego® blocks. Sam's preferred choices were a miniature jet plane, action figures, and toy vehicles.

Measurements

Independent Variables

The study had two levels of the modeling independent variable: video modeling and video self-modeling. Detailed descriptions of each are presented below.

Video sequence construction. Video recording of all play activities took place in the designated play area. Videos were created using a Sony Handycam® Camcorder mounted on a tripod. The camera was unobtrusively placed across the room and aimed at the target play area.

Video model. The video model depicted the sibling sitting in a chair holding a toy. Similar to the procedures of Nikopoulos and Keenan (2003), the experimenter approached the sibling, took his/her hand and said, "Let's play." The experimenter then sat down on the carpet with the sibling and proceeded to play together with the toy. The video sequence duration lasted 35 seconds.

Video self-model. The self-model also depicted the sibling sitting in a chair holding a toy. To create the video, the experimenter used a combination of verbal and physical prompts to instruct the participant to go to his sibling, take their hand, and

say, “Let’s play.” He was further instructed to sit on the carpet with his sibling and play with the toy. To create the video self-model, the experimenter edited the video, removing all prompts. The final video depicted the participant executing the target initiation and playing seamlessly with their sibling, without the aid of instruction. The video self-model sequence duration also lasted 35 seconds.

Dependent Variables

The main outcome of the study was social engagement. This variable encompassed two distinct behaviors: (1) social initiation latency; and (2) play duration. All sessions were video-taped and were later used to compute the dependent measurements. Detailed descriptions of each variable are presented below.

Social initiation latency. By definition, latency refers to the time between a stimulus event and the onset of a behavior (Pierce & Cheney, 2013). To measure the social initiation latency response, the experimenter executed several steps: (1) led participant to the play area; (2) instructed the sibling to remove the cloth covering the toy; and (3) simultaneously held up a sign toward the camera that said ‘START.’ This signaled the start of the latency period, which measured the length of time it took for the participant to emit social initiation behaviors toward their sibling. Social initiations were defined as any gesture (e.g. taking the sibling’s hand) or vocal utterance toward the sibling (e.g. ‘Let’s play’). Measures of latency were computed in increments of seconds.

Social engagement duration. This variable was the amount of time the participant engaged in play with his sibling. Engagement was defined as the child’s

intentional interaction with their sibling (e.g. turn-taking with the toy, touching the toy at the same time with their sibling, touching each other, talking about the toy, imitating the sibling's actions, words, or sounds, etc.). Measures of duration were computed in increments of seconds.

Experimental Design

The present study utilized an alternating treatment design to control for extraneous explanations of treatment effect. Similarly, Sherer et al. (2001) implemented an alternating treatment design to compare the effects of video modeling and in-vivo modeling. The intervention targeted improvement in conversational skills for five children diagnosed with ASD; dependent measures were rate of skill acquisition and response accuracy. Results indicated no apparent difference between treatments. However, further investigation of treatment implementation revealed a potential confound. Rather than randomly alternating presentation of each treatment, conditions were scheduled on alternating days. The consistently selected days of the week may have influenced the treatment outcome. To prevent a similar confound, this study randomly scheduled treatment conditions (either video modeling or video self-modeling) using a random number generator in Microsoft Excel® software.

Procedures

The study consisted of three phases: Baseline, Intervention, and Generalization. Existing literature indicated that the use of visual schedules for children diagnosed with ASD helped in transitioning from one activity to another

(Dettmer, Simpson, Myles, & Ganz, 2000; Gray & Garand, 1993; Heflin & Simpson, 1998). Therefore, at each session, the experimenter used a visual schedule to help the child understand the sequence of activities. The schedule used words and illustrations to indicate the order of session activities (Figure 1).

Figure 1. Visual schedule used in experiment sessions.

During the music activities, subjects watched lively animated children's songs on a computer screen. This provided a visual and auditory signal for the beginning and ending of the home visit. Embedded in the visual schedule was also a reinforcement system whereby the participant received a sticker at the completion of each activity. The stickers were collected on a designated sticker page that the children kept at the end of each home visit.

Baseline

Prior to the intervention exposure, participant response latency and duration of play was assessed. The child was led to the play area where his sibling was sitting in a

chair holding the target toy. The experimenter stepped away and observed the interaction without offering any prompts or instruction. Prior to the session, the experimenter instructed the sibling to remain in the chair unless the child approached and initiated a play interaction as previously defined. Each trial lasted 5 minutes (300 seconds) with a total of three trials per home visit. An interval of 5 minutes separated each trial. During this break, the experimenter took the child out of the play area and back to the viewing area. The baseline phase consisted of nine trials (three trials per day / three days). Only one toy was presented per day. The order of presentation was determined by random selection using a random number generator in Microsoft Excel® software.

Video Model Intervention

After completion of all nine baseline trials, the experimenter created the video model with the sibling. This model served as one level of the independent variable. As previously described, the video model depicted the experimenter initiating play with the sibling and engaging in unscripted play together with the target toy. A 35 second video sequence was created with each toy for a total of three video presentations. Each video model intervention session began with the child watching one of the 35 second video sequences in the designated viewing area. The experimenter then led the participant to the play area where their sibling was waiting with the target toy presented in the video sequence.

Video Self-Model Intervention

After completion of all baseline sessions, the experimenter created a video self-model with the participant and their sibling. This served as the second level of the independent variable. As previously described, the final video model was edited to depict the participant seamlessly executing the target initiation and play behavior with their sibling. A 35 second video sequence was created with each toy for a total of three self-model video sequences. Each video self-model intervention trial began with the child watching one of the 35 second video self-model sequences in the designated viewing area. The experimenter then led the participant to the play area where their sibling was waiting with the target toy presented in the video sequence.

Success Criteria

Nikopoulos and Keenan (2003) defined success as the participant emitting social initiation behavior within 25 seconds in three consecutive trials with the presentation of an array of toys. Results indicated that social initiation did not occur in the presence of several toys. The child's responses did not meet criterion until the experimenter removed the array and presented only one toy per trial. In light of these findings, this study presented only one toy per trial during the intervention phase. A new toy and video depicting the toy was presented once the participant reached criterion of initiation within 25 seconds in three consecutive trials. The total intervention phase consisted of nine trials (three trials per day / three days) for participants 1 and 2. Participant 3 required additional trials to reach criterion. His total intervention phase consisted of twelve trials (three trials per day / four days).

Correction Protocol

In the event that a participant was noncompliant or engaged in inappropriate behavior towards his sibling to gain access to the toy (e.g. hitting, kicking, screaming, etc.), the experimenter implemented a modeling procedure to reduce the unwanted behavior (Johnson & Brown, 1969). Without prompts or verbal reprimands, the experimenter ignored the child's inappropriate behavior while verbally praising the sibling for appropriate behavior (e.g. "Melissa is sitting so nicely. She is ready to start. Great job, Melissa!"). The experimenter then turned away from the participant, removed attention, and waited until the behavior stopped to continue with the trial. During baseline, on an average of three occasions, two participants exhibited mildly inappropriate behavior that required the use of this protocol. For example, Fred jumped on the couch and hid his head under the pillows at the beginning of the trial. Sam planted himself on the floor and turned away from his sibling. By the time of the intervention phase, these unwanted behaviors had extinguished.

Generalization

The generalization phase occurred after completing the intervention phase. The experimenter examined how the children responded with sibling social initiation and engagement when novel toys were presented and no videos were shown. The participant was led to the play area with the sibling sitting in the chair holding a novel toy. Similar to baseline, neither the experimenter nor the sibling offered any prompting to encourage the participant to emit the appropriate response. A generalization trial ended once the participant emitted the appropriate social initiation

or 25 seconds has passed, whichever came first. The total phase length for all three participants was nine trials, three trials for each novel toy.

Interobserver Agreement (IOA)

For purposes of IOA, all sessions were videotaped. First, the experimenter watched the session videos and scored participant latency response and engagement durations. Next, an objective observer unaware of the intervention conditions watched 30% of session videos. Percentage agreement was calculated using the following formula: IOA = number of agreements ÷ (number of agreements + number of disagreements) x 100. Because response times were recorded in increments of seconds, agreements were defined as scores within ± 1 second. Average IOA across participants was 89%.

RESULTS

As expected, baseline responses of social initiation and engagement were minimal. However, after exposure to both interventions, all participants demonstrated marked improvements in the target social skills across three preferred toys and three novel toys. An in-depth discussion of each phase provides further clarification of each participant's responses. A summary of initiation latency results is provided in Figure 2. Engagement duration results are provided in Figure 3.

Baseline Phase

Sam used vocal speech to initiate brief engagement with his sibling in three of nine baseline sessions. His speech consisted of 3-5 word phrases, with two directives and one question (i.e. "You ready Alex?"; "Alex, come on, play"; and "Let's play hide and seek"). These initiations occurred very early into a trial (21 seconds) or towards the end of the trial (230 seconds) with a baseline average latency of $M = 238$ seconds. In these preliminary stages, the duration of social engagement was not consistent. For example, the siblings battled with action figures for 30 seconds or hid their cars under the carpet for almost 3 minutes. Although Sam was the initiator, their interaction would often end with him turning away to play alone or ignoring his sibling's attempts to converse about the toys. Outside of these three trials, Sam did not demonstrate social behaviors during baseline. Instead, he drank juice, laid down on the carpet, and looked at the toys without any acknowledgement of his younger brother. On two occasions, Sam left the play area and did not return.

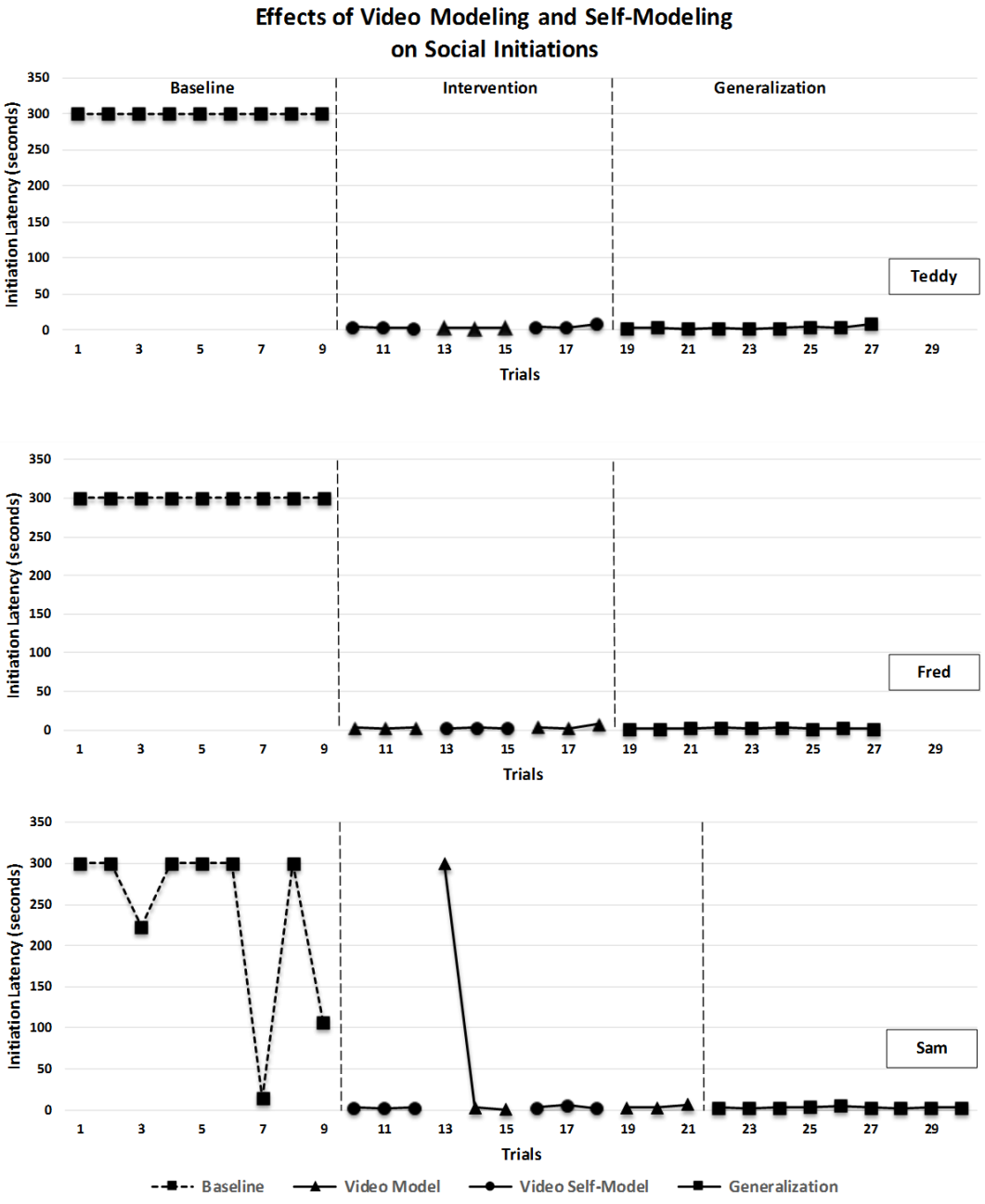

Figure 2. Latency between exposure to play activity and target initiation response. Graphs show latency responses during baseline, intervention, and generalization phases. Vertical lines indicate phase transitions.

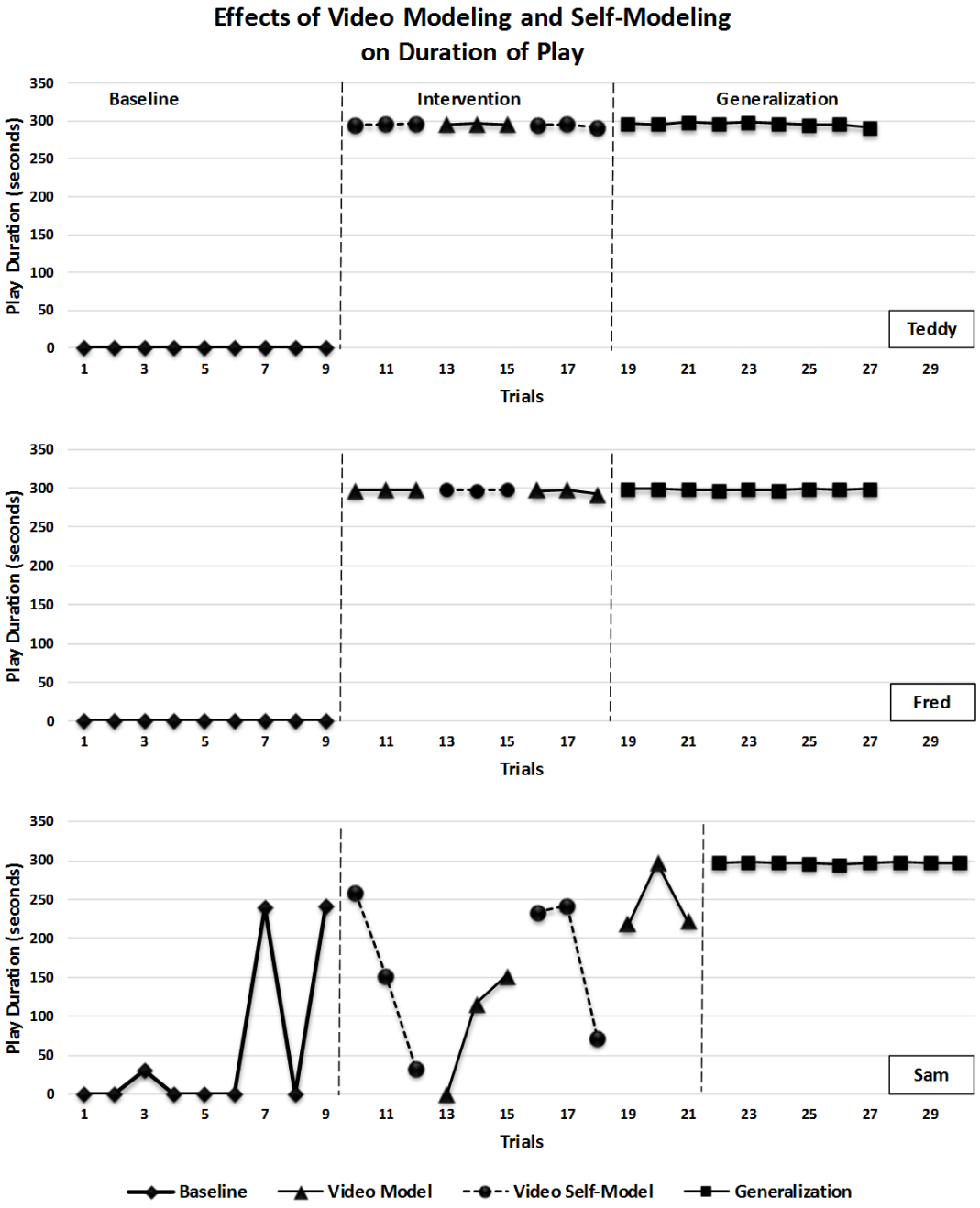

Figure 3. Duration of time participants engaged in play activity with their sibling. Graphs show duration responses during baseline, intervention, and generalization phases. Vertical lines indicate phase transitions.

During Baseline, neither Teddy nor Fred initiated social interaction with their sister. It is important to note that since Teddy and Sam resided in the same household, they were separated during research sessions to prevent observation effects. To that end, one child completed his sessions downstairs, while the other remained with another family member inside a room with a closed door on the second level of the home. Regardless of separation, Teddy and Fred emitted similar behaviors. In 61.5% of baseline sessions, both took the target toy from their sister's lap and engaged in solitary play. Teddy occasionally gave his sibling a quick glance, then continued playing with the toy. Fred did not acknowledge his sister; he simply took the toy from her lap, walked away, and became engrossed in manipulating it (e.g. spinning it around, throwing it into the air). In remaining trials, Teddy left the play area, paced around the carpet, and pushed his sister's chair without direct communication. Fred walked away from the play area then quickly returned, only to stand on the carpet without any interaction with his sibling for the remainder of the baseline session.

Intervention Phase

Social Initiation Latency

The order of treatment presentation was randomly assigned. Teddy and Sam received Video Self-Modeling (VSM) first, while Fred's first intervention exposure was Video Modeling (VM). Social initiation latency responses were: Teddy (VSM: M = 3.67 s; VM: M = 5.0 s); Fred (VSM: M =2.3 s; VM: M = 3.5 s); and Sam (VSM: M = 3.2 s; VM: M = 3.4 s). On average, participants initiated social interaction

with their sibling within three seconds after exposure to VSM and within four seconds after VM.

Social Engagement Duration

The time participants spent in social engagement was inversely related to the time it took for them to initiate play. Hence, a shorter latency response was associated with a longer play duration. This was true for Teddy and Fred. Once they initiated interaction, they played with their sibling for the entirety of the intervention sessions.

On the contrary, Sam and his sibling did not play consistently throughout their play sessions. After Sam initiated play with Alex, they played for an average of 1-2 minutes, stopped for approximately 1 minute, and then resumed play for another 1-2 minutes. During times when play stopped, Sam would freeze all movement and stare into space. Alex mimicked his big brother, and waited until he was active again. Sam's lapse of activity occurred during both the VM and VSM intervention sessions; thus, it did not appear that this behavior was a result of treatment exposure. When considering contextual antecedents, there was no consistent demand that the participant escaped, nor was there any additional social reinforcement gained. Possibly, an unknown automatic reinforcer may have been maintaining the behavior. To validate such an assumption, further assessment would be necessary.

Generalization Phase

In a return to baseline phase, the experimenter removed both levels of the IVs and introduced novel toys. Through direct observation, the experimenter noticed that the children (including siblings) exhibited different levels of language and fine motor

skills. Hence, the selected novel toys were different across participants. Generalization games for Teddy, Fred, and their sibling included: (1) Hasbro® Hungry Hungry Hippo; (2) Let's Go Fishin'; and (3) Zingo® (a picture matching game similar to Bingo). Games for Sam and his sibling included: (1) Hasbro® Hungry Hungry Hippo; (2) Elefun; and (3) Paw Patrol. Each game was cooperative in that simultaneous participation was required to achieve success. Before each novel toy was presented, the experimenter provided the sibling a brief demonstration of play with the toy. Results indicated that each participant generalized the target social skills across three novel play conditions.

An unexpected generalization effect was observed for Sam. During the last three generalization sessions, Sam's sibling was unavailable to participate. As a substitution, Sam's father volunteered as the play partner. The experimenter instructed Sam's father to remain in the chair until Sam approached and initiated play. Sam appropriately walked to his Dad, took his hand and said, "Let's play." Anecdotally, his father shared that Sam had not exhibited this behavior before. The new skill was a welcomed surprise. Hence, Sam demonstrated generalization of the social skill across three novel toys and across two familiar individuals. It is important to note that Dad possessed proficient social skills. One would expect that Dad had a greater ability to sustain interaction with Sam. Caution should be taken when considering Sam's behavior as generalization to a new person. Quite possibly, interaction with Dad introduced variables other than intervention exposure, which may have attributed to a successful social outcome.

DISCUSSION

Learning through observation allows children to acquire a variety of new skills. This study used video modeling as an active stimulus for behavior reproduction. Study participants did not exhibit proficiency in social initiation or play engagement prior to intervention exposure. However, all participants rapidly acquired improvements in both target responses during the intervention phase. There were slight differences in response times (± 1-2 s), suggesting that participants were faster to initiate play interaction after viewing themselves as the model (VSM). These outcomes are consistent with previous research that suggested models are more effective if they share similar characteristics with the observer (Varni, Lovaas, Koegel, & Everett, 1979).

Close inspection of the study's descriptive data indicated that video modeling not only demonstrated effectiveness in teaching the target skills, but it also lead to the expression of skills beyond the scope of treatment interventions. For example, one child exhibited self-monitoring behavior during the intervention phase. He walked to his sibling, took the toy, and did not ask to play. Without prompting, the child put the toy back into his sibling's lap and requested appropriately by saying, "Let's play." This act of self-management supports the assertion that video modeling promotes independence in the learner (Hume, Loftin, & Lantz, 2009).

Another example of possible collateral effects occurred when one participant and his sibling interjected sound ("vroom-vroom") into their imaginary play. This is

particularly noteworthy because the 35-second video model (VM and VSM) did not incorporate sounds that cars make. It only showed the actor with the sibling moving the car around and occasionally running the cars into each other. Future studies might probe a cluster of skills at baseline to determine whether certain behaviors were truly a result of video modeling or already present in child's repertoire.

Although the study was focused on the child diagnosed with ASD, the nondisabled sibling may have also benefitted. Perhaps, after coaching during the construction of the video model, the sibling gained necessary skills to successfully interact with their brother diagnosed with ASD. Converging evidence infers that sibling interactions provide access to a variety of learning opportunities that benefit psychosocial development (Brody, 2004). Improvements to these adaptive skills have the potential to rectify negative effects often associated with the sibling dyad that includes a child diagnosed with ASD.

Study Limitations and Future Directions

The study was limited in its collection of supplementary data. For example, in a parent interview, one parent indicated that the siblings had difficulties sharing toys. The child diagnosed with ASD was often aggressive and appropriated the toys for solitary play. During the intervention phase, occasional interactions between siblings demonstrated difficulties with sharing. There was no data collected on the frequency of this behavior nor on behavior extinction. Similarly, it was necessary for the experimenter to utilize the correction protocol to extinguish unwanted behavior. However, the reduction of this behavior was not tracked. Future studies could benefit

from an evaluation of video modeling in the reduction of unwanted behaviors while also enhancing adaptive skills.

Additionally, birth order appeared to play a role in differential treatment effects. For example, one participant diagnosed with ASD was the older sibling. Literature suggests that the elder serves as a primary model for their younger sibling (Knott et al., 1995). Although study objectives sought to improve behavior through modeling, the participant's baseline deficiencies in social skills may have influenced the subsequent interaction. Specifically, study results show inconsistent engagement between Sam (the elder diagnosed with ASD) and his younger sibling. Future video modeling studies could investigate whether there is a substantial difference in treatment gains for older siblings diagnosed with ASD versus younger siblings diagnosed with ASD. Behaviorally, birth order might influence the history of social reinforcement and shape-maintained behavior for each child. For example, if the child diagnosed with ASD is the older sibling, he may not respond to the younger sibling's bids for social attention. This might result in the extinction of social behavior from the sibling directed toward the child diagnosed with ASD. Thus, future research might explore whether birth order combined with disability influences treatment outcomes. Overall, this study's findings show promise for using video modeling to improve social interactions between children diagnosed with ASD and their siblings. The intervention resulted in positive effects for sibling interaction in addition to collateral socialization benefits.

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