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Teaching pretend play to toddlers with autism

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Recommended Citation

TEACHING PRETEND PLAY TO TODDLERS WITH AUTISM

By

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Dissertation Defense
Submitted to the Department of Psychology
and the College of Arts and Sciences at
Western New England University in partial
fulfillment of the requirements for the
Degree of Doctor of Philosophy

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Abstract

Pretend play is a social skill that emerges early in typically developing children and has been

shown to be an important contributor to the development of a participant's social and language

skills (MacDonald et al., 2005, 2009). Unlike typically developing children, children with autism

often exhibit persistent deficits in social communication and social interaction across multiple

contexts, in addition to engaging in restricted, repetitive patterns of behavior, interests, or

activities. A multiple probe design across play scenarios within and across participants was used

to evaluate in-vivo modeling, least-to-most prompting, and multiple exemplar training on the

quality of pretend play skills with three toddlers diagnosed with an autism spectrum disorder.

The toddler participants observed the experimenter model a play scenario, then had an

opportunity to complete the scenario independently, and the experimenter used least-to-most

prompting as needed. Each participant was taught nine play scenarios, three scenarios per play

theme (e.g., firefighter, chef, and doctor play themes). Test probes were systematically

conducted throughout to determine whether generalized play within and across play sets had

occurred. Results of this study indicate an increase in scripted pretend play and generalized play

following training.

 Keywords: autism, generalization, multiple exemplar training, pretend play, toddler

Teaching Pretend Play Skills to Toddlers with Autism

Pretend play is a social skill that emerges early in typically developing children and has been shown to be an important contributor to the development of a child's social and language skills (MacDonald et al., 2005, 2009). Play can take many forms but is thought to occur in a developmental sequence progressing from treating all objects the same, such as mouthing all items, to discriminating between objects and using them in their intended manner, to more advanced pretend play with dolls, characters, and/or dress up materials (Lifter, 2000). According to Lifter, in typical development, pretend play often begins around 17 to 19 months as children engage in pretend actions with familiar events, they have participated in on a daily basis such as washing, eating, and sleeping. Pretend play is often one single action (e.g., child pretends to sleep, or drink from an empty cup) and the children move quickly from one pretend action to another. At this age, children do not typically extend play beyond themselves. Around 19 to 22 months, children begin to engage in pretend play with actions they observed others in their environment do, such as cooking like mom or shaving like dad. At this age, children begin to extend pretend play actions beyond themselves to others in their environment or to dolls and stuffed animals. At 2-years-old, pretend play is still observed as single behaviors (not engaging in sequences of behavior yet), but more actions are emitted with familiar everyday activities and the child begins using short sentences that may include *ing*, plural, and possessive markers. At 2 ½ - years-old, children engage in less familiar everyday pretend play scripts, and begin engaging in more particularly memorable scripts such as shopping at the store or going to the doctor when you are sick. Children of this age begin to talk to a doll or stuffed animal and will include dyadic or complementary roles (e.g., doctor/patient or cashier/shopper). Finally, around 3-years-old, children begin to combine single pretend play actions into sequential scripts. Children begin

speaking in past and future events, and a more extensive monologue is sustained rather than a series of short utterances. Pretend play continues to develop in complexity of actions and language through middle school years (Lifter, 2000).

Unlike typically developing children, children with autism (CWA) often exhibit persistent deficits in social communication and social interaction across multiple contexts, in addition to engaging in restricted, repetitive patterns of behavior, interests, or activities. These deficits often result in limitations in effective communication, social participation, social relationships, and academic achievement (American Psychiatric Association, 2013). Furthermore, children with autism may have limited educational opportunities, leading to further exclusion from interactions with typical peers, and minimizing access to various consequences or reinforcers due to invariable or repetitive responding during play such as a strong preference for one toy (Wetherby et al., 2004), repetitive manipulation of play materials (MacDonald et al., 2005), or limited sampling of stimuli associated with a play activity (Lalli et al.1994; Bancroft et al., 2016). Additionally, if stereotypic behavior is not addressed and treated in young children with autism, it can persist at substantially higher levels than that of same age peers (MacDonald et al., 2007). MacDonald et al. (2007) examined the occurrence of stereotypic play in 30 children with autism and 30 typically developing children. A 10 min sample of the Early Skills Assessment Tool (ESAT; MacDonald at el., 2006) was conducted with each participant and used in their study. Five minutes of the assessment the child was free to play with toys provided by the researchers, and 5 mins of the assessment was a structured sub-test for motor imitation, vocal imitation, and answering social questions. Stereotypic behaviors were not interrupted or redirected during the assessment. Researchers found that 2-year-old children with autism engaged in somewhat higher rates of stereotypy than compared to typically developing children

while the 3 and 4-year-old children with autism displayed substantially higher levels of

stereotypy than that of their same age peers. Due to children with autism presenting with skill

deficits in these areas, play has become an important focus of early childhood curricula for

children with disabilities.

Previous research has noted the significance of early intervention for children with

autism. MacDonald et al. (2014) noted the importance of early intensive behavioral intervention

(EIBI) on the development of early learning skills such as initiating and responding to joint

attention, eye contact, play, motor and vocal imitation, answering social questions, and following

directions. Results of this study found that children beginning EIBI between 18 and 23 months

old (i.e., 1-year-old) showed the greatest changes in joint attention, play, imitation, and language

more than the other three groups. Some children from the 1-year-old group made such significant

gains that their performance was at or above the same aged peers. In fact, some children returned

to a typical setting with no additional support. The authors reported, large gains were observed in

the length and complexity of play, as well as a decrease in stereotypic behavior for some children

in the 1-year-old group. These results suggest the importance of children with autism receiving

EIBI services at the earliest age possible.

Research shows there is a clear rationale for teaching play skills at an early age, but what

exactly is play? Weiss and Harris's (2001) taxonomy outlines the level of socialization required

within play. Solitary play occurs when a child plays by themselves and requires the least amount

of socialization. Next, parallel play occurs when a child plays near another child and may show

interest in what the other child is playing with, but there is no social interaction. Associative play

occurs when several children are engaged in the same play and interact with one another, but

each child goes about playing their own way. The highest level of socialization in play is

cooperative play. During cooperative play, children work together toward a common goal or share a pretend play theme that requires mutual exchange to build a play scenario. Additionally, Lifter (2000) outlined a taxonomy of play beginning with the least complex play, indiscriminate play, through the most complex play, socio-dramatic or thematic fantasy play. Prior to intervention, young children with autism often engage in stereotypic play behavior, or treat all objects in the same way such as mouthing all objects. As their play behavior develops and becomes more sophisticated, children begin to engage in discriminate play. During discriminate play, children engage with toys in their intended manner such as putting pretend food on a plate, banging a hammer, or sitting and riding on a ride on car. As play behavior develops across Lifter's taxonomy, child begin to engage in pretend play. According to Lifter, pretend play is defined as the participant: (1) extending familiar actions to a doll or stuffed animal figure, with the participant as agent of the activity (e.g., animal walks, drinks, jumps with an indirect path, or any character plus an action such as running, flying, talking), (2) relating objects to their self, indicating a pretend quality to the action (e.g., brings empty cup to mouth as if to drink), (3) play including substitutions with or without objects (i.e., one object to stand in place for another) paired with a specific play scenario, and/or, (4) adopting various familiar roles in play theme (e.g., play house or assigning the various roles) or arranging the environment to create a scene (e.g., crash cars or trains). The current study focused on teaching pretend play skills to 2-year-old children with autism because typically developing 2-year-olds engage in pretend play skills. It is important to know the taxonomy of play outlined by Lifter because children entering the study often engage in indiscriminate play and require intervention to move up in the hierarchy of the play taxonomy before developing pretend play skills.

Research has shown a variety of techniques for establishing and improving pretend play skills in children with autism including pivotal response training (PRT; e.g., Stahmer, 1995), discrete trial training (DTT; e.g., Wong et al., 2007), video modeling (e.g., MacDonald et al., 2005, 2009), and in-vivo modeling (e.g., Goldstein & Cisar, 1992; Jahr et al., 2000). A noted limitation throughout the play literature is the lack of generalization of trained play responses to different toys, different settings, or different play partners. According to Baer et al. (1968, 1987), a skill is not truly mastered if it does not generalize to different settings, people, or stimuli. Similarly, Stokes and Baer (1977) suggested that researchers should not expect generalization to occur, but rather, they should actively program for generalization by using the following strategies: train sufficient exemplars, mediate generalization, train loosely, program common stimuli, reinforce response variation, and teach the skill at the level required for natural reinforcement of the setting. Therefore, it is important for behavior analysts to program and assess for generalization when teaching play skills.

Some studies have demonstrated effective procedures for expanding and generalizing play skills. Dauphin, Kinney, Stromer, and Koegel (2004) used video enhanced activity schedules and matrix training to teach socio-dramatic play skills to a child with autism. MacManus et al. (2015) used video modeling and matrix training to increase generalization across play sets with male students between the ages of five and seven years old. Furthermore, Dupere, MacDonald, and Ahearn (2013) added substitutable loops of actions and vocalizations to a play scenario to increase variety in play behavior. In this study, researchers used video models with substitutable loop play scripts to teach pretend play with figurines. Three children with autism ages five and 6-years-old with a history of learning from video models participated. In the video models, researchers modeled the scripted actions and vocalizations with the figurines and

corresponding play sets. Also in the video models, were a few extra characters that were present but never used by the researchers in the video. Overall, results showed that video modeling was effective at increasing scripted pretend play across participants and play sets. The use of the untrained characters in play varied across the participants and the play sets. The authors noted the length and complexity varied across the play scripts which could have resulted in the varied outcomes related to the play observed with untrained characters. Overall, these studies demonstrated effective procedures for expanding and generalizing play skills through implementation of multiple exemplar training.

While same procedures have proven to be effective in teaching play skills, more research is warranted to identify the most effective procedures for expanding and generalizing pretend play skills in young toddlers with autism. The purpose of the current study was to examine the effects of in-vivo modeling and multiple exemplar training on teaching pretend play to young children with autism, and to assess whether generalized play emerged across untaught stimuli within and across play themes.

Method

Participants

Three 2-year-old children receiving 15 to 30 hrs per week of in-home applied behavior analytic services participated in this study. A Mullen Scale of Early Learning Assessment (MSEL; Mullen, 1995) was conducted for participant Anna. Andy was 30 months at the time of the study. Paul was 28 months at the time of the study. Anna was 29 months (Mullen: Age Equivalent =33 months) at the time of the study. To be selected as a participant in this study, children exhibited the following skills: vocal repertoire, attending skills, waiting skills, imitation skills, and choice making skills. Additionally, a participant was selected to participate in this

study if their play behavior was brief, lacked variety, or was often stereotypic. Children who engaged in high levels of challenging behavior in the form of self-injury or aggression were not included in this study.

Setting and Materials

Experimenters conducted all sessions in the participants' home in a designated play or work area for the participant. On average, sessions were conducted five to 10 times per week for 3 to 5 min per session.

There were nine dress-up scenarios included in this study. Each dress up scenario had its own specific materials and script. See Table 1 for all dress up materials used in this study. Additional materials included: a Microsoft Surface Pro to record all sessions, a writing utensil, a prepopulated data sheet, and participant specific reinforcers.

Play Scripts

Play scenarios were developed based on transcribed observations of typically developing 2-year-old and 3-year-old children in a daycare setting with the same materials as those used in this study. One goal of this study was to increase generalized play across play scenarios. Because of this, it was important to create the play scripts to be similar, with just a few changes, across the play scenarios within the play theme. Table 2-4 depicts the play scripts across play themes used in this study for all participants.

Response Measurement

The primary dependent variables were the percent of independent scripted pretend play and generalized play. Percent independent was calculated by dividing the number of actions and vocalizations independently completed by the total number of possible actions and vocalizations and multiplying by 100.

Scripted pretend play was defined as the combination of scripted actions and vocalizations. Scripted pretend play was measured as % of steps independent and % of session in duration.

Scripted actions were defined as any action that was identical or mostly identical to those modeled by the experimenter using the exact play materials and resulted in the same change in the environment as seen in the model. For example, the participant picking up a fire extinguisher and moving it from side to side. A non-example would include the participant picking up the fire extinguisher and pressing down on the handle. Actions that were repeated a second time were not scored again. During baseline and probe conditions, scripted actions were scored as correct regardless of the order. During training, scripted actions were scored as correct if they occurred in the correct order. All scripted actions used in this study are depicted in Tables 2-4.

Scripted vocalizations were defined as any vocalization that was identical or similar to that modeled by the experimenter. For example, the participant picking up the fire extinguisher and saying, "Psssss". A non-example would be the participant picking up the fire extinguisher and saying, "Get the fire out". Statements that were repeated a second time were not scored again. During baseline and probe conditions, scripted vocalizations were scored as correct regardless of the order. During training, scripted vocalizations were scored as correct if they occurred in the correct order. All scripted vocalizations used in this study are depicted in Tables 2-4.

Generalized play was defined as independently completing the scripted actions and vocalizations for an untrained play script and untrained materials.

Additionally, the quality of play behavior emitted by the participant was evaluated. A real-time measurement method (Miltenberger et al., 1999), which required second-by-second

recording, was used to measure the percent of session the participant was engaged in indiscriminate, discriminate, scripted pretend play, and unscripted pretend play.

Indiscriminate play was defined as the participant treating all objects alike or if the participant engaged in the same play action with the same play material for more than 10 s or repeated the same scenario of behaviors more than two times. Examples of indiscriminate play can be found in Table 5.

Discriminate play was defined as the participant differentiating among objects, preserving their physical or conventional characteristics. Examples of discriminate play can be found in Table 5.

Pretend play was defined as: pretend play is defined as the participant: (1) extending familiar actions to a doll or stuffed animal figure, with the participant as agent of the activity (e.g., animal walks, drinks, jumps with an indirect path, or any character plus an action such as running, flying, talking), (2) relating objects to their self, indicating a pretend quality to the action (e.g., brings empty cup to mouth as if to drink), (3) play including substitutions with or without objects (i.e., one object to stand in place for another) paired with a specific play scenario, and/or (4) adopting various familiar roles in play theme (e.g., play house or assigning the various roles) or arranging the environment to create a scene (e.g., crash cars or trains). In this study, pretend play was measured as scripted pretend play (% of steps independent and % of session) and unscripted pretend play.

Scripted pretend play (duration) was defined as the percent of session the participant was engaged in scripted actions and scripted vocalizations.

Unscripted pretend play (related to play theme) was defined as actions and vocalizations that did not meet the definition for scripted play, but that were contextual with respect to the materials and the theme. Examples of unscripted pretend play are depicted in Table 5.

Interobserver Agreement

A second observer scored 33% of video recorded sessions across all phases and participants. Agreement was calculated per session by dividing the smaller frequency of recorded events by the larger across observers and converting them to a percentage. Mean interobserver agreement across conditions was 91% for Andy (range, 81% to 100%), 94.5% for Paul (range, 80.3% to 100%), and 90.5% for Anna (range, 80% to 100%).

Pre-Assessment

Paired-Stimulus Preference Assessment

Eight leisure items were evaluated per participant in a paired-stimulus preference assessment (Fisher et al., 1992) to identify potent reinforcers to be used during treatment. Items included in the preference assessment were identified via direct observation and via parent report. Items were randomly assigned numbers from one to eight and written on a data sheet. Items were presented in paired comparison sets according to the data sheet until all stimuli had been paired together. The participant was required to choose between two stimuli. An item was chosen once the participant touched one of the items. If the participant did not touch one of the items, the experimenter removed both items and represented that pairing. Preference was measured by the number of times the item was chosen, divided by the number of times the item was presented, and multiplied by 100. Items associated with higher percentages were assumed to be most preferred.

Intervention Assessment

Experimental Design

A multiple-probe design across play scenarios as well as within and across participants (Dupere, MacDonald, Ahearn, 2013) was used to evaluate the independent variable (in-vivo modeling, least-to-most prompting, and multiple exemplar training) and to exert experimental control over responding. The order of play scenarios taught was randomly assigned for each participant. Baseline was conducted prior to training for each play scenario and a mastery probe was conducted following training to ensure acquisition in the absence of the experimenter's model. Following mastery of a play scenario, a generalization probe was conducted to test whether the child's play behavior generalized from one play scenario to the next. Throughout the study, an all materials probe was conducted to evaluate the child's play behavior in a naturalistic setting.

Procedures

Baseline. During baseline, the participant and the experimenter sat on the floor or at a table across from one another with the play materials placed between them. The experimenter instructed the participant, "It's time to play", and the participant had 5 min to play with the materials. If the participant looked at the experimenter, the experimenter smiled and showed positive affect. If the participant gave a toy to the experimenter while tacting it, the experimenter repeated the tact. If the participant handed the experimenter a play material, the experimenter took the object from the participant. The experimenter did not, however, model new ways to play with the play material or model any new language around the theme of the play. Lastly, if the participant left the play area or began playing with another toy in their environment, the experimenter redirected the participant back to the play area. If redirection was unsuccessful

after a few tries, if redirection resulted in challenging behavior, or 5 min elapsed, the session was terminated. All sessions were video recorded for later scoring.

Training. Prior to each training trial, the experimenter conducted a mini preference assessment by holding up two highly preferred options from the paired stimulus preference assessment and asking the participant what they wanted. The item the participant chose was provided for correct responding or the completion of the task analysis during that trial. Similar to baseline, the participant and the experimenter sat across from one another on the floor or at the table with the play materials between them. The experimenter first modeled the full scenario with actions and vocalizations with the materials while the participant waited and attended. After the experimenter modeled the play scenario, she placed all the materials in between her and the participant, then delivered the discriminative stimulus (i.e., "It's time to play"). The participant then had the opportunity to complete the play scenario. The experimenter used a least-to-most physical prompting hierarchy when needed. If the participant reached for the wrong object, completed an incorrect action with the object, or if the participant was sitting without engaging with the item for more than 2 s, the experimenter used least-to most prompting to prompt the correct action with the correct object. For prompting vocalizations, if the participant did not say the necessary vocalization or said an incorrect vocalization, the experimenter stated the vocalization once, then waited 2 s. If the participant repeated the vocal, the experimenter smiled and/or provided brief praise and the participant continued the play scenario. If the participant did not say the vocalization after the experimenter provided the prompt, the experimenter gained the participant's eye contact, repeated the prompt one more time, then waited 2 s. If the participant repeated the vocal, the experimenter smiled and/or provided brief praise and the participant continued the play scenario. If the participant did not repeat the vocal after the second prompt,

the experimenter recorded this step as an error and allowed the participant to continue the play

scenario. At the end of the play scenario, the experimenter removed the play materials, provided

brief praise, and provided the participant a break. If the participant had completed 80% or more

of scripted pretend play or generalized play, the experimenter also presented the highly preferred

item or activity paired with praise. If the participant did not complete 80% of more of scripted

pretend play or generalized play, the experimenter removed the play materials, provided the

participant a brief break, then conducted the next training session.

Mastery probes. Once 80% of scripted actions and vocalizations were completed by the

participant across two consecutive training sessions, a mastery probe was conducted. The

mastery probe session was identical to baseline in that the participant and the experimenter sat on

the floor or at a table across from one another with the play materials placed between them. The

experimenter instructed the participant, "It's time to play", and the participant had 5 min to play

with the materials. The experimenter did not model the play script and no prompts or error

correction was used. If 80% of scripted actions and vocalizations were completed, the

experimenter conducted a generalization probe for an untrained play scenario within the play

theme. The purpose of the mastery probe was to evaluate whether or not the participant

completed the scripted play actions and vocalizations in the absence of the experimenter's

model.

Generalization probes. Once 80% of scripted pretend play was completed by the

participant in the mastery probe, a generalization probe was conducted for an untrained play

scenario within the play theme. The generalization probe session was identical to baseline in that

the participant and the experimenter sat on the floor or at a table across from one another with

the play materials placed between them. The experimenter instructed the participant, "It's time to

play", and the participant had 5 min to play with the materials. The experimenter did not model the play script and no prompts or error correction was used. If 80% correct independent responding was observed, the therapist then conducted a generalization probe for the next play script, if one of the three was remaining. If mastery was met but no other play scripts were remaining in the play theme, the therapist moved on to baseline for the next play scenario. If 80% correct independent responding was not observed, the therapist began training that play scenario. During the generalization probe, the participant had not yet been taught or exposed to the specific play script and materials. The purpose of the generalization probe was to evaluate whether the participant completed the scripted play actions and vocalizations for an untrained play scenario within the play theme.

All materials across play scenarios probes. The all materials across play scenarios probes were identical to baseline conditions. The materials available were all materials across all nine play scenarios. The purpose of the all materials probe was to evaluate the quality of play when all materials were presented at one time. This probe emulated a typical preschool environment classroom or a child's play area in which all the pretend play materials are mixed together in one area.

Intervention Assessment Results

Figures 1-13 show the results of the current study across participants and play themes. These graphs demonstrate experimental control in that, the percent of completed scripted pretend play across play themes within participant did not increase until training was implemented. Overall results showed participants mastered all play script scenarios in zero to 29 training sessions. A decrease in indiscriminate play was observed across participants following training, as well as an increase in scripted pretend play and the duration of time spent in scripted pretend

play. Lastly, a decrease in the number of training sessions required for mastery within a play theme per participant was observed, except for the chef play theme for Anna.

Figures 1 depict the percent of session and percent independent across the play themes for participant Andy. During baseline, elevated levels of indiscriminate play were observed compared to all other measures. Training began with the doctor play theme for Andy. Criteria to conduct a mastery probe was met for the doctor animal theme in 14 sessions. Andy completed 93.7 of scripted pretend play during the mastery probe. Next a generalization probe was conducted for the next untrained play scenario in the doctor play theme, doctor baby. Andy completed 87.5% of generalized play during the generalization probe. Therefore, it was determined that Andy's play behavior generalized to the untrained play scenario and training on the doctor baby scenario was not necessary. A generalization probe was conducted for the final play scenario in the doctor play theme, doctor figurine. Andy completed 93.7% of generalized play during the generalization probe. Therefore, it was determined Andy's play behavior generalized to the untrained play scenario and training on the doctor figurine scenario was not necessary. Next, baseline and training was conducted for the chef play theme. Criteria to conduct a mastery probe was met for the chef cake theme in five sessions. Andy completed 93.7% of scripted pretend play during the mastery probe. Generalized play behavior was not observed during the generalization probe for chef pizza nor chef pie, so training occurred for both play scenarios. Criteria to conduct a mastery probe was met for the chef pizza and chef pie play themes in five sessions. Andy completed 87.5% and 81.2% of scripted pretend play during the mastery probe, respectively. Finally, baseline and training began for the firefighter play theme. Criteria to conduct a mastery probe was met for the firefighter house fire in seven sessions. Andy completed 100% of scripted pretend play during the mastery probe. Generalized play was not

observed during the generalization probe for the firefighter car fire, so training began. Criteria to conduct a mastery probe was met in two sessions. Andy completed 100% of scripted pretend play during the mastery probe. During the generalization probe for firefighter kitchen fire, Andy completed 93.7% of generalized play. Therefore, it was determined Andy's play behavior generalized to the untrained play scenario and training on the firefighter kitchen fire scenario was not necessary.

Figure 2 depicts the average percent of play across play themes for participant Andy. The average percent of play was calculated by adding up all X type of play for X condition within X play theme, dividing by the number of sessions with that measure, and multiplying by 100. For example, adding all indiscriminate play across all baseline sessions within the doctor play theme, dividing by the number of baseline session, and multiplying by 100. Across play themes, a decrease in indiscriminate and discriminate play compared to baseline was observed. An increase in unscripted pretend play was observed in all conditions compared to baseline except for the generalization probe in the firefighter play theme. An increase in the duration of scripted pretend play was observed in all conditions compared to baseline except for the all materials probe condition following training with the doctor play theme. An increase in scripted pretend play measured as percent independent was observed in all conditions compared to baseline except for the all materials probe following training with the doctor play theme.

Figure 3 depicts the percent of play and percent independent during the all materials probes specifically. An overall decrease in indiscriminate play from baseline was observed. An increase in discriminate play following training with the doctor play theme (13%) as compared to baseline (10.6%), and a decrease following training with the chef (5.6%) and firefighter (1%) play themes was observed. Further, an increase in unscripted pretend play following training

with the doctor theme (27.6%), the chef theme (19%), and firefighter theme (14.3%) compared

to baseline measures (9.6%). An increase in the duration of scripted pretend play compared to

baseline measures (0%) following training for the chef theme (28.3%) and firefighter theme

(47%). Finally, an increase in scripted pretend play measured as percent independent following

training with the doctor theme (.6%), the chef theme (10.4%), and the firefighter theme (7.6%)

compared to baseline measures (0%).

Figure 4 depicts the percentage of change across play themes for participant Andy. The

percentage of change was calculated by subtracting the mastery probe or generalization probe

measure by the baseline measure, dividing by the baseline measure, and multiplying by 100 (new

number-old number/ old number X 100). Across all play scenarios, the percentage of

indiscriminate play decreased across all play scenarios (-49.7%, -29.3%, -26.4%, -74.1%, -

50.3%, -19%, -21.5%, -49.5%, and -53.4%, respectively). Across all scenarios, the percentage of

discriminate play decreased (-100%, -62.5%, -100%, -89.3%, -100%, and -100%, respectively)

with the exception of doctor figurine (12.8%), chef cake (61.4%), and fire fighter kitchen (2.4%).

The percentage of unscripted pretend play increased across all play scenarios (376.5%, 156%,

99.1%, 254.7%, 5,241%, 850%, 194%, and 4,555%, respectively) with the exception of fire

fighter kitchen (0%). Across all play scenarios, the percentage of scripted pretend play measured

in duration increased (1,410%, 3,122%, 6,870%, 6,380%, 7,298%, 2,580%, 3,657%, 8,066%,

and 7,788%, respectively) from the initial baseline. Lastly, across all scenarios, the percentage of

scripted pretend play measured as percent of steps independent increased (1,400%, 8,650%,

9,275%, 1,400%, 1,300%, 1,200%, 700%, 9,900%, and 1,400%, respectively) from the initial

baseline.

Figures 5 depict the percent of session and percent independent across the play themes for participant Paul. During baseline, elevated levels of indiscriminate play was observed compared to all other measures. Training began with the chef theme for Paul. Criteria to conduct a mastery probe was met for the chef cake scenario in 23 sessions. Paul completed 81.2% of scripted play during the mastery probe. Paul completed 62.5% of scripted play during the generalization probe for the chef pizza scenario so training began. Criteria to conduct a mastery probe was met in six sessions. Paul completed 87.2% of scripted pretend play during the mastery probe. During the generalization probe for chef pie, Paul completed 31.2% of scripted pretend play so training began. Criteria to conduct a mastery probe was met in 15 sessions. Paul completed 100% of scripted pretend play during the mastery probe. Next, baseline and training began for the doctor theme. Criteria to conduct a mastery probe was met in 12 sessions for the doctor animal scenario. During the mastery probe, Paul completed 75% scripted pretend play, so training continued. After two training sessions in which 93.7% scripted pretend play occurred, a mastery probe was conducted, and Paul completed 81.2% scripted pretend play. A generalization probe for doctor baby was conducted and Paul completed 93.7% of generalized play. Therefore, it was determined Paul's behavior generalized to the untrained play scenario and training on the doctor baby scenario was not necessary. During the generalization probe for doctor figurine Paul completed 75% generalized behavior and training began. Criteria to conduct a mastery probe was met in five training sessions. Paul completed 87.5% of scripted pretend play during the mastery probe. Finally, baseline and training began for the firefighter theme. After 26 training sessions, criteria to conduct a mastery probe was met for the firefighter kitchen fire scenario. During the mastery probe, Paul completed 75% of scripted play so training continued. Following training for three more sessions, a mastery probe was conducted. Paul completed 87.5% of scripted

pretend play during the mastery probe. During the generalization probe for firefighter care fire

Paul completed 62.5% of scripted pretend play, so training began. Criteria to conduct a mastery

probe was met after eight sessions. During the mastery probe, Paul completed 81.2% of scripted

pretend play. A generalization probe was conducted for the firefighter house fire and Paul

completed 87.5% of generalized play.

Figure 6 depicts the average percent of play across play themes for participant Paul. An

overall decrease in indiscriminate play compared to baseline was observed. Mixed results were

observed for the discriminate play measure. During the doctor theme, a decrease of discriminate

play was observed in the mastery probe (8.6%) compared to baseline (9.4%), and an increase

during the generalization probe (27.6%) and the all materials probe (26.6%). During the chef

theme, a decrease was observed during the generalization probe (8%) and mastery probe (0%)

conditions compared to baseline (11.9%), and an increase in the all materials probe (24.3%). In

the firefighter theme, discriminate play increased during the generalization probe (47.8%), the

mastery probe (24.8%), and all materials probe (38.6%) compared to baseline (17.1%).

Unscripted pretend play increased during the all materials probe condition only across play

themes (7.6%, 8.3%, 11.8% respectively) compared to baseline (.7%, .2%, 5.5%, respectively).

An increase in the duration of scripted pretend play across conditions and play themes (55.7%,

34.8%, 15.3%, 15.9%, 74.6%, 23%, 34%, 11.4%, 13.3%, respectively) as compared to baseline

(.3%, 0%, 1.3%, respectively) was observed. Scripted pretend play measured as percent

independent increased during the generalization probe (84.3%) and the mastery probe condition

(81.2%) in the doctor theme compared to baseline (14.5%) but decreased in the all materials

probe (.6%). Scripted pretend play measured as percent independent increased during the

generalization probe (31.2%), mastery probe (89.5%), and all materials probe (2%) compared to

baseline (0%) during the chef theme. During the firefighter theme, scripted pretend play

measured as percent independent increased in the generalization probe (75%) and mastery probe

(81.2%) compared to baseline (16.8%) but decreased in the all materials probe (0%).

Figure 7 depicts the percent of play and percent independent during the all materials

probes specifically. An overall decrease in indiscriminate play from baseline was observed. An

increase in discriminate play following training with the chef theme (24.3%), doctor theme

(26.6%), and firefighter theme (38.6%) as compared to baseline (16%) was observed. Further, a

decrease in unscripted pretend play following training with the chef theme (2%), the doctor

(.6%), and firefighter theme (0%) compared to baseline measures (2.3%) was observed. An

increase in the duration of scripted pretend play compared to baseline measures (4%) following

training for the chef theme (23%), doctor theme (15.3%), and the firefighter theme (13.3%) was

observed during the all materials probes throughout the study. Finally, an increase in scripted

pretend play measured as percent independent following training with the chef theme (8.3%), the

doctor theme (7.6%), and the firefighter theme (11.8%) compared to baseline measures (2.7%)

was observed.

Figure 8 depicts the percentage of change across play themes for participant Paul. Across

all scenarios, the percentage of indiscriminate play decreased (-64.2%, -100%, -55.9%, -100%, -

65%, -23.8%, -92.8%, and -21.3%, respectively) with the exception of fire fighter car (10.6%).

The percentage of discriminate play decreased in the following scenarios: animal doctor (-

100%), doctor figurine (-7.4%), chef cake (-100%), and chef pizza (-75.8%). The percentage of

discriminate play increased in the following scenarios: doctor baby (3,317%), chef pie (433%),

firefighter house fire (27.3%), firefighter car fire (16.5%), and firefighter kitchen fire (152.4%).

The percentage of unscripted pretend play increased during the firefighter car fire scenario

(733%) and decreased in the following scenarios: doctor figurine (-100%), chef cake (-100%), firefighter house fire (-100%), and firefighter kitchen fire (-95.6%). Across all play scenarios, the percentage of scripted pretend play measured in duration increased (6150%, 4,460%, 2,614%, 9,030%, 5,833%, 7,233%, 18,506%, 2,066%, and 130.5%, respectively) from the initial baseline. Lastly, across all scenarios, the percentage of scripted pretend play measured as percent of steps independent increased (160%, 9,275%, 600%, 8,025%, 8,620%, 9,900%, 180%, 12,210.6%, and 366.6%, respectively) from the initial baseline.

Figures 9 depict the percent of session and percent independent across the play themes for participant Anna. During baseline, elevated levels of indiscriminate play were observed compared to all other measures. Training began with the doctor play theme for Anna. Criteria to conduct a mastery probe for the doctor animal theme was met in 18 sessions. During the mastery probe, Anna completed 87.5% of scripted pretend play. A generalization probe was conducted for the doctor baby scenario and Anna completed 6.2% generalized play. Five training sessions were conducted before a mastery probe for doctor baby in which Anna completed 81.5% scripted pretend play. A generalization probe was conducted for doctor figurine and Anna completed 81.2% generalized play. Next, baseline and training began for the firefighter theme. Criteria to conduct a mastery probe was met in 13 sessions. During the mastery probe, Anna completed 6.2% scripted pretend play, so training continued. Three more training sessions were conducted before a mastery probe was conducted in which Anna completed 93.7% of scripted pretend play. A generalization probe for the firefighter house fire was conducted and Anna completed 62.5% of generalized play, so training began. After two training sessions, Anna met criteria to conduct a mastery probe. During the mastery probe Anna completed 81.2% scripted pretend play. Finally, baseline and training began with the chef theme. Criteria to conduct a mastery probe was met in

nine training sessions. During the mastery probe, Anna completed 87.5% of scripted pretend play. A generalized probe was conducted for the chef cake. After seven training sessions, criteria was met to conduct a mastery probe. Anna completed 56.2% of scripted pretend play during the mastery probe, so training continued. Nine more training sessions were conducted, and a mastery probe was conducted in which Anna completed 93.7% of scripted pretend play. Finally, a generalization probe was conducted for the chef pizza scenario. Anna completed 6.2% generalized play, so training began. Criteria to conduct a mastery probe was met in 10 training sessions. During the mastery probe, Anna completed 87.5% of scripted pretend play.

Figure 10 depicts the average percent of play across play themes for participant Anna. An overall decrease in indiscriminate play compared to baseline was observed. Mixed results were observed for the discriminate play measure. During the doctor theme, an increase in discriminate play was observed during the generalization probe (20.2%), the mastery probe (9.4%), and the all materials probe (40.3%), compared to baseline (8.3%). During the chef theme, a decrease was observed during the mastery probe (10.9%) compared to baseline (13.1%), and an increase in the generalization probe (33.9%) and the all materials probe (25.6%). In the firefighter theme, discriminate play decreased during the mastery probe (9.7%) compared to baseline (14%) and increased during the generalization probe (15.6%) and the all materials probe (47.6%). Mixed results were observed for unscripted pretend play. During the doctor theme, unscripted pretend play decreased during the generalization probe (2.3%), the mastery probe (10.5%), and the all materials probe (5.5%) as compared to baseline (13.4%). During the chef theme, unscripted pretend play decreased during the mastery probe (.5%) as compared to baseline (4.5%) and increased during the generalization probe (20.4%) and all materials probe (23.6%). During the firefighter theme, unscripted pretend play decreased during the mastery probe (.3%) as compared

to baseline (1.6%) and increased during the generalization probe (4%) and all materials probe (7.3%). A decrease in the duration of scripted pretend play was observed during the doctor theme in the generalization probe (10%) and all materials probe (10.3%), as compared to baseline (10.9%), and increased during the mastery probe (42.7%). During the chef theme, an increase was observed during the generalization probe (4.4%), the mastery probe (56.5%), and all materials probe (27.6%) compared to baseline (2.1%). During the firefighter theme, an increase in scripted play measured in duration was observed across conditions (8.7%, 22.1%, 10%, respectively) compared to baseline (8.4%). Scripted pretend play measured as percent independent decreased during the all materials probe (0%) condition in the doctor theme compared to baseline (33.3%), and increased during the generalization probe (43.7%) and mastery probe (84.5%) conditions. Scripted pretend play measured as percent independent increased in all conditions (12.5%, 81.2%, 15.9%, respectively) compared to baseline (8.3%) in the chef theme. During the firefighter theme, scripted play measured as percent independent decreased during the all materials probe (8.3%) compared to baseline (25%), and increased during the generalization probe (68.7%) and mastery probes (65.6%).

Figure 11 depicts the percent of play and percent independent during the all materials probes specifically. An overall decrease in indiscriminate play (46.3%, 30%, 12.6% respectively) from baseline (81%) was observed. An increase in discriminate play (40.3%, 47.6%, 25.6%, respectively) from baseline (13.6%) was observed. Further, an increase in unscripted pretend play following training with the firefighter theme (7.3%) and following the chef theme (23.6%), compared to baseline measures (6.3%), and a decrease following the doctor theme (0%) was observed. An increase in the duration of scripted pretend play compared to baseline measures (0%) following training for the doctor theme (10.3%), firefighter theme (10%), and chef theme

(27.6%). Finally, an increase in scripted pretend play measured as percent independent following training with the doctor theme (5.5%), the firefighter theme (8.3%), and the chef theme (15.9%) compared to baseline measures (2%).

Figure 12 depicts the percentage of change across play themes for participant Anna. Across all play scenarios, the percentage of indiscriminate play decreased (-62.8%, -59.5%, -79.6%, -100%, -80.4%, 67.3%, -65.5 %, and 42.5%, respectively) with the exception of fire fighter house fire (16%). The percentage of discriminate play decreased for the following scenarios: doctor animal (-40%), chef cake (-100%), firefighter car fire (-28.5%), and firefighter kitchen fire (-40.3%). The percentage of discriminate play increased for the following scenarios: doctor baby (76.6%), doctor figurine (618.3%), chef pizza (59.2%), chef pie (104.3%), and firefighter house fire (204%). The percentage of unscripted pretend play decreased across all play scenarios (-100%, -100%, -100%, -100%, -37.5%, -100%, and -100%, respectively) with the exception of doctor baby (71.6%) and chef pie (26.5%). Across all play scenarios, the percentage of scripted pretend play measured in duration increased (414.9%, 136.3%, 89.5%, 2,521.6%, 5,970%, 917.3%, 380.2%, 422.2%, and 10%, respectively) from the initial baseline. Lastly, across all scenarios, the percentage of scripted pretend play measured as percent of steps independent increased (600%, 86.2%, 85.7%, 650%, 8,650%, 600%, 116.67%, 1,400%, and 160%, respectively) from the initial baseline.

Finally, Figure 13 shows the results for all generalization probes across all participants. The black boxes depict play scenarios that were trained, and the red boxes depict play scenarios for which the participant completed 80% or more of generalized play. The bottom row of the figure shows the total number of play scenarios the participant engaged in generalized play over 80% independent. Andy engaged in generalized play in 50% of possible opportunities, Paul

engaged in generalized play in 33% of opportunities, and Anna in 16.6% of opportunities. It was

observed that all participants showed generalized play in the doctor play theme, but none of the

participants engaged in generalized play during the chef theme. Further, even though the

participants did not meet the 80% criteria for generalized play in some play scenarios,

generalized play was still occurring across play scenarios within a play theme in all

generalization probes. This result is shown in the light grey boxes of the figure.

Discussion

The purpose of the current study was to evaluate in-vivo modeling (including prompting

and reinforcement) and multiple exemplar training to increase pretend play skills in young

toddlers with autism. The goal of this study was to increase scripted pretend play and generalized

play while decreasing indiscriminate play following training. The results of this study

demonstrate that in-vivo modeling and multiple exemplar training increased scripted pretend

play in all participants across all 9 play scenarios. Further, generalized play occurred across all

participants in 50%, 33%, and 16% of opportunities, respectively. A decrease in indiscriminate

play was observed across all participants following training, and an overall decrease in training

sessions required to meet mastery criteria following the initial training within a play theme was

observed.

As shown in Figures 1, 5, and 9, no change in scripted pretend play was observed until

the independent variable was introduced for any of the participants. Following the introduction

of training for the first play scenario within the play theme, scripted pretend play increased

immediately with a substantial change in level across all participants demonstrating functional

control over responding. The goal of the current study was to increase generalized play, therefore

it was important to show that the initial introduction of training was responsible for the observed

change in behavior. As anticipated, following the introduction of training for at least one play scenario within the play theme, generalized play occurred for each participant during the study. This outcome demonstrates that functional control over responding occurred due to the introduction of training, while generalized play occurred due to exposure to the intervention during previously taught play scenarios.

The data depicted in the within participant across play theme graphs show generalized play did occur for each participant following training of one or two play scenarios within the play theme. This was a successful outcome given the participants had never been exposed to the untrained play scripts paired with the untrained materials. It is possible this result is due to the multiple exemplars within a play theme and the consistency across the play scripts within and across play themes. All participants engaged in generalized play within the doctor play theme, however, no participants engaged in generalized play within the chef play theme. Tables 2-4 depict the play scripts across all play scenarios. The doctor play script stays the same with the same actions, mostly the same materials (1 difference), and mostly the same vocalizations across play scenarios. The difference across the play scripts within the doctor play theme are the patient used (baby, figurine, animal), and the language used to address the patient (e.g., "Lay down, X"; "You are sick, X"; "It's ok, X"). It is possible because the doctor play scripts within the doctor play theme are so similar with only minor differences, generalized play occurred across all participants. On the other hand, the chef play scripts varied across play scenarios. The primary difference across the play scenarios was in the middle of the script when the materials, actions, and vocalizations varied. For example, in the cake play scenario there was a knife, frosting, and candy to be added to the cake. In the pizza scenario there was toppings and grated cheese to be added to the pizza. In the pie scenario, there was fruit and pie crust tops to be added to the pie.

Further, all participants did not have the tact for "pie", "tops", or "cheese" in their repertoire prior to training with the chef theme, but they did have the tact for all other materials used. It is possible these differences within the chef play scripts were responsible for a lack of generalized play across participants within the chef play theme.

As noted, all play scripts were created from transcribed observations with typically developing children playing with the same materials used in this study. Additionally, examples of actions and vocalizations commonly observed with 2-year-old children were also used from Lifter (2000) to help create the play scripts. It is important to note that during observations of typically developing toddlers, it was observed that some children showed difficulty with putting on and taking off the dress up materials. If a child was having difficulty, they would either ask an adult for help, or they would only put on what they could independently (e.g., hat, mask, apron). Given this observation, throughout the study, the participants were only required to put on one of the two dress up garments available. If the participant independently put on one of the garments, or if the child independently asked for help, the experiment recorded this step as correct. During training, the experiment would help the child put on the second garment, however, this was not counted as incorrect or an error. Also, if the experimenter was helping the participant put on the second garment and the participant requested, "All done," the experimenter would honor the request.

Throughout the study, an all materials probe was conducted. This probe was conducted initially in baseline and following the completion of training across all play scenarios within a play theme for a total of 4 probe sessions per participant. The purpose of this probe was to evaluate the participant's play behavior in a more natural environmental arrangement in which all materials from all nine play scenarios were mixed together and present at the same time. It is

common for dress up materials to be mixed in one area in a child's playroom or in a preschool or daycare setting. Results showed an increase in scripted pretend play and the percent of session spent engaged in scripted pretend play, and a decrease in indiscriminate play following training for all participants. An increase in unscripted pretend play was also observed for Andy and Anna. During the all materials probes, it was observed that the participants often chose one or two play scenario materials to play with and would engage with those materials for the full five minutes instead of playing with a variety of materials. However, during the final all materials probe for Anna, she engaged with a variety of materials and completed more scripted pretend play and less indiscriminate play compared to previous all materials probes.

Overall, the current study replicated and extended previous research in the area of teaching pretend play skills. The use of scripts to teach play has been shown effective in the play literature (Goldstein & Cisar, 1992; Dupere, MacDonald, & Ahearn, 2013), as does the use of in-vivo modeling to teach play skills (Pierce & Schreibman, 1995). The current study replicated the use of Lifter (2000) definitions for the quality of play observed in this study. The current study extended previous research by demonstrating how to increase scripted and generalized play behavior with dress up pretend play for 2-year-old toddlers with autism. Further, although studies have shown effective use of teaching play through scripts, researchers have not gone into much detail to explain how those scripts are created and whether they were transcribed from observations of typically developing children.

The current study specifically extended the Dupere, MacDonald, and Ahearn (2013) study by teaching dress up pretend play across a variety of materials to 2-year-old children with autism. Further, the current study measured the quality of play observed during the study in addition to measuring scripted actions and vocals. Dupere, MacDonald, and Ahearn taught their

play scripts in the same order across participants and noted in the discussion that it might be better to vary the order across participants. The current study did vary the order of play scripts taught across participants. The current study used in-vivo modeling to teach play instead of video modeling. Finally, Dupere, MacDonald, and Ahearn noted that variations in their results could have resulted from their play scripts varying in length and complexity. In the current study, all nine play scripts were generated as 16 actions and vocalizations. Efforts were made to ensure all play scripts were equal in complexity with respect to the actions and language.

A limitation of this study was the lack of testing for generalization across settings and people. The current study primarily focused on response generalization and stimulus generalization across materials and play themes. Another limitation of this study was the lack of testing for maintenance over time. However, the all materials probes in this study do provide some evidence of the quality of play behavior over time across participants as it was implemented periodically throughout the study. The all materials probe also provides a new environmental arrangement of the materials presented, but the setting the participant was in did not change. Future research should examine generalization across settings and people, as well as maintenance over time of these newly acquired pretend play repertoires.

In the end, teaching pretend play skills to young children with autism is critical. Play is an important skill for young children to learn and can aid in the development of their social skills as well as language skills. Given the research noting the presence of stereotypic behaviors (MacDonald et al., 2007) and lack of play skills in young children with autism (Lifter, 200), it is important for behavior analysts to make teaching play skills to young children a priority in treatment. Promoting generalized play repertoires in young children with autism can be difficult. Often, research results show that children engage in play behaviors verbatim from what was

taught. It is important for behavior analysts to be trained and proficient in procedures promoting generalization when teaching play skills. More research is needed with strong demonstrations of programming for generalization as outlined by Stokes and Baer (1977) to aid in developing play repertoire in young children with autism.

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Table 1

Materials used for play scenarios

Role	Play Scenario	Materials
Chef	Cake	Apron, hat, cake, cake plate, frosting, knife, cake toppings, spatula, serving plate
	Pizza	Apron, hat, pizza, pizza plate, toppings, cheese shaker, pizza cutter, serving plate
	Pie	Apron, hat, pie crust, fruit, pie plate, spatula, serving plate
Doctor	Baby	Coat, mask, doll, blanket, stethoscope, shot, band-aid
	Figurine	Coat, mask, figurine, blanket, stethoscope, shot, band-aid
	Animal	Coat, mask, animal, blanket, stethoscope, shot band-aid
Fire Fighter	House Fire	Coat, hat, phone, ride on car, house, cardboard fire, fire extinguisher
	Car Fire	Coat, hat, radio, ride on car, toy car, cardboard fire, fire hose
	Kitchen/Grill Fire	Coat, hat, phone, kitchen/grill, cardboard fire, fire hose

Table 2

Play scripts for chef scenarios cake, pizza, pie

Chef Play Scenarios			
	Cake (1a)	Pizza (2a)	Pie (3a)
Objects	Apron and hat	Apron and hat	Apron and hat
Action	Put on apron and/or hat	Put on apron and/or hat	Put on apron and/or hat
Vocalization	"I'm making cake"	"I'm making pizza"	"I'm making pie"
Objects	Cake and plate	Pizza and plate	Pie and plate
Action	Put cake triangles on plate to make a circle	Put pizza triangles on plate to make a circle	Put pie triangles on plate to make a circle
Vocalization	"Cake on plate"	"Pizza on plate"	"Pie on plate"
Objects	Frosting and knife	Pizza and toppings	Pie crust and fruit
Action	Put knife in frosting container then run knife on top of cake pieces	Add toppings on pizza	Put fruit in pie crust
Vocalization	"Now frosting"	"Now veggies"	"Now fruit"
Objects	Cake and topping pieces	Pizza and cheese shaker	Pie crust toppers
Action	Place toppings on cake	Shake cheese over pizza crust	Place crust tops on pie pieces
Vocalization	"Add candy"	"Add cheese"	"Add the tops"
Objects	Cake and spatula	Pizza and pizza cutter	Pie and spatula
Action	Use spatula to cut slices apart	Use pizza cutter to cut slices apart	Use spatula to cut pie pieces apart
Vocalization	"Cut the cake"	"Cut the pizza"	"Cut the pie"
Objects	Cake and plate	Pizza and plate	Pie and plate
Action	Move piece of cake to plate with hands	Move piece of pizza to plate with hands	Move piece of pie to plate with hands
Vocalization	"I want cake"	"I want pizza"	"I want pie"
Objects	Cake	Pizza	Pie
Action	Lift cake to mouth as if to eat	Lift pizza to mouth as if to eat	Lift pie to mouth as if to eat
Vocalization	"Yummy cake"	"Yummy pizza"	"Yummy pie"
Objects	Apron and hat	Apron and hat	Apron and hat
Action	Take off apron and/or hat	Take off apron and/or hat	Take off apron and/or hat
Vocalization	"Time to clean up"	"Time to clean up"	"Time to clean up"

Table 3

Play scripts for doctor scenarios baby, figurine, and animal

	Baby (1b)	Figurine (2b)	Animal (3b)
Doctor Play Scenarios			
Objects	Coat and mask	Coat and mask	Coat and mask
Action	Put on coat and/or mask	Put on coat and/or mask	Put on coat and/or mask
Vocalization	"I'm a doctor"	"I'm a doctor"	"I'm a doctor"
Objects	Baby and blanket	Figurine and blanket	Animal and blanket
Action	Lay baby down on blanket	Lay figurine down on blanket	Lay animal down on blanket
Vocalization	"Lay down, baby"	"Lay down, X"	"Lay down X"
Objects	Baby and stethoscope	Figurine and stethoscope	Animal and stethoscope
Action	Put stethoscope to baby's chest	Put stethoscope to figurine's chest	Put stethoscope on animal's chest
Vocalization	"Boom, boom"	"Boom, boom"	"Boom, boom"
Objects	Baby	Figurine	Animal
Action	Pat baby on belly	Pat figurine on belly	Pat animal
Vocalization	"You are sick, baby"	"You are sick, X"	"You are sick, X"
Objects	Baby and shot	Figurine and shot	Animal and shot
Action	Put shot on baby's arm/body	Put shot on figurine's arm/body	Put shot on animal's arm/body
Vocalization	"Ouch"	"Ouch"	"Ouch"
Objects	Baby and band aid	Figurine and band aid	Animal and band aid
Action	Put band-aid on baby	Put band-aid on figurine	Put band-aid on animal
Vocalization	"Here's a band aid"	"Here's a band aid"	"Here's a band aid"
Objects	Baby	Figurine	Animal
Action	Hug baby	Hug figurine	Hug animal
Vocalization	"It's ok, baby"	"It's ok, X"	"It's ok, X"
Objects	Coat and mask	Coat and mask	Coat and mask
Action	Take off coat and/or mask	Take off coat and/or mask	Take off coat and/or mask
Vocalization	"Feel better"	"Feel better"	"Feel better"

Table 4

*Play scripts for fire fighter scenarios house fire, car fire, and kitchen fire*

Fire Fighter Play Scenarios			
	House Fire (1c)	Car Fire (2c)	Kitchen Fire (3c)
Objects	Coat and hat	Coat and hat	Coat and hat
Action	Put on coat and/or hat	Put on coat and/or hat	Put on coat and/or hat
Vocalization	"I'm a fire fighter"	"I'm a fire fighter"	"I'm a fire fighter"
Objects	Phone	Radio	Phone
Action	Hold phone to face	Hold radio to face	Hold beeper to face
Vocalization	"Ring, ring"	"Ring, ring"	"Ring, ring"
Objects	Ride on car	Ride on car	Ride on car
Action	Sit on car and move a few feet	Sit on car and move a few feet	Sit on car and move a few feet
Vocalization	"Drive the truck"	"Drive the truck"	"Drive the truck"
Objects	House and cardboard fire	Toy car and cardboard fire	Kitchen and cardboard fire
Action	Point toward house and fire	Point toward car and fire	Point toward kitchen and fire
Vocalization	"Look! Fire!"	"Look! Fire!"	"Look! Fire!"
Objects	Fire extinguisher	Fire hose pack	Fire hose
Action	Hold fire extinguisher up toward house	Hold fire hose up toward car	Hold fire hose up toward kitchen
Vocalization	"Psssssss"	"Psssss"	"Psssssss"
Objects	House and cardboard fire	Car and cardboard fire	Kitchen and cardboard fire
Action	Knock down the fire	Knock down the fire	Knock down the fire
Vocalization	"I did it!"	"I did it!"	"I did it!"
Objects	Phone	Radio	Phone
Action	Hold phone to face	Hold radio to face	Hold beeper to face
Vocalization	"The house is ok"	"The car is ok"	"The kitchen is ok"
Objects	Coat and hat	Coat and hat	Coat and hat
Action	Take off coat and/or hat	Take off coat and/or hat	Take off coat and/or hat
Vocalization	"The fire is out"	"The fire is out"	"The fire is out"

Table 5

Dependent variable definitions and examples

Quality of Play	Definition	Examples
Indiscriminate	Defined as the participant treating all objects alike or if the participant engaged in the same play action with the same play material for more than 10 s or repeated the same scenario of behaviors more than two times.	All objects are mouthed, picking up and dropping items, smells everything, taps everything, holding object but not acting on it, the participant put a spoon in a bowl then brings the spoon to their mouth as if to eat three or more times consecutively, shaking the cheese container more than 10 s consecutively.
Discriminate	Defined as the participant differentiated among objects, preserving their physical or conventional characteristics.	Rolling the pizza cutter on the floor, shaking the cheese, saying "pizza" while picking up a pizza slice, sitting on the ride on car and riding around, taking apart and putting back together the fire hose made of pop beads.
Pretend Play	Defined as the participant: (1) extending familiar actions to a doll or stuffed animal figure, with the participant as agent of the activity (2) relating objects to their self, indicating a pretend quality to the action (3) play including substitutions with or without objects paired with a specific play scenario, and/or (4) adopting various familiar roles in play theme or arranging the environment to create a scene.	(1) animal walks, drinks, jumps with an indirect path, or any character plus an action such as running, flying, talking; (2) brings empty cup to mouth as if to drink; (3) bring block to hear and saying, "Hello?" ;(4) playing "house" or assigning the various roles, crash cars or trains.
Unscripted Pretend Play	Defined as actions and vocalizations that did not meet the definition for scripted play but that were contextual with respect to the materials and the theme.	Using the doctor tools on themselves, walking the doll or stuffed animal, feeding the doll or stuffed animal, "I love pizza," or "The baby is tired, go to sleep baby, wake up" while laying the baby down and picking the baby back up.

Figure 1

Percent of session and percent of steps independent across the doctor, chef, and firefighter play themes for participant Andy
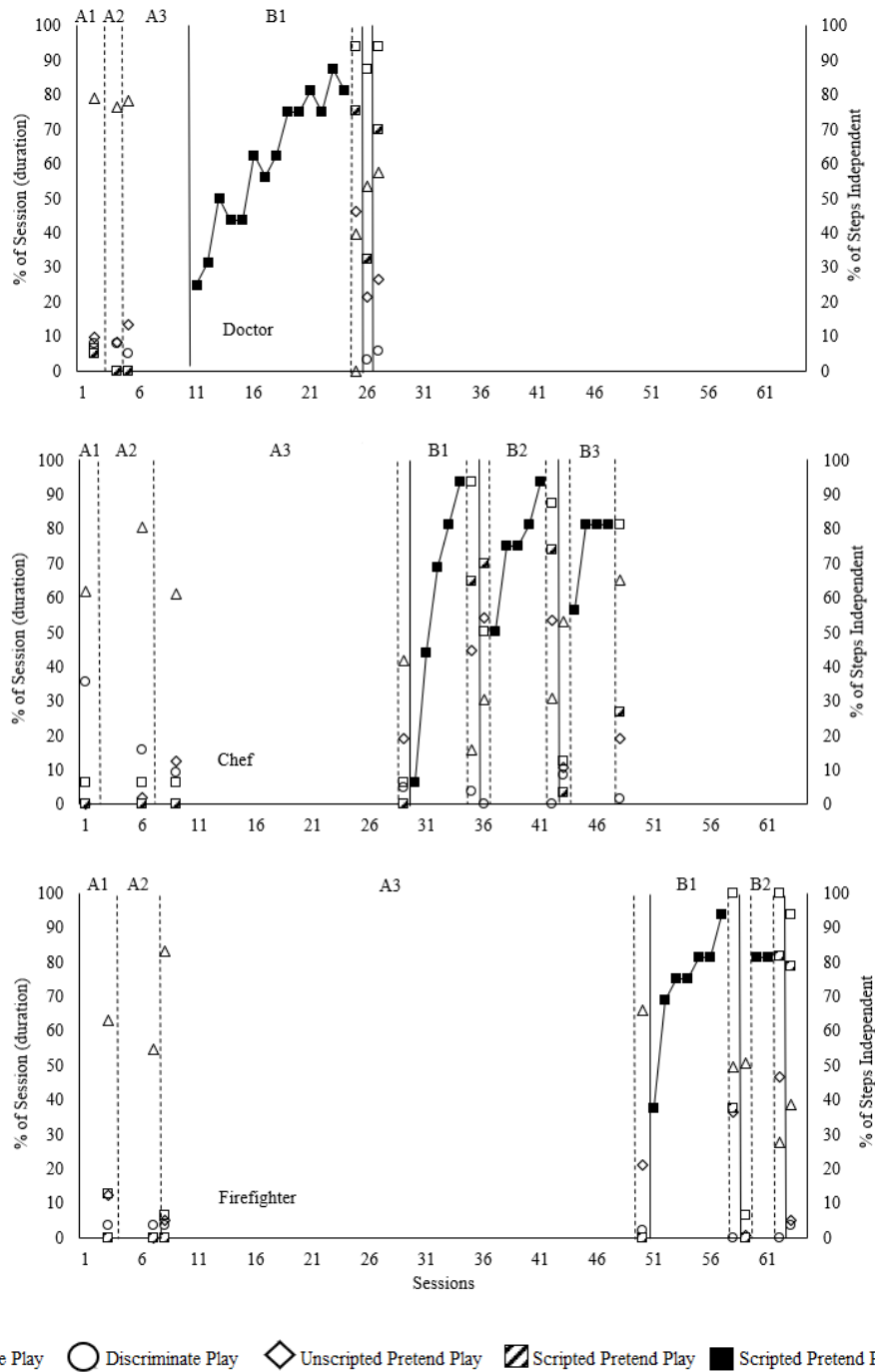
Note. Open shapes represent measures collected during probe conditions while the closed black squares represent data collected during training. A1, A2, and A3 represent baseline conditions across play themes while B1, B2, and B3 represent training conditions across play themes.

Figure 2

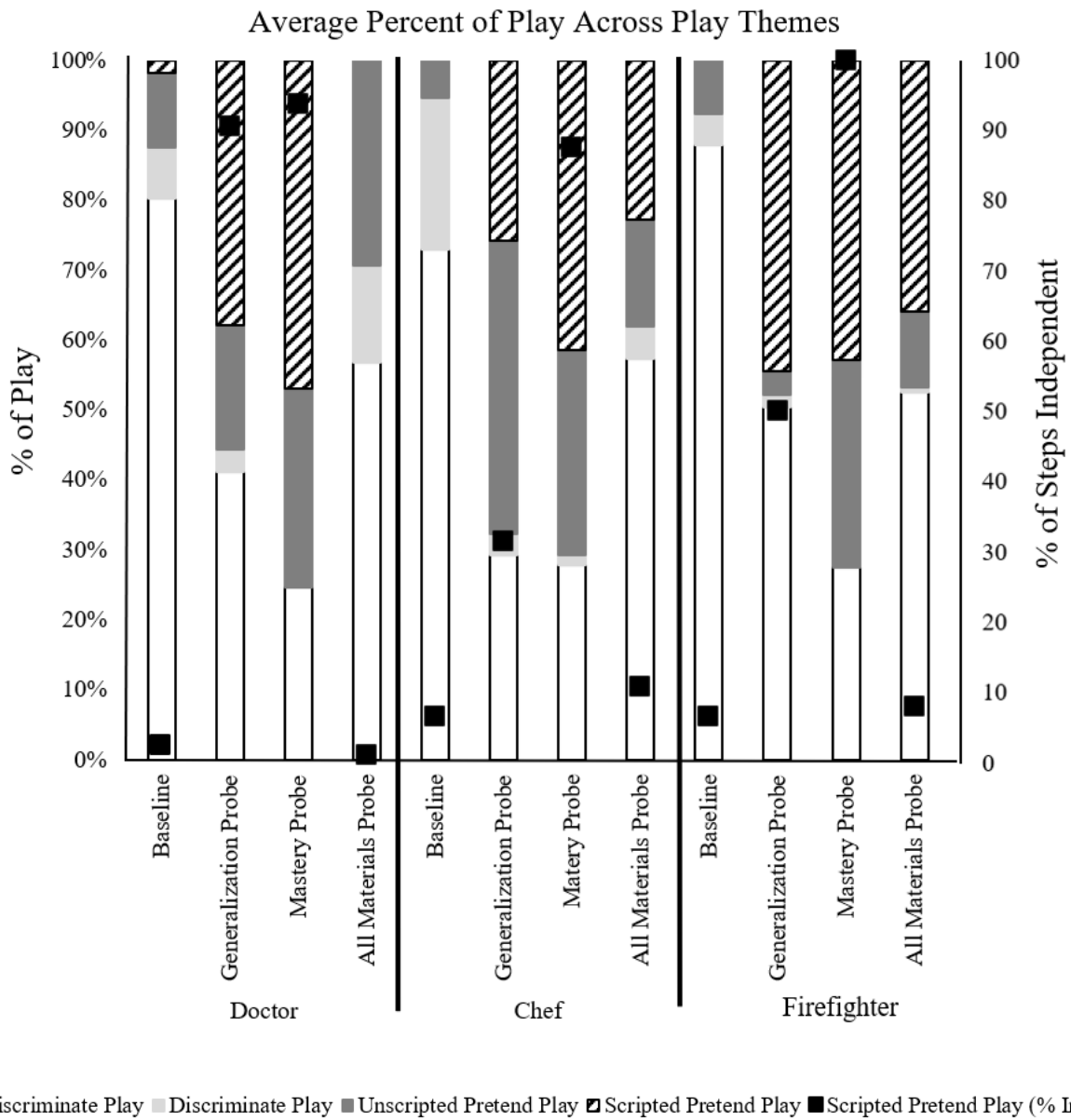*Average percent of play across play theme for participant Andy*

Average Percent of Play Across Play Themes

□ Indiscriminate Play   ■ Discriminate Play   ■ Unscripted Pretend Play   ◪ Scripted Pretend Play   ■ Scripted Pretend Play (% Ind.)

Figure 3

Percent of play during all materials probes for participant Andy

All Materials Probe

□ Indiscriminate Play ■ Discriminate Play ■ Unscripted Pretend Play ◪ Scripted Pretend Play ■ Scripted Pretend Play (% Ind.)
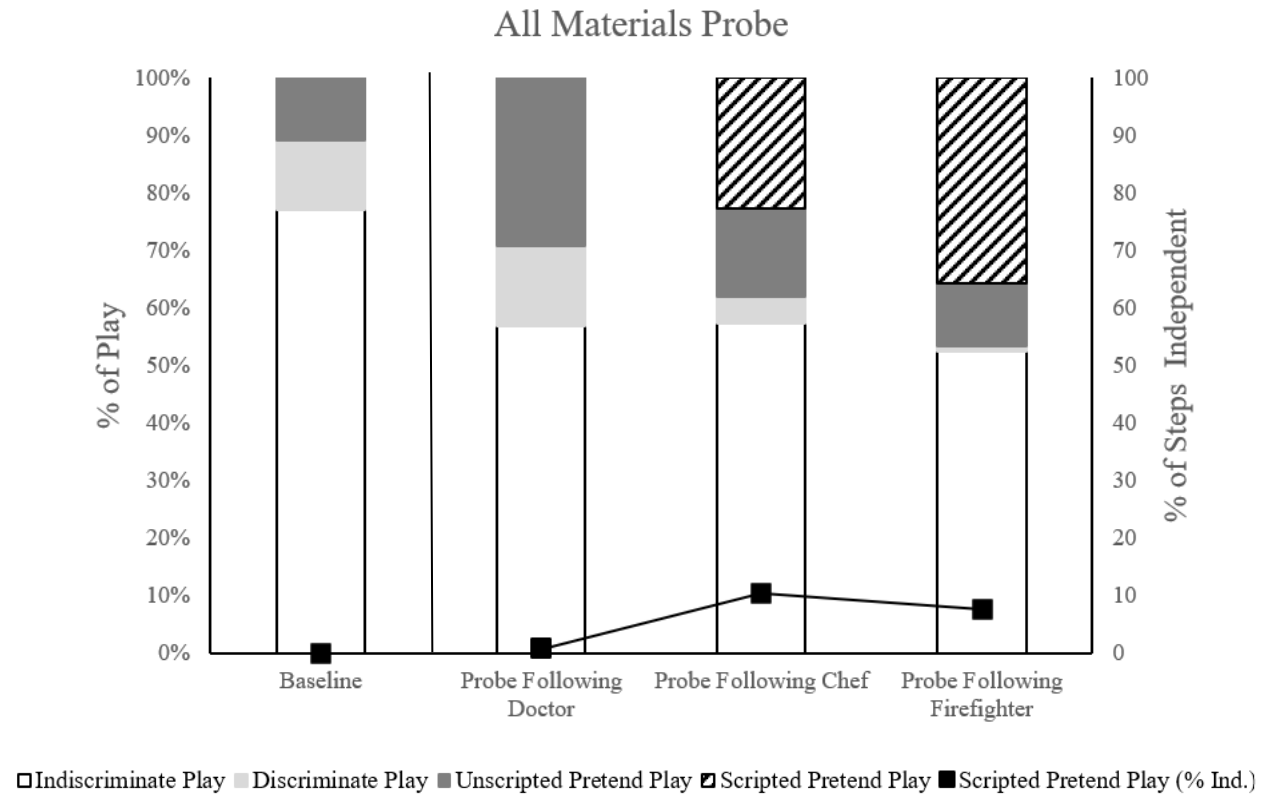
Figure 4

Average percent of change across play scenarios for participant Andy

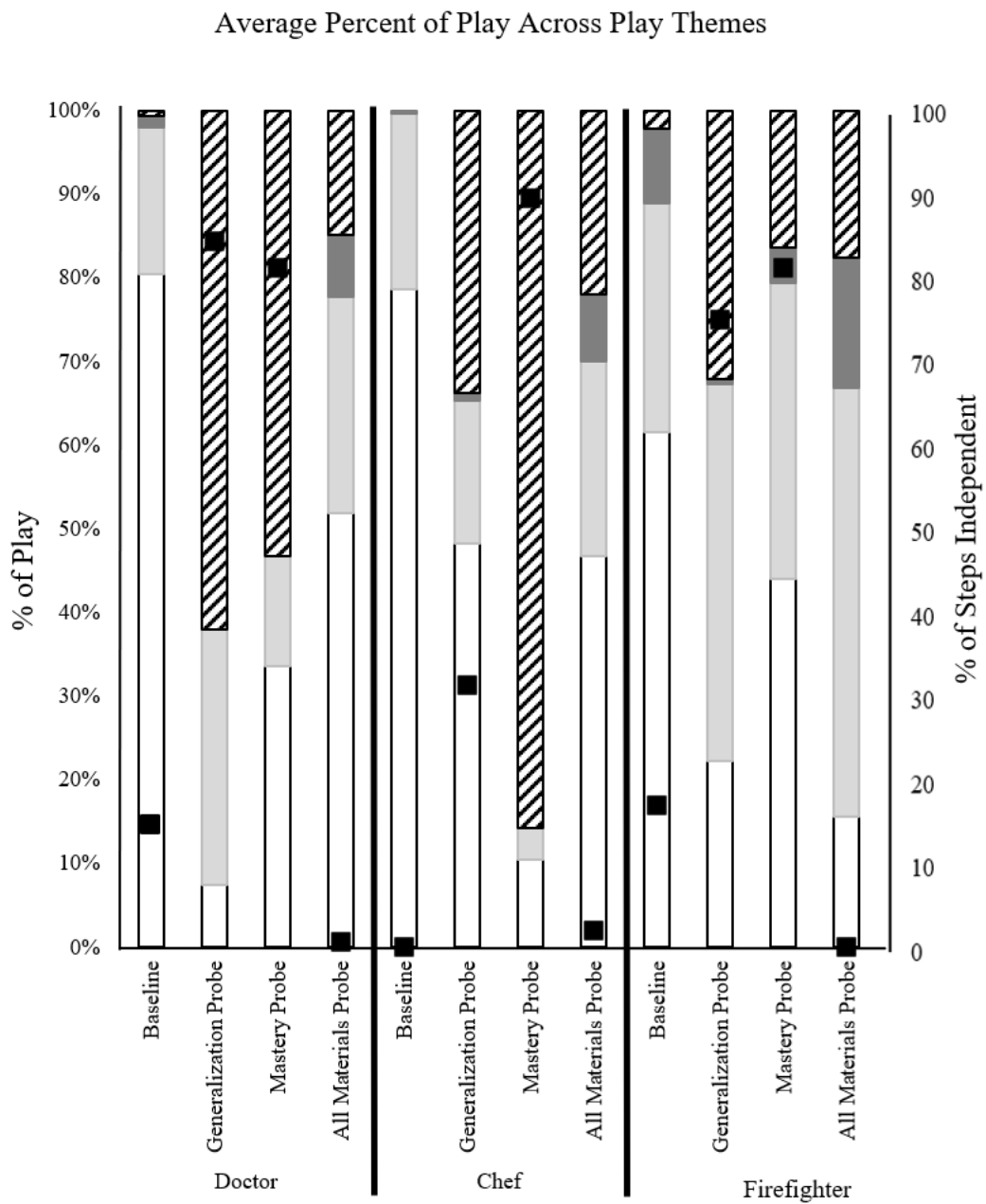|	Doctor Animal	Doctor Baby	Doctor Figurine	Chef Cake	Chef Pizza	Chef Pie	Firefighter House	Firefighter Car	Firefighter Kitchen
Unscripted Indiscriminate Play	-49.7	-29.3	-26.4	-74.1	-50.3	-19	-21.5	-49.5	-53.4
Unscripted Discriminate Play	-100	-62.5	12.8	61.4	-100	-89.3	-100	-100	2.4
Unscripted Pretend Play	376.5	156	99.1	254.7	5,241	850	194	4,555	0
Scripted Pretend Play	1,410	3,122	6,870	6,380	7,298	2,580	3,657	8,066	7,788
Scripted Pretend Play (% of steps independent)	1,400	8,650	9,275	1,400	1,300	1,200	700	9,900	1,400

Figure 5

Percent of session and percent of steps independent across the chef, doctor, and firefighter play themes for participant Paul
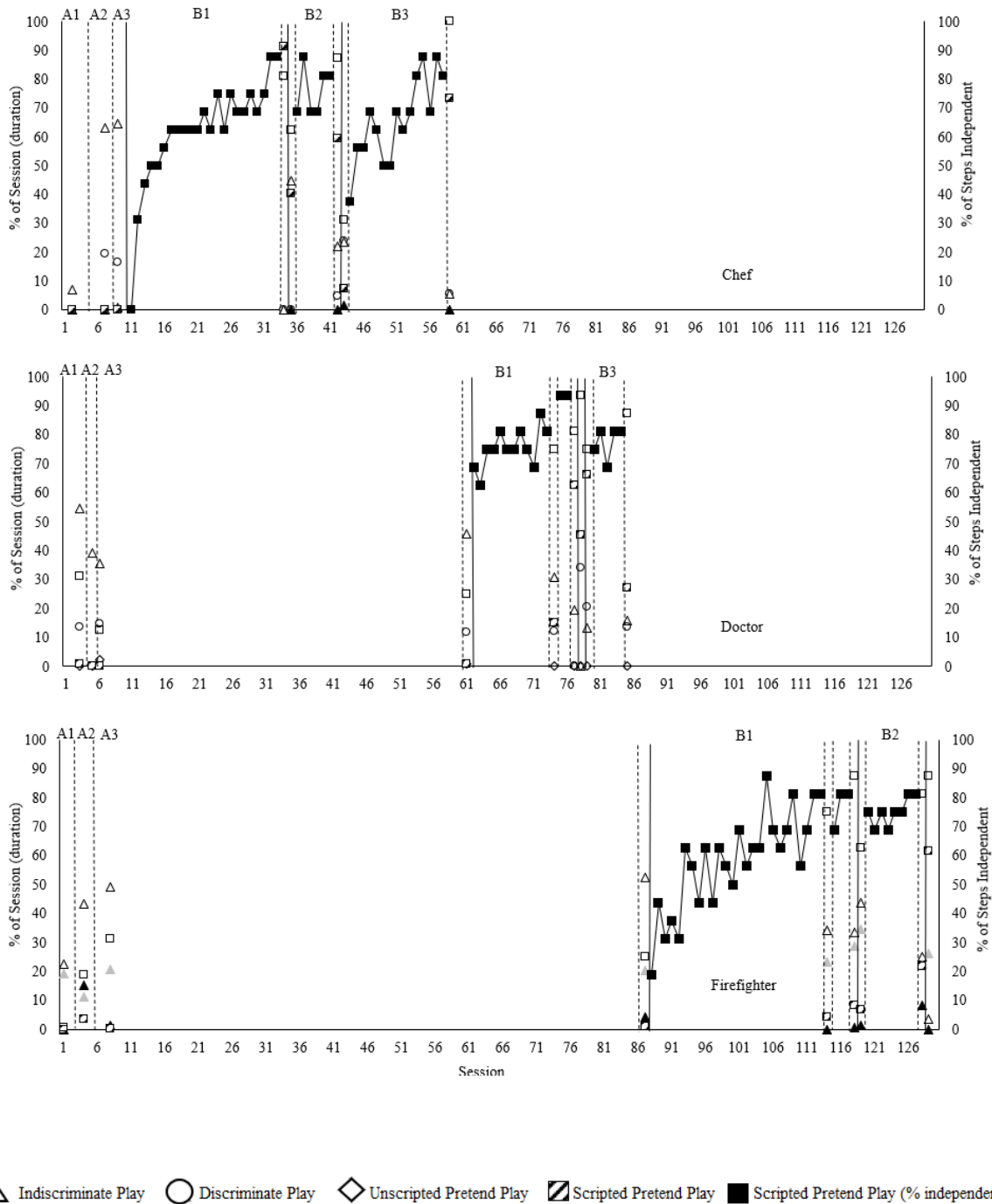
Note. Open shapes represent measures collected during probe conditions while the closed black squares represent data collected during training. A1, A2, and A3 represent baseline conditions across play themes while B1, B2, and B3 represent training conditions across play themes.

Figure 6

Average percent of play across play theme for participant Paul

Average Percent of Play Across Play Themes

☐ Indiscriminate Play ▨ Discriminate Play ▨ Unscripted Pretend Play ▨ Scripted Pretend Play ■ Scripted Pretend Play (% Ind.)

Figure 7

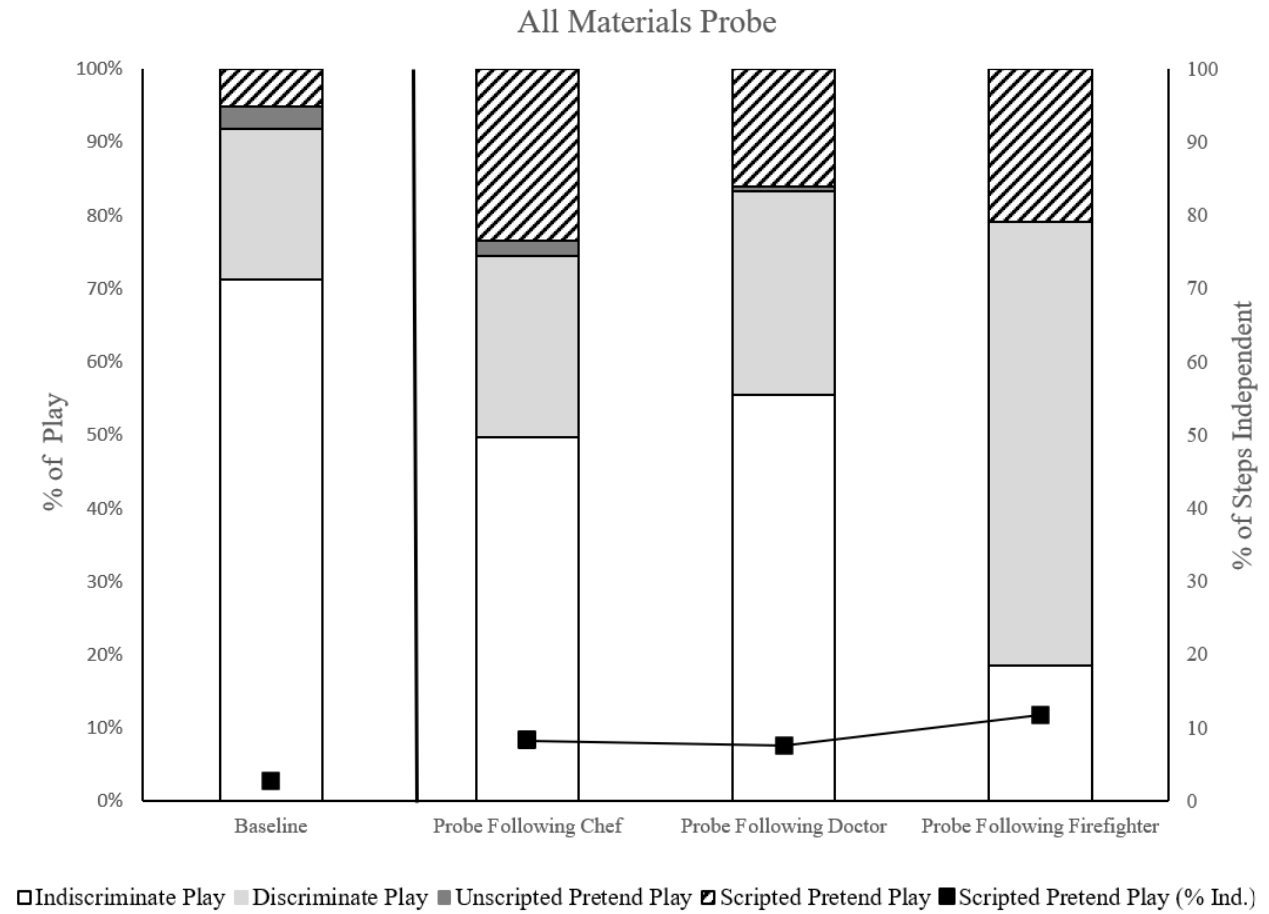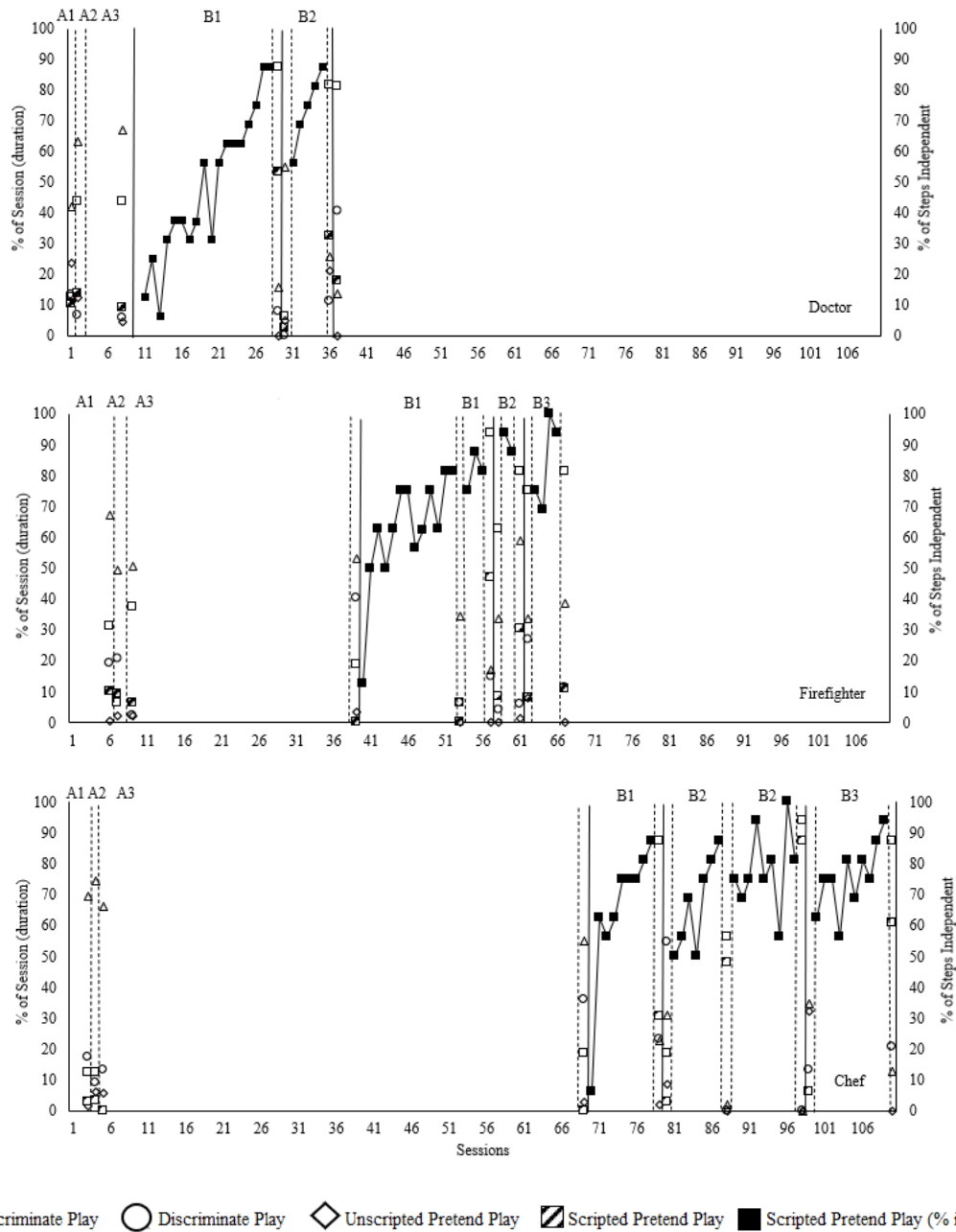*Percent of play during all materials probes for participant Paul*

Figure 8

Percentage of change across play scenarios for participant Paul

	Doctor Animal	Doctor Baby	Doctor Figurine	Chef Cake	Chef Pizza	Chef Pie	Firefighter House	Firefighter Car	Firefighter Kitchen
Unscripted Indiscriminate Play	-64.2	-100	-55.9	-100	-65	-23.8	-92.8	10.6	-21.3
Unscripted Discriminate Play	-100	3,317	-7.4	-100	-75.8	433	27.3	16.5	152.4
Unscripted Pretend Play	0	0	-100	-100	0	0	-100	733	-95.6
Scripted Pretend Play	6,150	4,460	2,614	9,030	5,833	7,233	18,506	2,066	130.5
Scripted Pretend Play (% of steps independent)	160	9,275	600	8,025	8,620	9,900	180	12,210.6	366.6

Figure 9

Percent of session and percent of steps independent across the doctor, firefighter, and chef play themes for participant Anna

Note. Open shapes represent measures collected during probe conditions while the closed black squares represent data collected during training. A1, A2, and A3 represent baseline conditions across play themes while B1, B2, and B3 represent training conditions across play themes.

Figure 10

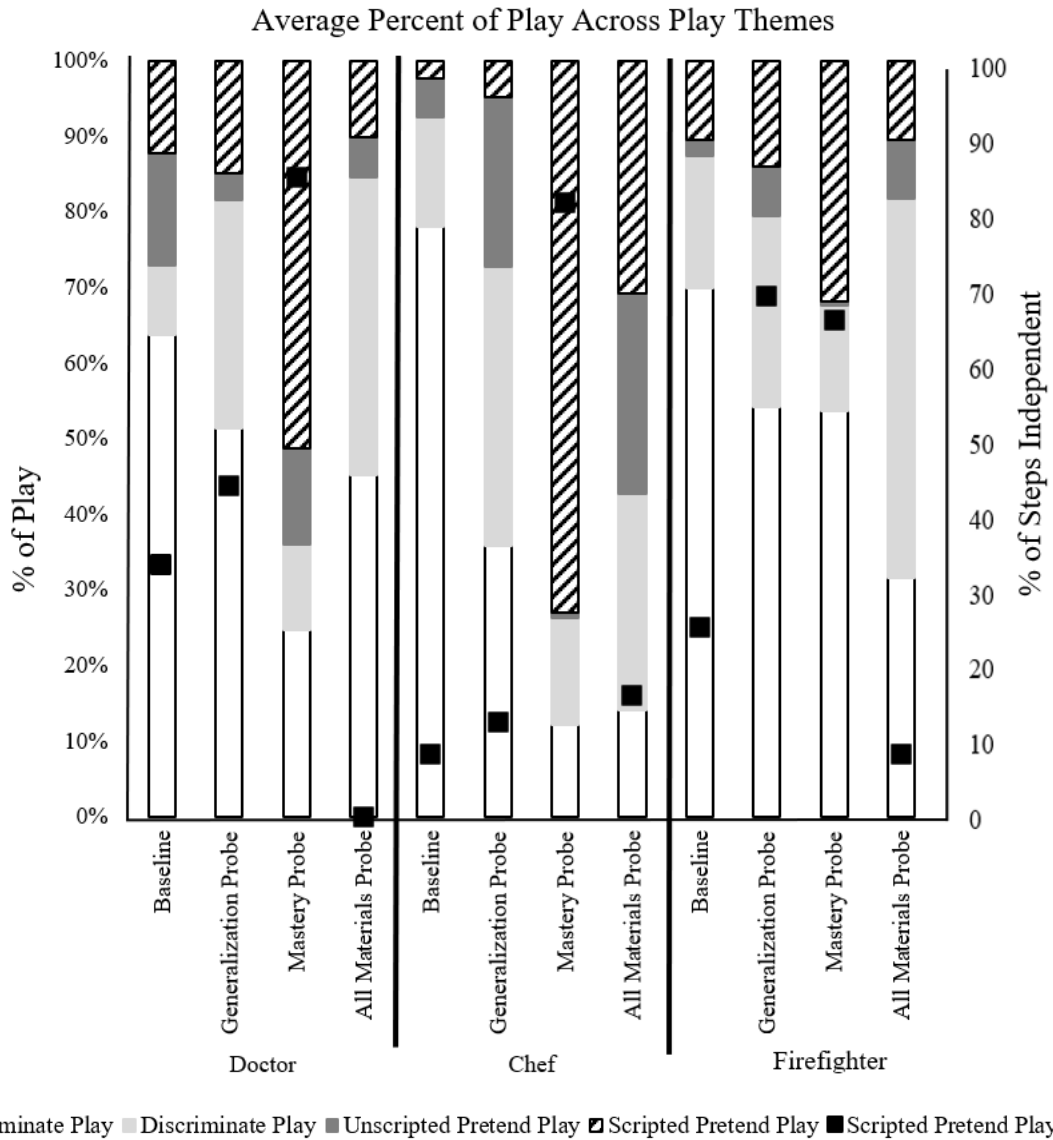*Average percent of play across play theme for participant Anna*

Figure 11

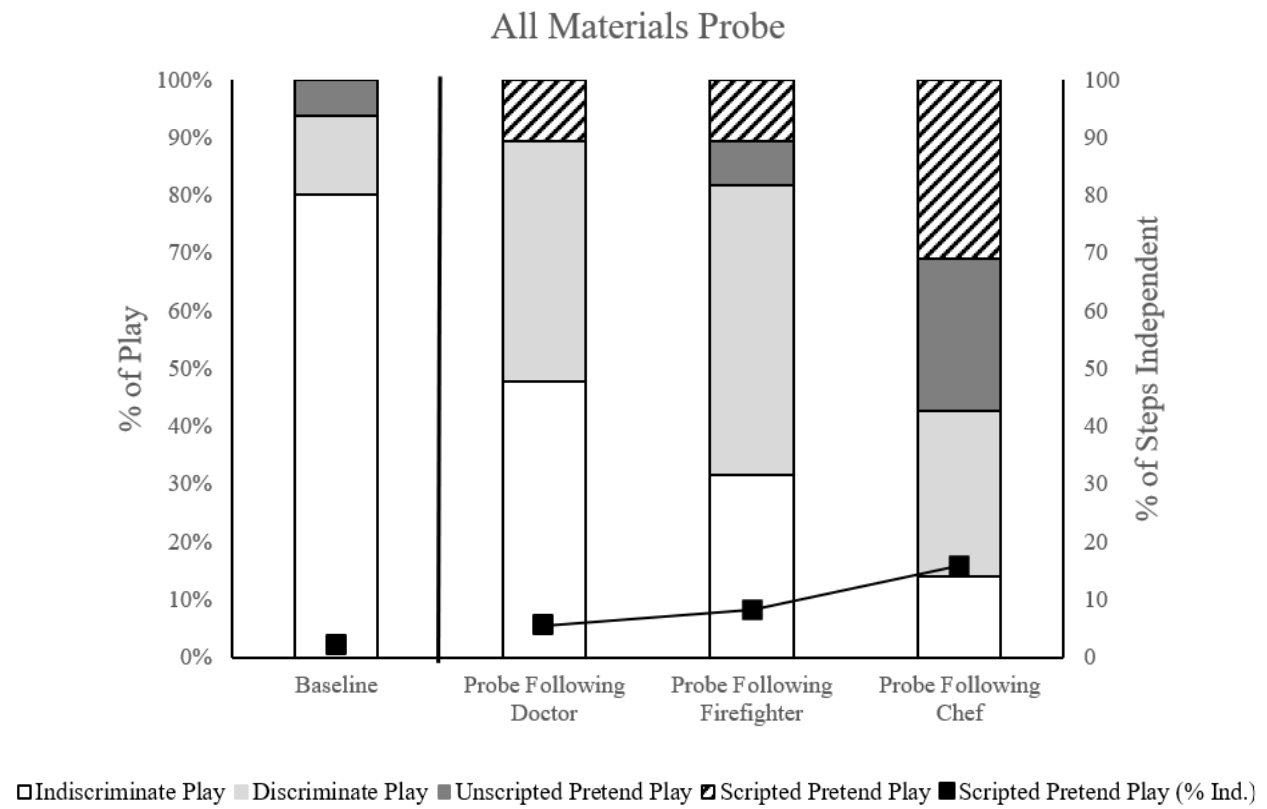*Percent of play during all materials probes for participant Anna*

Figure 12

Percentage of change across play scenarios for participant Anna

	Doctor Animal	Doctor Baby	Doctor Figurine	Chef Cake	Chef Pizza	Chef Pie	Firefighter House	Firefighter Car	Firefighter Kitchen
Unscripted Indiscriminate Play	-62.8	-59.5	-79.6	-100	-80.4	-67.3	16	-65.5	-42.5
Unscripted Discriminate Play	-40	76.6	618.3	-100	59.2	104.3	204	-28.5	-40.3
Unscripted Pretend Play	-100	71.6	-100	-100	-100	26.5	-37.5	-100	-100
Scripted Pretend Play	414.9	136.3	89.5	2,521.6	5,970	917.3	380.2	422.2	10
Scripted Pretend Play (% of steps independent)	600	86.2	85.7	650	8,650	600	116.6	1,400	160

Figure 13

Percent independent of generalized play across participants across all 9 play scenarios

Play Scenario	Andy	Paul	Anna
Chef Cake			18.75%
Cake Pizza	50%	62.5%	6.25%
Chef Pie	12.5%	31.25%	
Doctor Animal			
Doctor Baby	87.5%	93.75%	6.25%
Doctor Figurine	93.75%	75%	81.25%
Firefighter House		87.5%	62.5%
Firefighter Kitchen	93.75 %		75%
Firefighter Car	6.25 %	62.5%	
TOTAL sessions with generalized play	3 out of 6 (50%)	2 out of 6 (33.3%)	1 out of 6 (16.66%)