

January 01, 2009

## Comparing video models to in vivo models as a way to teach play skills to children under the age of 3

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### Recommended Citation

Lane, Janine, "Comparing video models to in vivo models as a way to teach play skills to children under the age of 3" (2009). *Applied Behavioral Analysis Master's Theses*. Paper 13. <http://hdl.handle.net/2047/d20000012>

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**Comparing Video Models to In Vivo Models as a Way to Teach Play Skills to  
Children Under the Age of 3**

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Submitted in partial fulfillment of the requirements for the degree of  
Master of Science in Applied Behavior Analysis  
In the Bouve College of Health Sciences Graduate School of  
Northeastern University, August 2009

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## Abstract

Video modeling and live modeling have been shown to be successful strategies for teaching play skills to children with autism. The purpose of the current investigation was to compare rates of acquisition of play scripts using video modeling versus in-vivo modeling. The subjects included one child with autism and one typically developing child under the age of three. Pre-requisite skills were assessed for each participant. The dependent variables were the number of scripted actions and vocalizations performed correctly and trials to mastery. The independent variables were the type of model used and video vs. in-vivo and. An alternating treatments design across model types was used. Each participant was trained on two play sets using a video model and two play sets using an in-vivo model. Results of the pre-requisite testing showed that both participants scored 100% on attending to a preferred video and below 80% on all other tests. Results for the child with autism and typically developing child showed that video modeling and in-vivo modeling were both effective in teaching actions with objects within a play script.

## Teaching Play Skills

Individuals with developmental disabilities have frequently shown difficulties in social interactions and complex play skills. A variety of techniques have been used to successfully increase appropriate social interactions and play skills through peer modeling, self-modeling, in-vivo modeling and video modeling.

Peer modeling consists of the teacher actively programming opportunities for social interactions between the child with autism and their typically developing peers. Typical peers serve as facilitators of learning, communication and play skills. Egel, Richman and Koegel (1981) performed a study in which four children diagnosed with autism who were having difficulty with tasks in the classroom would observe a typically developing peer give the correct response to an instruction. The teacher gave the child with autism the same instruction given to the peer and provided reinforcement for correct responses. The results showed that in all children diagnosed with autism there was an increase in correct responding across all discrimination tasks. Egel et al. discussed several factors for the success of peer modeling in their study. The first factor that may have contributed to the increase in correct responding is that the participants used in the study were not among the most severe autistic population. The participant's imitative repertoires, receptive language and early stages of expressive language may be higher than average across individuals diagnosed with autism. It may be the case that with other children, these pre-requisite behaviors would need to be trained prior to beginning the peer modeling. The models used in the study were also the same age as the participants which may be overall more effective than using models outside of the participant's age. The novelty of using peer models as a learning tool could increase attentional skills, more

so than other teaching methods. Egel et al. suggest integration should be considered for all children diagnosed with autism because the typically developing peers could promote learning in a novel way through observation. Another study using peer models evaluated one boy with autism and four typically developing peers who served as models (Arntzen, Halstadro, & Halstadro 2003). This study differed from the Egel et al. study in that the typically developing peers received tokens as reinforcement for correct responding. The teachers used physical and verbal prompts to teach the steps of a game to the child with autism and he not only reach the performance criterion, but increased his overall social interactions with the typically developing peers. Overall, peer modeling is an effective teaching method for children with autism.

Self-modeling is yet another teaching method used with children with developmental disabilities and involves the participant viewing themselves in situations where they perform at a more advanced level than they typically function (Buggey, Toombs, Gardner, & Cervettie 1999). This is done through recording the child and editing the video so that it reveals only the desired behaviors. Buggey et al. used self-modeling to teach three children diagnosed with autism to answer questions typically asked during play interactions. After viewing the videos of themselves making correct responses to the questions, all three children showed increases in desired behaviors. Self-modeling is an effective means of teaching responding behaviors and the authors noted that the participants enjoyed watching themselves.

Video modeling is used to teach a variety of behaviors such as social interaction, perspective taking, complex play, academic skills and self-help tasks. Video modeling includes a model that is videotaped, where as in vivo modeling includes a live model.

Both methods are often used to encourage changes in existing behaviors and promote the learning of new skills (Nikopoulos & Keenan 2003). After watching the live or video model, the learner then demonstrates the acquired skills in natural settings. A number of researchers have conducted studies to determine if in vivo or video modeling is a more effective teaching procedure in children with developmental disabilities. Gena, Courloura and Kymissis (2005) conducted a study in which three preschoolers diagnosed with autism were taught affective behaviors through in vivo and video modeling. The preschoolers did speak in full sentences and did not display any affective responses. Following both treatments, preschoolers showed increases in affective behavior, and generalization occurred. In vivo and video modeling were equally effective. In contrast, another study showed that five children diagnosed with autism had a higher frequency of correct responding on a variety of tasks when the model was in the form of a video rather than live (Charlop-Christy, Le, & Freeman 2000). Not only did they show that video modeling is more effective but also that it is more efficient. Video modeling provides a reliable and consistent treatment method since the videotape allows an identical showing of the behavior each time it is viewed. The cost of recording a model's behavior once is less than that of using a live model across different children, behaviors and settings.

Nikopoulos and Keenan (2003) examined the use of video modeling to teach participants with profound mental retardation to initiate social interactions. This study compared the use of typically developing peers, familiar adults, unfamiliar adults and the individual themselves as models in the video. The results showed that there were equal results in the decrease of latency to social interactions and the amount of time spent

engaging in appropriate play by each participant regardless of the type of model used in the video.

Perspective taking is another skill taught using video modeling and involves an “understanding of what another person believes about events may be different from reality and that those beliefs will guide future behavior” (Leblanc et al., 2003). The Sally-Anne false-belief task tests of the perspective taking skill involves the child predicting the behavior of a puppet. The child watches the puppet observe a hidden object in one location and the puppet does not see where the object is moved. If the child has perspective taking skills, he or she will answer based on the puppets observation and not their own observation. This is an important skill since it is an integral function of social behaviors and children with autism have difficulty with false-belief tasks. Research shows that using video modeling combined with the child explaining what the video showed is an effective tool for teaching children diagnosed with autism the perspective taking skill (LeBlanc et. al 2003).

Complex play skills are another area of difficulty for children diagnosed with autism. Many studies have examined the effectiveness of video modeling to teach these skills and one such study involves one preschooler with autism who exhibited repetitive and rigid play behavior, rarely verbalized during play, and engaged in self-stimulatory toy manipulation (D’Ateno, Mangiapanello, & Taylor, 2003). The authors used an adult model who demonstrated play sequences which addressed deficits in imaginative play skills including motor and verbal responses. There was no praise, prompting or correction procedures and the results revealed an increase in the number of modeled verbal and motor responses and low frequency of novel and non-modeled play.

Jahr, Eldevik, and Eikseth (2000) evaluated video modeling with six individuals diagnosed with autism who had little to no cooperative play. The authors split the participants into two groups. The first group just viewed the video, while the second group viewed the video and described the play episode verbally. Cooperative play was acquired when the model observations were paired with verbal descriptions of the play sequence.

When video modeling alone is not effective, breaking a video into segments may be (Reamer, Brady, & Hawkins 1998). Reamer et al. used the segments to teach three children with autism different toy structures. They used response blocking to interrupt response errors and did not use any physical prompts.

Tereshko (unpublished) showed that participants who displayed seven pre-assessment skills (matching identical pictures to objects, delayed matching pictures to objects, generalized imitation, motor imitation with objects, attending to a video, matching computer screen pictures to objects and motor skills needed to assemble toy structures) were more likely to learn through the use of full video modeling. When the participants lacked the skill of delayed picture to object matching, they benefited from having the video broken into segments. This demonstrated that delayed object to picture matching may be a pre-requisite to video modeling because there is a short delay from when the participant views the video model to when they are ready to play with the materials.

In summary, video modeling and in vivo modeling as treatment procedures are effective and can be done in a variety of forms and teaches a variety of different skills. The purpose of this study was to compare video models to in vivo models as a way to

teach play skills to children under three and to compare the effectiveness of both models with one child with autism and one typically developing child.

### Method

#### *Participants*

The participants were one boy diagnosed with autism and one boy who was typically developing. Charlie was a 19 month old boy who was diagnosed with autism and was receiving home-based therapy. He lived at home and mainly communicated through gestures and vocal approximations. Daniel was a typically developing 19-month-old boy, only one week younger than Charlie. He attended a daycare 5 days a week for a total of 40 hours. Daniel communicated vocally to make requests and comments.

#### *Setting*

All sessions for the typically developing child were conducted in a room equipped with a video camera, DVD player (in sessions using a video as the model), play sets required for each session and a table with two chairs. Any other toys or materials were removed from the room.

All sessions for the child with autism were conducted in the child's home. An area of the child's workspace was cleared of unnecessary materials. The child sat in a cube chair with an attached tray, rather than at a table. The space was equipped with a video camera, DVD player (in sessions using a video as the model) and play sets required for each session.

#### *Materials*

Pre-assessment materials included common objects and identical pictures. During the baseline and training, the following materials were used: the little people toy sets bus, an airplane, a carwash and baby farm animals. The airplane and bus both

consisted of 8 actions, while the carwash and the baby farm animals both consisted of 9 actions.

### *Videos*

*Bus.* A school bus play set included a bus driver already seated in the driver's seat, a boy, and a girl in a wheelchair. The bus had a side door and a back door.

*Airplane.* An airplane play set included a pilot, 2 other passengers, and a suitcase.

*Carwash.* A carwash play set included a car with a driver, an attendant, a stoplight, a gas pump and a carwash.

*Baby farm animals.* A baby farm animal play set included a duck, goat, rabbit, rooster and girl. The structure had two fences containing pretend food that the animals would eat and a water well from which the duck drank water.

### *Independent Variables*

One independent variable was the type of model used, video model versus in vivo model. The video was a clip of an adult engaging with the play set two times and following a specific script of actions and vocalizations. The in vivo model was an adult performing the scripts with each play set live in front of the child two times. A second independent variable was whether the child was diagnosed with autism or typically developing.

### *Dependent Measures*

All sessions were scored for scripted play actions and the number of trials to mastery.

*Scripted actions.* Scripted actions were defined as a motor response that was the same as the motor response demonstrated in the video model or in vivo model. A play

action was scored complete regardless of the order in which the child completed the actions. An example of a scripted action was the participant moving a pilot to the driver's seat of the airplane. A non-example was the participant moving the pilot to a passenger's seat of the airplane.

### *Experimental Design*

An alternating treatments design across play sets and type of model was used to examine the effects of the use of a video model versus a live model and compare the effectiveness of both models with a typically developing child and a child diagnosed with autism. Charlie was trained on the bus and carwash using a video model and on the airplane and baby animals using an in vivo model. Daniel was trained on the bus and carwash with an in vivo model and on the airplane and baby animals with a video model. (See Table 1) A baseline was taken prior to training on all toy structures for both participants.

### *Procedures*

*Pre-assessment.* During the pre-assessment condition, both participants were tested on the following eight skills: motor imitation, picture to object matching, actions with objects, delayed picture to object, attending to video, computer screen to object matching, motor tasks with actions with objects and delayed computer screen to object matching (See Table 2). Prior to each assessment condition, a mini-preference assessment was conducted and the preferred edible was then used as reinforcer for correct responses. Any attempts made by the participant to leave the table were blocked and redirected using least-to-most manual guidance. All sessions were video taped.

*Baseline.* The experimenter used least to most manual guidance to direct the participant to the table and placed the toy construct on the table. The participant was given 3 min to engage with the materials and no reinforcement was provided. There was no consequence for comments directed at the experimenter.

*Video Modeling.* The participant was led into the session room and prompted to sit at the table. The therapist started the video and the video model was shown two times. Attempts to leave the chair were neutrally blocked and redirected. The play set was hidden under the table until the model was complete. Upon completion of the model, the participant was given the corresponding toy construct and told, "It's time to play". Any comments directed to the therapist were ignored. If the participant tried to leave the table, the therapist used least-to-most guidance to redirect the child back to the table. Following completion of the play script or two minutes the child was directed away from the play set and no programmed consequences were provided. The participants did not have access to any of the play sets or stimuli outside of the sessions.

*In Vivo Modeling.* The participant was led into the session room and prompted to sit at the table. The therapist sat in a chair next to the participant and demonstrated correct play with the appropriate play set two times. Attempts to leave the chair were neutrally blocked and redirected. The play set was hidden under the table until the model was complete. Upon completion of the model, the participant was given the corresponding toy construct and told, "It's time to play". Any comments directed to the therapist were ignored. If the participant tried to leave the table, the therapist used least-to-most guidance to redirect the child back to the table. Following completion of the play script or two minutes the child was directed away from the play set and no programmed

consequences were provided. The participant did not have access to any of the play sets or the stimuli outside of the sessions.

*Criterion for mastery for scripted actions during training.* The criterion for scripted actions was 80% accuracy on all play sets for 2 consecutive sessions.

*Mastery Probes.* Probes were conducted following mastery of each play set and were identical to the baseline conditions. The child was given the toy construct and told, “It’s time to play” and given 3 minutes to interact with the materials. If the child completed all of the scripted actions prior to the 3 min, the child was led away from the table.

#### *Interobserver Agreement*

Interobserver agreement (IOA) was calculated using direct observation and review of videotapes. IOA was collected on 56 % of pre-assessment sessions for Charlie and 36% of pre-assessment sessions for Daniel. IOA for Charlie and Daniel’s pre-assessment sessions were 97% and 98% (range, 96.96% -97.6%), respectively. IOA was collected on Charlie’s scripted actions in 33% of baseline and treatment sessions for the bus play set with 97% accuracy, 33% of baseline and treatment sessions for the airplane play set with 91% accuracy, 45% of baseline and treatment sessions for the baby animal play set with 96% accuracy and 45% of baseline and treatment sessions for the carwash play set with 98% accuracy. IOA was collected on Daniels’s scripted actions in 45% of baseline and treatment sessions for the bus play set with 100% accuracy, 54% of baseline and treatment sessions for the airplane play set with 98% accuracy, 40% of baseline and treatment sessions for the baby animal play set with 94% accuracy and 33% of baseline and treatment sessions for the carwash play set with 100% accuracy.

## Results

Results on the pre-assessment for Charlie and Daniel are shown in Table 2. During the motor imitation task, Charlie and Daniel responded correctly in 56% and 78% of trials, respectively. In matching pictures to objects, Charlie and Daniel responded correctly in 28% of trials. During imitating actions with objects, Charlie and Daniel responded correctly in 33% and 44% of trials, respectively. During delayed picture to object matching, Charlie and Daniel responded correctly in 33% and 44% of trials, respectively. Charlie and Daniel attended to a preferred video for 100% of intervals. During computer screen to object matching, Charlie and Daniel responded correctly in 33% and 44% of trials. Charlie and Daniel imitated motor tasks with actions with objects correctly in 44% and 78% of trials. Finally, during delayed computer screen to object matching, Charlie and Daniel responded correctly in 0% of trials.

Results for Charlie on the first set of play sets are displayed in Figure 1. During the baseline sessions, Charlie accurately completed 3 out of 8 actions with the school bus play set and 2 out of 8 actions with the airplane set. The model used for Charlie for the school bus play set was a video model while the training used for the airplane was an in vivo model. Charlie mastered the bus play set (video model) in 3 sessions and the airplane play set (in vivo model) in 4 sessions. Charlie maintained 100% accuracy in the probe sessions for the school bus and the airplane.

Results for Daniel on the first play sets are displayed in Figure 2. Daniel accurately completed 3 out of 8 actions with the school bus play set and 2 out of 8 actions with the airplane play set. The model used for Daniel for the school bus play set was an in vivo model while the training method used for the airplane was a video model. Daniel

mastered the bus play set (in vivo model) in 4 sessions and airplane play set (video model) in 3 sessions. Daniel maintained 75% accuracy in the probe sessions for school bus and airplane.

Following the mastery of the first set of play structures, Charlie and Daniel were re-tested on the pre-assessment skills of imitating actions with objects. They were also tested on imitation of actions with objects following a 3-second delay. Results of these assessments are shown in Table 3. Charlie responded correctly in 100% of trials to imitate actions with objects and to imitate actions with objects with a 3-second delay. Daniel responded correctly in 55% of trials to imitate actions with objects and in 89% of trials to imitate actions with objects with a 3-second delay.

Results for Charlie on the second set of play sets are displayed in Figure 3. During the baseline sessions for the second set of play sets, Charlie completed 2 out of 9 actions with the carwash play set and 0 out of 9 actions with the baby farm animal play set. Charlie mastered the carwash play set (video model) and the baby animal play set (in vivo model) in 9 sessions. Charlie maintained 100% accuracy in the probe session for the carwash play set and 75% accuracy in the probe session for the baby farm animal play set. Results for Daniel on the second set of play sets are displayed in Figure 4. During the baseline sessions, Daniel completed 1 out of 9 actions with the baby farm animal play set and 3 out of 9 actions with the carwash play set. Daniel mastered the carwash play set (live model) in 3 sessions and the baby farm animal play set in 9 sessions. Beginning on session 11, an instruction was added in which the experimenter stated “I am going to play with this two times, and then I want you to do what I do”. The instruction was added due to a variety of novel play scripts emerging and taking the place of the modeled play

script. Daniel maintained 100% accuracy in the probe session for the carwash play set and 66.6% accuracy in the probe session for the baby farm animal play set.

### Discussion

The results of the current study were consistent with previous research that indicated that video modeling and in vivo modeling are effective methods for teaching play skills in children with autism (Gena et al., 2005). In the current study, both participants acquired the scripted actions that were taught using a video model and in vivo model. This study shows that video modeling and in vivo modeling were an effective teaching method for children under the age of three. Initially the experimenter collected data on scripted actions and vocalizations. Following several sessions, the experimenter concluded that the participants did not have the verbal repertoire needed for the play scripts. Data collection on vocalizations was discontinued. Prior to discontinuing data collection on vocalizations, there was variability in responding within the in vivo treatment condition. The experimenter also continued running sessions past the mastery criteria for Daniel; however the same variability within the in vivo model was not replicated.

In the current study neither participant had the pre-assessment skills at the start of training sessions, and both participants reached mastery criteria for all 4 play sets used, regardless of whether the model was a video or in vivo. Following the mastery of the first set of play constructs, the participants were re-tested on imitation of actions with objects, as well as imitation of actions with objects following a 3-second delay. Although Charlie (child with autism) responded accurately in 100% of trials, Daniel (typically developing child) only responded accurately in 55% of trials to imitate actions with objects and 89%

of trials to imitate actions with objects with a delay. At the time of the reevaluation of these skills, Charlie was 27 months old and Daniel was 28 months old. Anecdotally, Daniel (typically developing child) was manipulating the materials in a functional manner rather than imitating the previously modeled arbitrary action. For example, when the experimenter modeled placing a tennis ball into a paper cup, Daniel picked up the ball and threw it across the session room. Future research should evaluate the actions used in the pre-assessment tasks and possibly use materials that are novel to the participant.

The following are some limitations of the study. First, only two children participated in the study, one child with autism and one typically developing child. A small sample of participants limited the external validity of this study. A second limitation is that due to the young age of the participants, it was extremely difficult to collect data on vocalizations. Future research should investigate the effect of attending behavior during the video model and in vivo model in children under three. It is possible that varied attending data could account for the variability in the data for Charlie and Daniel's responding in Set 1. A possible confound of this study was an overall slower acquisition rate with the farm animal play set due to the nature of the task. The scripted actions in the baby farm animal set included pretending to make animals eat various food items. It is possible that this task was more difficult than the other three play sets. Future research should also equate task difficulty and investigate novel actions and vocalizations to determine if the video or in vivo model would teach only a script or generalized play skills.

Another area of research could be to investigate whether the procedures used to test the pre-assessment skills are appropriate for children under three. It is possible that

some children under the age of three have the necessary pre-requisite skills for video modeling but the pre-assessment test is not appropriate for them. It is possible that the children have more limited experience with the types of tasks used in the pre-requisite test, and so they were unable to perform accurately. Finally, the current results indicate that using video modeling and in vivo modeling are effective in teaching play skills to children with autism and typically developing children under the age of three, regardless of the accuracy on the pre-assessment skills tested in this study.

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Table 1. Training Conditions

	Video Model	Live Model
Charlie	Bus/Carwash	Airplane/Baby animals
Daniel	Airplane/Baby Animals	Bus/Carwash

Table 2. Pre-assessment results for Charlie and Daniel

Task	Charlie	Daniel
Motor Imitation	56%	78%
Pictures to Objects	28%	28%
Actions with Objects	33%	44%
Delayed Picture to Object	33%	44%
Attending to Video	100%	100%
Computer Screen to Object Matching	33%	44%
Motor Tasks with Actions with Objects	44%	78%
Delayed Computer Screen to Object Matching	0%	0%

Table 3. Re-evaluation for Charlie and Daniel on imitating actions with objects with and without a delay.

Task	Charlie	Daniel
Actions with Objects	100%	55%
Actions with Objects-3 second delay	100%	89%

Figure Captions

Figure 1. Number of correct actions with the bus play set (video model) and the airplane play set (in vivo model) for Charlie.

Figure 2. Number of correct actions with the bus play set (in vivo model) and airplane play set (in vivo model) for Daniel.

Figure 3. Number of correct actions with the carwash set (video model) and the baby farm animal play set (in vivo model) for Charlie.

Figure 4. Number of correct actions with the carwash play set (in vivo model) and baby farm animal play set (in vivo model) for Daniel.

Figure 1.

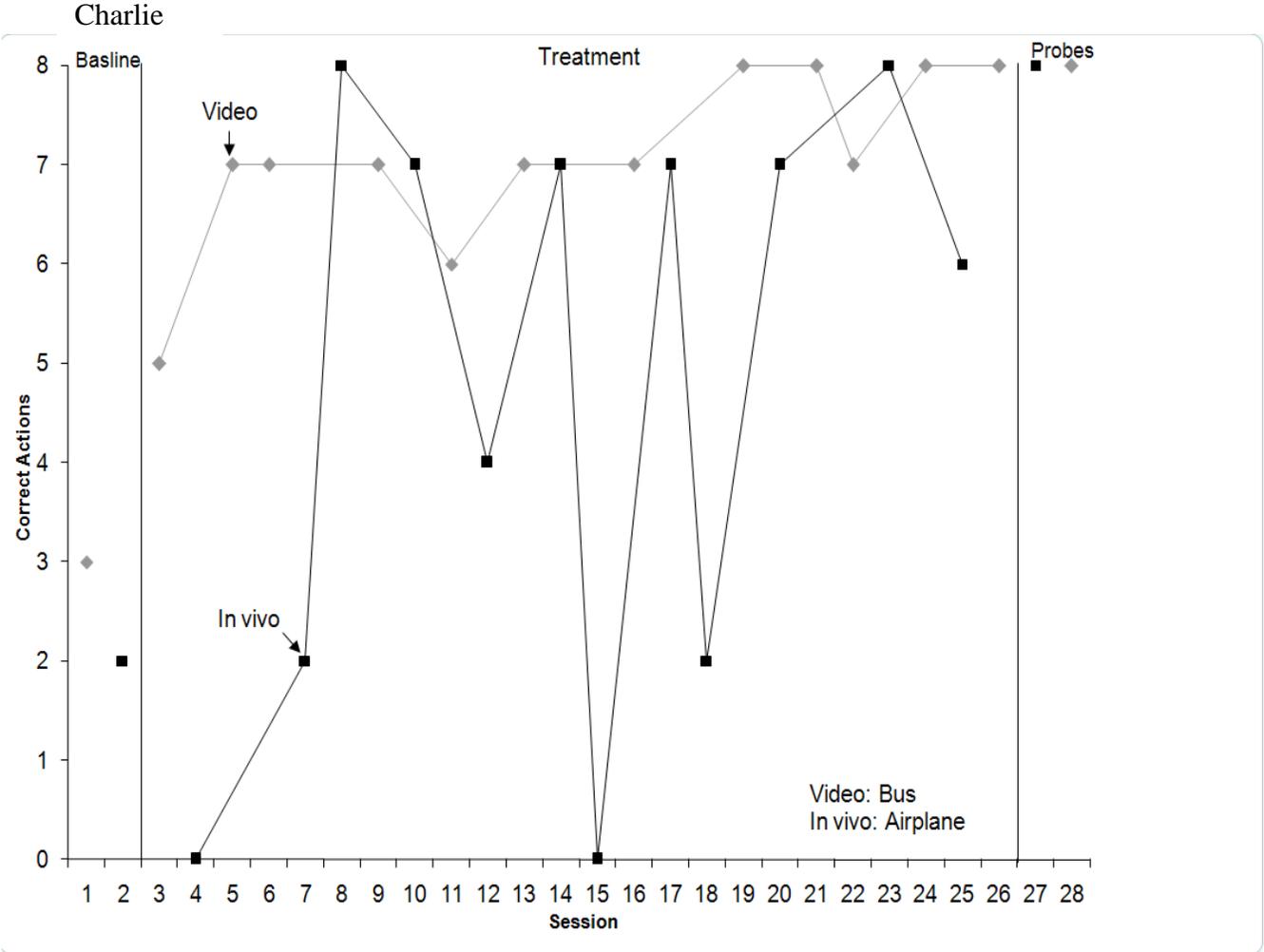


Figure 2.

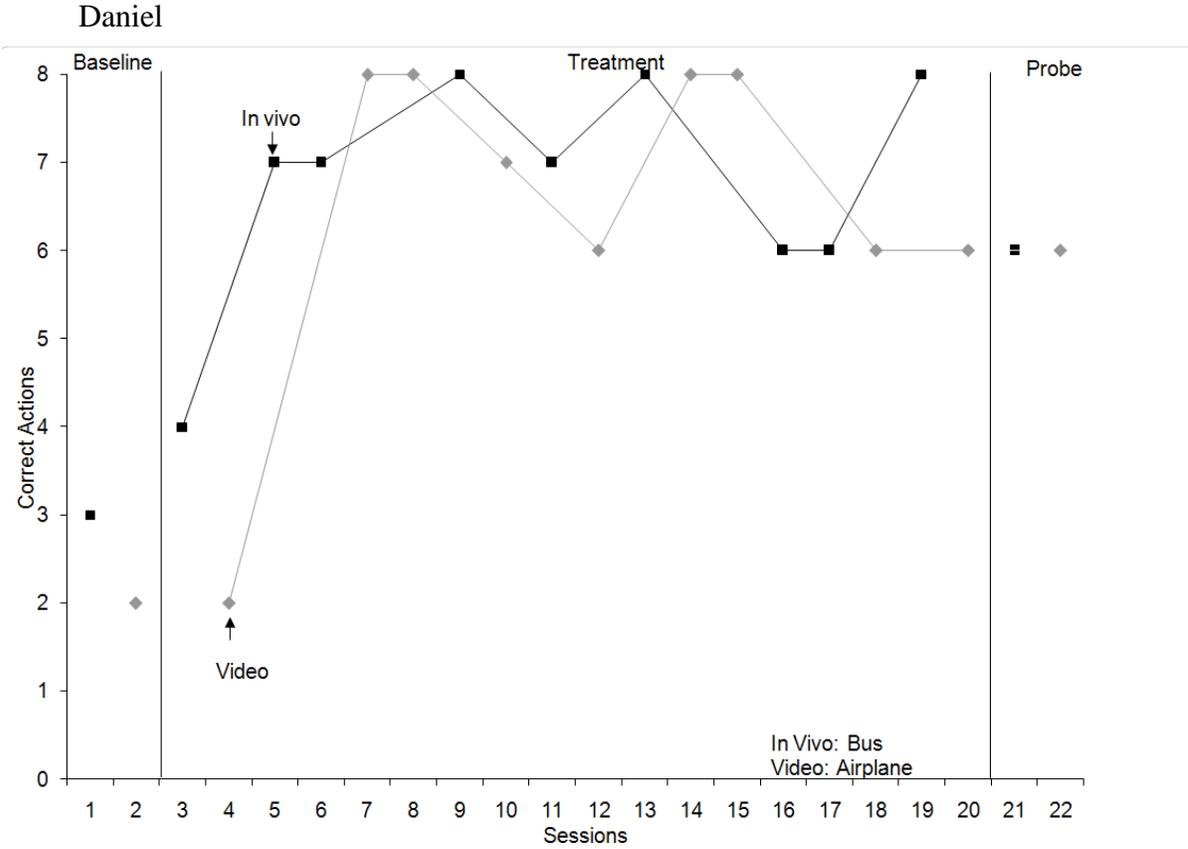


Figure 3.

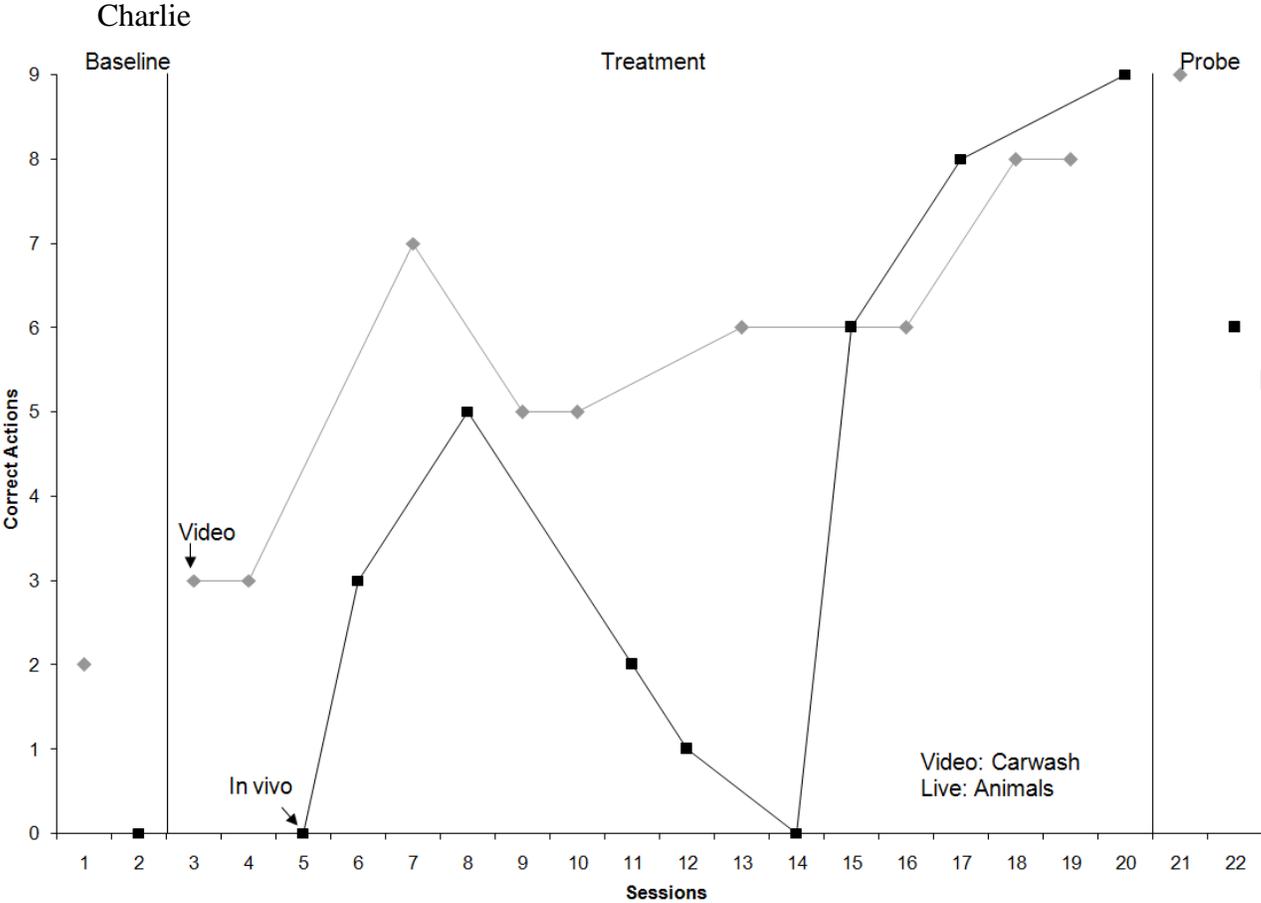


Figure 4.

