Title: There is limited evidence supporting video modeling as an effective intervention to improve social and play skills in children ages 20 months to 6 years with a diagnosis of autism or autism spectrum disorder, when compared to no intervention or other social skills interventions

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CLINICAL SCENARIO:

Condition/Problem:

Autism is a neurological disorder with symptoms that primarily affect social skills, communication, and behavior. Autism symptoms are highly variable; each person with autism can exhibit significantly different characteristics and severity (Case-Smith & Clifford O'Brien, J., 2015). People with autism may experience difficulty with social situations, problems regulating their senses, communication impairments, exhibit repetitive behaviors, inflexibility of routine, and impaired ability to sleep. Socially, people with autism typically find it difficult to create and sustain relationships due to several of the defining characteristics of autism. For example, they may have difficulty perceiving social cues, such as sarcasm or changes in tone, and have trouble empathizing with others. They may avoid eye contact and often prefer to be alone. All of these factors result in an impaired ability to successfully interact with others while adhering to social norms (Autism spectrum disorder: Signs, 2015).

Incidence/Prevalence:

The Center for Disease Control found one in sixty eight children have an autism spectrum disorder (ASD), with occurrence five times more likely in boys (occurring in one in forty two boys) than in girls (occuring in one in one hundred eighty nine). ASD occurs in all racial, ethnic, and socioeconomic groups, and is present in around 1% of the general population in North America (Autism spectrum disorder: Data, 2015). Deficits in social skills and communication are found in all children with autism, as these are required criteria for diagnosis (Kroeger, Schultz & Newsom, 2007).

Impact on Occupational Performance:

Two of the main occupations of children are participation in school and play. Autism makes these activities difficult to successfully engage in due to deficits in communication, social skills and play skills. Communication deficits negatively affect a child's participation in school by making it difficult to answer questions in class or convey their needs to parents or teachers. Deficient social skills may make it more difficult for the child with autism to make friends and relate to people their own age. Further, their limited understanding of social norms and physical boundaries impact the creation and preservation of relationships. For example, a person with autism may have very specific interests and enjoy telling others about it; however, they may not be able to attend to nonverbal cues indicating that their social partner is uninterested. Lastly, children with autism may have problems with taking turns, imitating others and using toys in the way they were intended. These factors may lead to a deficit in the development of play skills. Video modeling has been used as a way to increase social skills and play skills to positively impact occupational performance in children with autism.

Intervention - Video Modeling:

Video modeling is an educational tool in which a model is video recorded demonstrating a behavior or task. After a student views the video, an opportunity is given for the child to practice the action that they viewed. Reinforcement may be given as a way to increase likelihood of the child performing the desired action or to increase attentiveness to the video model. Cardon & Wilcox (2011) stated, "The television offers a restricted field of vision and can therefore focus a child's attention on relevant stimuli while decreasing their tendency to attend to irrelevant stimuli" (p. 655). Additionally, Cardon & Wilcox (2011) stated that television and watching videos is particularly

motivating for children with autism. Video modeling has been used to teach functional skills in children with ASD, such as how to perform first aid (Ergenekon, 2012), as well as social and play skills (Cardon & Wilcox, 2011; Lydon, Healy & Leader 2011; Kroeger, Schultz & Newsom 2007). The interventions in the examined studies used a process of viewing videos followed by immediate practice of skills. The videos were a few minutes long and were shown to the children one to three times. The videos contained 1-12 actions or behaviors such as imaginary play or involved appropriate social interactions. After viewing, the children were given similar or exact toys as those in the video and were told to play. Reinforcement during play included observation with no reinforcement or praise and rewards (cartoons and food). Within the studies reviewed, Kroeger, Schultz and Newsom (2007) observed skills related to positive socialization; specifically, they observed initiating, interacting, responding and prosocial behaviors. Alternatively, Cardon & Wilcox (2011) and Lydon, Healy & Leader (2011) observed play skills, including acts of imitation, length of play, playful verbalization and types of play. Two of the studies used videos of children while the last (Cardon & Wilcox 2011) used videos of the experimenter to demonstrate desired behaviors. In total, the video modeling training for each experiment ranged from 1-2 hours (Lydon, Healy & Leader 2011), 7-7.5 hours (Cardon & Wilcox 2011), and 15 hours of intervention (Kroeger, Schultz & Newsom, 2007).

OT Theoretical Basis:
　　　　Bandura's social learning theory, which was derived in behavioral psychology, applies to video modeling by explaining the process of observational learning. It is theorized that through observing actions and their consequences, changes occur in the cognition of the observer. In video modeling, children watch a pre-recorded example of behavior, attempt to reproduce the behavior in the video and receive reinforcement in the process. It is thought that feedback from the environment gives the opportunity for the process to be internalized and refined through reinforcement. If positive reinforcement occurs, the observer will be more motivated to continue performing a specific behavior. If the reinforcement is negative, the observer will be less motivated to continue performing the behavior (Corbett & Abdullah, 2005).

Science:
　　　　With this intervention, learning occurs through observing the behavior of other people which elicits cognitive and behavioral changes in the observer. The person may begin the learning process by consciously attending to people or events in their immediate environment and taking in sensory stimuli. The observer internalizes the information and retains it by physically and mentally practicing the behavior. When the observer begins to reproduce the behavior, they continue to learn through feedback from the environment which can be used to positively or negatively reinforce the behavior (Corbett & Abdullah, 2005). This process of observation, feedback, and practice creates a neuronal motor map through the properties of neuroplasticity.

Why is this intervention appropriate for OT?
　　　　Based on the studies reviewed, video modeling can be used to address several areas of occupation in the occupational therapy framework, including formal education participation, play, social participation, and social interaction skills (American Occupational Therapy Association, 2014). Video modeling is an activity intervention, as it addresses sections of an occupation (e.g. initiation) to promote the improvement of engagement in occupations (e.g. social participation) through the "development of performance skills and performance patterns" (American Occupational Therapy Association, 2014). Video modeling addresses the activity and participation areas of the International Classification of Functioning, Disability and Health (The ICF: An overview, n.d.).

FOCUSED CLINICAL QUESTION:
　　　　Is video modeling (VM) an effective intervention, compared to no intervention or other social skills interventions, to improve social and play skills in children, ages 20 months to 6 years, with a diagnosis of autism or autism spectrum disorder.

This CAT investigates the effectiveness of video modeling compared to other interventions or no interventions to improve social and play skills in children with autism, ages 20 months to 6 years.

SEARCH

- 9 databases searched
- 23 relevant articles located
- 3 articles found addressing similar skills through limited studies
- 20 other articles were not reviewed due to lack of rigor or lack of study structure

Research supports video modeling as an effective intervention for social and play skills. There is mixed evidence for the strength of generalizability for skills taught through video modeling.

CLINICAL BOTTOM LINE: There is limited evidence supporting video modelling as an effective intervention to improve social and play skills in children ages 20 months to 6 years with a diagnosis of autism or autism spectrum disorder, when compared to no intervention or other social skills interventions.

Limitation of this CAT: This critically appraised paper (or topic) has been reviewed by occupational therapy graduate students and the course instructor.

SEARCH STRATEGY:

Table 1: Search Strategy

Databases Searched	Search Terms	Limits used	Inclusion and Exclusion Criteria
1. CINAHL Plus with Full Text (EBSCO HOST) 2. Search at UW Murphy Library 3. EBSCO HOST 4. OT Search 5. JSTOR 6. Health Professions DataBase through EBSCOHost 7. Pubmed Search 8. Google Scholar 9. Springer via Murphy library	"Autism AND social skills AND video modeling AND children" "Autism AND video modeling AND children" "Social skills training AND children AND autism spectrum disorders AND meta-analysis" "Video modeling AND autism" "Video modeling AND skills AND autism"	"and"	**Inclusion:** Children with autism spectrum disorder or autism **Exclusion:** Studies comparing types of video modeling, studies published prior to 2005

RESULTS OF SEARCH

Table 2: Summary of Study Designs of Articles Retrieved

Level	Study Design/ Methodology of Articles Retrieved	Total Number Located	Data Base Source	Citation (Name, Year)
Level 1a	Systematic Reviews or Metanalysis of Randomized Control Trials	0	N/A	N/A
Level 1b	Individualized Randomized Control Trials	0	N/A	N/A
Level 2a	Systematic reviews of cohort studies	0	N/A	N/A
Level 2b	Individualized cohort studies and low quality RCT's (PEDro ≤4)	1	1. Murphy Library General Search	1. Lydon, Healy & Leader, 2011
Level 3a	Systematic review of case-control studies	0	N/A	N/A
Level 3b	Case-control studies and non-randomized controlled trials (quasi experimental or clinical trials)	2	1. Murphy Library General Search 2. Murphy Library General Search	1. Nikopoulos & Keenan, 2007 2. Kroeger, Schultz, & Newsom, 2007
Level 4	Case-series and poor quality cohort and case-control studies	17	1. Murphy Library General Search 2. Murphy Library General Search 3. EBSCO HOST 4. Murphy Library General Search	1. Allen, Wallace, Renes, Bowen & Burke 2010 2. Bellini, Akullian & Hopf, 2007 3. Cardon & Wilcox, 2011 4. Charlop, Dennis, Carpenter & Greenberg, 2010 5. Clifford-Scheflen, Freeman & Paparella 2012

				5. JSTOR search through Murphy Library 6. Murphy Library General Search 7. Murphy Library General Search 8. Murphy Library General Search 9. Murphy Library General Search 10. JSTOR via Murphy Library 11. Murphy Library General Search 12. EBSCO HOST 13. JSTOR via Murphy Library 14. Murphy Library General Search 15. Murphy Library. General Search 16. JSTOR via Murphy Library 17. Springer via Murphy Library	6. Drysdale, Lee, Anderson,& Moore, 2014 7. Ergenekon, 2012 8. Jowett, Moore & Anderson, 2012 9. Qi & Lin, 2012 10. Ozen, Batu & Birkan, 2012 11. Plavnick & Ferreri, 2011 12. Plavnick, MacFarland & Ferreri, 2015 13. Reagon, Higbee, & Endicott, 2006 14. Sancho, Sidener & Reeve, 2010 15. Stewart & Umeda, 2014 16. Taber-Doughty, Bouck, Tom, Jasper, Flanagan & Bassette, 2011 17. Yakubova, Hughes & Hornberger, 2015

Level 5	Expert Opinion	3	1. Google Scholar 2. EBSCO HOST 3. JSTOR via Murphy Library	1. Kaffer, 2010 2. Wang, Cui, Parrila & 2011 3. Wang & Spillane, 2009

STUDIES INCLUDED

Table 3: Critique of Selected Articles

	Study 1 (Kroeger, Schultz, & Newsom, 2007)	**Study 2** (Cardon & Wilcox, 2011)	**Study 3** (Lydon, Healy, & Leader, 2011)
Design	Quasi-experimental	Single subject multiple baseline	Randomized control trial with crossover
Level of Evidence	3b	4	2b
Rigor Score	SNS 7/8	SCED Score 10/11	Pedro 4/8, 2/2
Population	Twenty-five 4-6 year old children who have autistic disorder (not including Rett's, Asperger's, or pervasive developmental disorders)	Six children with autism who were 20-48 months old	Five children with age ranging from 3 years 10 months - 6 years 1 month old with autism disorder who had language abilities equal to that of a typically developing 2 year old
Intervention Investigated	Video Modeling	Video modeling	Video modeling
Comparison Intervention	Play activities group (control)	Reciprocal imitation training	Pivotal response training
Dependent Variables	Frequency, duration, and nature of social interactions (initiation, response, and interaction)	Motor imitation, object imitation, body imitation	Duration of interactions with toys, number of actions appropriate for theme, number of verbalizations appropriate for play theme
Outcome Measures	The Social Interaction Observation Code, and the Assessment of Basic Language and Learning Skills (ABLLS)	Motor imitation scale	Observation of specified behaviors
Results	Both groups made statistically significant	Both groups had improved imitation	Video modeling and pivotal response training

	improvements in prosocial behavior, but the video modeling group "consistently made more gains" (Kroeger, Schultz, & Newsom, 2007, p. 814). Additionally, both groups improved their learning readiness and group orienting behaviors, but the video modeling group did not show more improvement than the play activities group.	when compared to baseline, but neither group did consistently better than the other. Generalization was higher at post assessment than at baseline for both groups.	both caused statistically significant increases in play actions in the training environment, and were equally effective. Play actions in the generalized environment did not significantly increase after video modeling, but did significantly increase after pivotal response training. Pivotal response training caused significantly more play actions than video modeling. Verbalizations in both environments did not significantly increase after either intervention, and neither intervention was more effective than the other. Neither intervention significantly increased the duration of interaction with toys. The sequence of treatment used did not affect the results.
Effect Size	Effect sizes were given in the article. Direct Teaching Group (Video Modeling) $\eta^2 = 0.215$ for initiating behaviors $\eta^2 = 0.328$ for responding behaviors $\eta^2 = 0.288$ for interacting behaviors "All were larger than 0.14, a level deemed a large effect size" (Kroeger et al., 2007)	N/A for case studies.	Effect size was not given and cannot be calculated due to lack of information. They presented the means and standard deviations in a graph, but specific values were not given.
Conclusion	Video modeling is more effective in improving prosocial behaviors than a play activities group. Video	Video modeling is equally as effective as reciprocal imitation training.	Video modeling is equally as effective in improving play verbalizations as pivotal response training.

	modeling is equally as effective as a play activities group in improving group readiness and orienting behaviors.		Video modeling is not as effective in improving play actions as pivotal response training.

SYNTHESIS SECTION:
IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH
Results - Similarities of Findings:

In the three articles looked at by this project, video modeling programs increased play and social skills when used with children ages 20 months to 6 years diagnosed with autism. Each study focused on participants diagnosed with autism or autism spectrum disorder. While one study specifically stated other spectrum disorders were excluded, the specificities of autism were not made clear in the other studies. Each study utilized videos of live models performing behaviors. They did not for example use cartoons or puppets to model behaviors. Statistical analysis was not provided for all the studies; therefore, it remains unclear if any particular intervention regimen was more effective than the other regimens studied.

Results - differences in findings:

- The Kroeger et al. (2007) study considered the effectiveness of video modeling and did not make comparisons to an alternative intervention. Instead, a control group of free play sessions was compared to video modeling regarding the acquisition of social skills, including initiation, responding, and interacting behaviors. The other two studies compared the effectiveness video modeling to other interventions. Skills examined included play skills (play duration, themed actions and verbalizations) as well as social (imitation of body and object).
- In total, the video modeling training for each experiment ranged to include 1-2 hours (Lydon, Healy, & Leader, 2011), 7-7.5 hours (Cardon & Wilcox, 2011), and 15 total hours (Kroeger et al., 2007); however, these studies also differed in participants' functional level which may have supported the use of differing treatment times.
  - o The treatment program in the Lydon et al. study included only children who had "sufficient language skills." The participants were ages 3-6 years old, but they were required to have language skills at least equal to typically developing children of age two (Lydon et al., 2011, p. 882). Having sufficient language skills may have supported the use of a shorter treatment time (1-2 hours) which still resulted in statistically significant increases in play actions including duration of play and number of themed actions and verbalizations.
  - o In the study with the most treatment time (Kroeger et al., 2007), there were no language requirements for participants; some participants were non-verbal or communicated using alternative methods. Further, participants with disorders related to higher function, such as Asperger's disorder, were excluded. With over 15 hours of treatment, statistically significant improvements were seen in initiating, responding, and interacting social behaviors.
- In only one study (Kroeger et al., 2007), toys used were not specifically stated to be identical to the ones modeled in the videos. However, unique methods of reinforcement were used to encourage attention to the material. Participants were given edibles (food or candy) when attending to the videos. There were also popular cartoon clips embedded periodically in the videos used. The other two studies did not use any form of external reinforcement, but satisfied the suggested method of using toys identical to those being modeled. It is unknown what effect the toy selection and use of reinforcements had on the outcome of the studies.

- - The Cardon & Wilcox (2011) study, which required participants to be children who watch at least one hour of television a day, stated that watching videos was stimulating enough and did not require further reinforcement.
- The Lydon et al. (2011) article utilized no typically developing children in their study, whereas the other two studies incorporated typically developing children into their study in some way. It remains unknown if these differences had any effect on the results of the study.
  - Cardon & Wilcox (2011) utilized typically developing children to participate in the baseline sessions. These children picked out the toys that would be used in the study. Additionally, the number of times the typically developing children imitated with the toys was recorded and used to compare against results of the children with autism.
  - The Kroeger et al. (2007) article utilized typically developing children in the videos themselves. These children were videotaped performing a specific task for the children with autism to imitate at a later time.
- Post test measures were taken at different times and in different environments between studies to assess generalizability
  - In Kroeger, et al. (2007), post test measures were taken directly at the end of intervention using the Social Interaction Observation Code in the same environment where the intervention occurred. Gains were found in social skills including initiating, responding, and interacting behaviors since pretest, and were greater than the control group. Generalizability or duration of effects were not measured.
  - In the study by Lydon et al. (2011), observations were made of play skills directly at the end of intervention sessions in a room different than the room used for intervention. Duration of play, number of theme appropriate actions, and number of theme appropriate verbalizations had increased since baseline. Video modeling resulted in significantly fewer play actions than pivotal response training; however, participants in the pivotal response training received a total of ten hours of treatment compared to the one to two hours of video modeling. Generalizability to other environments directly after intervention was observed; however, duration of effects were not measured.
  - The study by Cardon & Wilcox (2011) took post test measures using the Motor Imitation Scale in a generalized environment directly after treatment sessions, one week post treatment, and three weeks post treatment. At all three post test sessions, video modeling had increased and maintained motor, body, and object imitation equally to other social skills intervention (reciprocal imitation training).

Boundaries:

A total of 36 children, ages 1 year 8 months to 6 years, were included in the three studies. In total, there were 5 girls and 31 boys. All the children had a diagnosis of autism, with varying levels of verbal communication skills.

- Cardon & Wilcox (2011) included only children who were avid T.V. watchers. The parents needed to report that their children watched over 1 hour of T.V. a day to be included in the study.
- Lydon et al. (2011) included only children who had language skills of at least that of a 2 year old typically developing child.
- Kroeger et al. (2007) excluded children with a diagnosis of Asperger's, Rett's disorder, childhood disintegrative disorder, and pervasive developmental disorder.

Implications for Practice:

Video modeling techniques may be a viable intervention option for teaching social or play skills to children diagnosed with autism. Gains in these skills were observed after as few as 1-2 hours of intervention, which consisted of watching a short video of a live person performing a behavior one to three times. Opportunities for practice were presented using similar or identical toys and varying levels of reinforcement.

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