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Teaching complex social skills to children with autism; advances of video modeling
Christos K. Nikopoulos & Panagiota Nikopoulou-Smyrni
School of Health Sciences and Social Care, Brunel University

Abstract

Although there has been a corresponding explosion of literature regarding the treatment of the social deficits in autism, the establishment of more complex social behaviors still remains a challenge. Video modeling appears as one approach to have the potential to successfully address this challenge. Following an introduction to modeling that constitutes the basis of this procedure, the current paper explores those video modeling studies that have targeted the promotion of complex social skills. It is suggested that this approach could be an effective addition to peer-mediated treatment procedures, especially for children with autism who cannot always be in environments where peers are present. Further, the likely success of video modeling seems to be dependent upon the prior elimination of behaviors that interfere with the development of imitation skills.

Authors' note

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Correspondence concerning this article should be addressed to either author at the School of Health Sciences and Social Care, Mary Seacole Building, Brunel University, Uxbridge, Middlesex, UB8 3PH, England. Tel.: +44 (0) 1895 268811. E-mails: christosnikopoulos@hotmail.com & panagiota.nikopoulou-smyrni@brunel.ac.uk

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Notwithstanding the fact that the diagnosis of autism is becoming more standardized (Volkmar, Lord, Bailey, Schultz, & Klin, 2004), even today, a generally accepted definition is hard to find (e.g., Baird, Cass, & Slonims, 2005). However, all definitions identify impaired ability for social interaction and communication as well as idiosyncratic behaviors and deficits. Specifically, the term autism is used to describe a pervasive developmental disorder characterized by severe impairments in several areas of development including reciprocal social interaction skills, communication skills and the presence of restricted, repetitive, and stereotyped patterns of behavior, interests and activities (e.g., American Psychiatric Association, 2000; Damasio & Maurer, 1978; Happe & Frith, 1996; Mundy, Sigman, Ungerer, & Sherman, 1986; Sweeten, Posey, Shekhar, & McDougle, 2002).

In particular, the presence of deficits in the area of social interaction was the main reason that Kanner (1943) chose the term autism to describe a group of 11 children who demonstrated relatively common characteristics, different from those that appeared in the diagnosis of schizophrenia or childhood psychosis. Since then, social deficits has retained a prominent position in diagnostic systems (e.g., American Psychiatric Association, 2000; World Health Organization, 1992) and many researchers have suggested that social impairments are the most critical element in the definition of this disorder (e.g., Anderson, Moore, Godfrey, & Fletcher-Flinn, 2004; Carter, Davis, Klin, & Volkmar, 2005; Constantino et al., 2003; Ruble, 2001; Scattone, 2007; Volkmar, Carter, Sparrow, & Cicchetti, 1993). Even during the first months of life, children with autism may not engage in simple social behaviours such as eye gaze, smiles, or responses to parents' efforts at verbalisation and play interaction (Hobson & Lee, 1998; Koegel & Koegel, 1999; Swettenham et al., 1998). Although, a variety of different treatment procedures have been designed, assessed, and evaluated to address these deficits a persistent problem remains; the establishment of more complex social behaviors. For example, it is a usual phenomenon that a child with autism may need continuous adult prompting to complete a sequence of already learned activities (MacDuff, Krantz, & McClannahan, 1993).

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As long ago as 1981, Applied Behaviour Analysis (ABA) was identified as the treatment of choice for individuals with autism that offers the best outcomes. More than 19,000 papers have been published in peer-reviewed journals using ABA within a variety of areas, including well over 1100 studies concentrating on children with autistic spectrum disorders. This extensive research evidence has resulted in ABA being regarded as the best empirically evaluated intervention (e.g., Collaborative Work Group on Autistic Spectrum Disorders, 1997; Department of Health, 1999; MADSEC Autism Taskforce, 1999; Simpson, 2001; U.S. Department of Health and Human Services, 1999). Enough teaching methods based upon ABA have been conducted to suggest that not only is the approach effective, but as a congregate group of learning based methods, it stands alone as the only scientifically validated effective treatment(s) for individuals with autism (e.g., Cohen, Amerine-Dickens, & Smith, 2006; Eikeseth, Smith, Jahr, & Eldevik, 2002; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Mudford, Martin, Eikeseth, & Bibby, 2001; Remington et al., 2007; Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000; Stahmer & Ingersoll, 2004). These teaching methods have incorporated basic behavioral principles such as positive reinforcement, prompting, shaping, chaining, fading, or modeling to name a few (e.g., Leslie, 2002).

Interestingly, modeling constitutes an important component of a significant number of these behavioral-oriented methods because functioning of children with autism in mainstream educational settings frequently demands skills that have not yet been learned (Buggey, Toombs, Gardener, & Cervetti, 1999). In addition, visually-cued instructions have increasingly incorporated in interventions since children with autism have been suggested to perform remarkably well in visual tasks (Marks et al., 2003; O’Riordan & Plaisted, 2001; O’Riordan, Plaisted, Driver, & Baron-Cohen, 2001; Quill, 1997; Shipley-Benamou, Lutzker, & Taubman, 2002). Considering both modeling and visually-cued instructions as significant elements of many treatment strategies, the use of video models targeting social deficits in autism was a logical outgrowth (Ayres & Langone, 2005). The following sections of this paper, therefore, will introduce modeling

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as a teaching method that video modeling is based on; explore those video modeling procedures that focus on the improvement of complex social skills and also particular procedural issues; argue that video modeling can be an efficient addition to broadly-used peer-mediated procedures; and conclude with the suggestion that recent advances in video and computer technology could become another promising means for the social training of children with autism.

An Introduction to Modeling

Modeling can be defined as a procedure whereby a sample of a given behavior is presented to an individual and then the behavior of that individual is assessed to determine if he/she engages in a similar behavior (Martin & Pear, 2002). In more technical words, modeling takes place when one person, the model, performs a behavior and this performance cues another person, the observer, to imitate that behavior. Hence, modeling can be considered as an antecedent strategy in terms that the behavior of the model exerts stimulus control over the observer's imitation of the modeled response (Cuvo & Davis, 1998; Heflin & Alberto, 2001).

Since the observer's behavior could be changed after even a single exposure to the model (Deguchi, 1984), modeling can be a powerful tool for both teaching new behaviors and improving already acquired ones (e.g., Igo, French, & Kinnison, 1997; Leaf & McEachin, 1999). In particular, when modeling is applied to treatment programs for children with autism, it is important that, at least, the following characteristic features of this procedure be taken under careful consideration. *First*, the observer may satisfactorily imitate the new behavior after the first exposure to the model's behavior only when this new behavior is one or two steps ahead of the observer's present level of competence. When a model's behavior is several steps ahead of the observer's current abilities, then the observer is less likely to perform a similar behavior successfully without practice (Baldwin & Baldwin, 1986).

Second, for modeling to occur, the observer has to be able to attend to the model's behavior in order to demonstrate the same or a similar behavior (Miltenberger, 1997). In

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a training session, for example, attending involves the child staying seated, keeping hands on a table, looking at the treatment provider when his/her name is called, and looking at the objects that they are indicated (e.g., Maurice, Green, & Luce, 1996).

Third, viewing the type of consequences that a model's behaviors obtain strengthens or weakens the observer's probability for an imitative response (Ross, 1981). This is because the consequences of the modeled behavior can function as discriminative cues for similar consequences for an observer's later imitation (Deguchi, 1984).

Likewise, the consequences of imitating a model's behavior may also influence the observer to imitate a model's behavior. If a specific behavior produces one kind of consequence for a model, while a very different kind of consequence for an observer, the latter consequences will eventually affect the likelihood of an imitative response.

Ultimately, people tend to do what works for them independently of whether it worked for a model (Chance, 1999).

Fourth, the modeled behavior must be consistent with the current competence of the observer. If the observer has to imitate a rather complex behavior, which demands skills that he/she does not have, then the observer may not be able to attend the model (Kazdin, 2001). *Finally*, past reinforcement for imitating a particular model or type of behavior increases the probability of performing the modeled behavior when discriminative stimuli and contexts are similar to those wherein reinforcement occurred in the past (Leslie & O'Reilly, 1999).

An Abbreviated Exploration of Video Modeling Procedures Pursuing Complex Social Skills

Video modeling has recently expanded into the realm of social development in autism. What follows, then, is a review of published studies that have been focused on examining the effectiveness of video modeling in teaching complex social skills to children with autism. Particular focus has been placed on both demonstrating critical aspects in the development of this procedure and illustrating specific practical/procedural issues, so distinctive to this intervention, as these were investigated in each study. Studies

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with core focus on verbal communication and teaching specific play formats (e.g., Charlop & Milstein, 1989; D'Ateno, Mangiapanello, & Taylor, 2003; Hine & Wolery, 2006; MacDonald, Clark, Garrigan, & Vangala, 2005; Paterson & Arco, 2007) were not included in the following review.

The first attempt was published in 1999 by Taylor, Levin, and Jasper. They conducted two experiments in their effort to increase play-related statements (i.e., scripted & unscripted comments) in two children with autism, aged 6 and 9 years, towards their siblings. Their verbal repertoires ranged from labeling nouns and verbs or requesting in three- to four-word sentences to speaking in seven to ten word sentences and engaging in simple exchanges of conversation. Also, the participants rarely initiated play or made appropriate play comments to their siblings. In both experiments the procedures comprised of two main phases, video viewing and practice in vivo. For the video viewing phase, three tapes were made each containing an average of 10 comments. Models were an adult and a sibling and since play sessions had been designed to occur in the presence of the sibling, it was anticipated that participants would imitate the comments made by the adult. In the first experiment, each participant viewed the entire video segment three consecutive times, before he experienced practice sessions with an adult using the same stimuli as depicted in the video. In the second experiment, a forward chaining procedure was implemented in that the length of the segment viewed on the tape increased contingent on the increase of play-related comments emitted by the participant during the practice sessions. Specifically, the participant watched brief videotaped segments of play comments between an adult and his sibling in a sequential format and, then, he experienced play sessions with the same adult and the same stimuli. In both studies, probes were conducted to assess whether each child with autism was able to emit any scripted or unscripted play comments to his sibling in the absence of any video viewing. Both of these studies revealed that video modeling was an effective intervention for teaching children with autism to make play-related statements whilst playing with their siblings. However, emergence of unscripted comments did not occur consistently

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which made the authors to suggest that additional instructional strategies may be necessary for some children to perform such comments.

A few years later, Nikopoulos and Keenan (2003) successfully used video modeling to promote social initiation and increase time spent in appropriate play in children with autism, aged 9-15 years who had restricted nonverbal imitation repertoires. That is, some participants rarely and others only parts of the time, imitated gross (body), fine (hands) motor movements or actions with objects. Three videotapes were constructed in which the models used were either a typically developing peer, an unfamiliar adult, or a familiar adult. Each videotaped scene was approximately 35 seconds in duration. The seven participants were classified into two dyads and one triad. Children in each group viewed the same model throughout the study whilst a different model was presented for each group. Initially, children viewed a video of one of three models engaged in a simple activity using a particular toy with an adult. After the model had emitted a social initiation, he/she played with the adult using a toy, which was varied across conditions, for about 15 seconds. Then, each child was assessed whether he/she could emit a social initiation response and engage in appropriate play with the adult using a particular toy in vivo. Successful performance occurred three consecutive times before another toy was used. Overall, children were assessed in the presence of five different toys. Results showed that out of seven participants video modeling enhanced both social initiation and appropriate toy play in four children. Responding in these children also generalized across settings, peers, and toys and was maintained at 1 and 2 months follow-up. The authors suggested that the likely success of video modeling is dependent upon the prior elimination of such behaviors that interfere with the development of imitation skills since the three children who failed to imitate the modeled behaviors exhibited high frequency of challenging behaviors. Based on the data collected, they also discussed the possibility of using the video modeling intervention in the design of a prolonged activity schedule by examining how many sequences of behavior could be included in individual video clips.

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Towards that direction, the same authors published two studies in the following year (Nikopoulos & Keenan, 2004a, 2004b). Etymologically, the term ‘prolong’ deals with ‘lengthening of time’ and therefore, in our subject matter, it simply means how the effects of video modeling would ‘last longer’. In more technical terms this includes the assessment of the effects of any given intervention in promoting generality of behavior change. Baer, Wolf, and Risley (1968) make this point well: “A behavior change may be said to have generality if it proves durable over time, if it appears in a wide variety of possible environments, or if it spreads to a wide variety of relevant behaviors” (p. 96). This is what was examined in the two studies by Nikopoulos and Keenan who investigated whether video modeling could enhance generalization of the target behaviors (social initiation & reciprocal play) across a number of different conditions. Specifically, in their first study (Nikopoulos & Keenan, 2004a), it was examined whether successful social interaction with one play-toy after viewing a respective video could increase the probability of success with new toys without firstly viewing any video. Three children with autism, aged 7.5 - 10.5 years, participated and a 30-s videotape was created depicting a typically developing peer engaged in a simple reciprocal play with an adult using a specific toy. Each child viewed the same videotape and when they consistently performed the modeled behaviors in vivo, programming for generalization across four other toys, peers, settings, and time in the absence of a videotape took place. Remarkably, results revealed that, for all participants in that study, the experience of only three or four video modeling sessions proved adequate to promote generalization across stimuli (i.e., toys), settings, and peers. In addition, the behavior changes maintained after a 1- and 3- month follow-up period.

A major finding of that study was that generalization of the target behaviors occurred in rather artificial circumstances. Children were assessed as to whether they emitted a social initiation and afterwards played with another person using the only toy available in the room. Also, each session terminated whenever play with each respective toy had been completed. Therefore, the next logical step would be the design of an

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intervention that would promote generalization of these two behaviors (i.e., social initiation and reciprocal play) across a number of toys without the session being terminated. In other words, would children emit numerous social initiations to play with another person (i.e., a sequence of behaviors) using a variety of toys that are available in the room at the same time in one session? That possibility would set up the ground of designing a prolonged activity schedule using short video clips, which was the main objective of these researchers' second study (Nikopoulos & Keenan, 2004b). However, results of previous research showed that children experienced difficulties in imitating the model's behaviors while in a setting with a variety of play-toys available (i.e., multiple stimuli). In that study (Nikopoulos & Keenan, 2003) these difficulties were overcome when the research setting was adapted in terms of presenting one stimulus at a time. This manipulation, though, would not facilitate the establishment of a prolonged activity schedule as only one toy would be available each time. Potentially, an alternative route for promoting children's imitative responses in an environment with a variety of toys would be to simplify the video display by reducing the number of behavioral components depicted in it. This is exactly what happened in this respective study. Using similar procedures, the researchers successfully taught three children with autism to emit multiple consecutive social initiations using a variety of toys. The children only watched a videotape showing a typically developing peer and an adult engaged in a simple social interactive play using only one toy. When criterion performance was not met, successful responding was facilitated by children watching only the first part of the tape that showed the model emitted a social initiation to the researcher.

In the same year, an alternative way and possibly a closer approximation to the use of video modeling in the design of activity schedules addressing complex social skills was examined in a study by Dauphin, Kinney, and Stromer (2004). There, video-enhanced activity schedules and matrix training were successfully used to teach generative sociodramatic play activities to a 3-year-old child with autism. After the participant had been taught to use a computer mouse and computer activity schedules, he

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experienced Phase 1. There, he initially learned computer activity schedules that were authored in Microsoft® PowerPoint® and featured embedded video models of what to say and do. In particular, digital photos, videos, text, and sound files were inserted into slides as required. Also, most-to-least prompting procedures were applied to teach the child schedule following. Afterwards, he left the computer, selected the materials, repeated the question modeled (Say), and finally performed the action (Do). In the case that he failed to perform the modeled Say or Do components, he was verbally or physically prompted, respectively. In Phase 2, a notebook replaced the computer and the child was taught to follow schedules with pictures cuing sequences of different play activities. In essence, the child was taught to follow activity schedules using a notebook as preparation for further analysis of computer schedules in Phase 3. In this last phase, the child was assessed whether he could perform novel questions (Say) and actions (Do) when only pictures appeared in his computer schedules as well as in his notebook schedules. The results showed that video-enhanced activity schedules can be effective in teaching sociodramatic play and also that the use of matrix training can enhance programming for generative learning outcomes. The authors, also, made the following interesting suggestions: a) activity schedules may establish play activities that could facilitate the development of new social and communication skills; b) some children with autism learn relatively easy by observing videos of complex scenarios; c) frequent exposure to video models could facilitate observational learning in children who are not initially inclined to do so; and d) identification of the requisite skill sets for children who might have difficulty imitating auditory and visual stimulus elements of videos should be systematically examined in further studies. It is worth mentioning that two of the authors of this study alongside their colleagues further explored the effectiveness of video enhanced activity schedules for teaching social skills presenting a case study (Kimball, Kinney, Taylor, & Stromer, 2003). Interestingly, they suggested that establishment of play and social skills using activity schedules may occur because these skills are “entrapped” by natural communities of reinforcement and support that are contacted off schedule.

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There has been one more study with a focus on advancing activity schedules with the use of short video clips for teaching complex social sequences to children with autism. This study comprised of two experiments and was conducted by Nikopoulos and Keenan in 2007. Four children with autism, ages 6.5 - 7.5 years, participated in that study. Four videotapes were constructed in which a peer with learning difficulties served as a model. The techniques used to teach this child to perform the modeled behaviors included verbal instructions, modeling in vivo, and behavior rehearsal. The first video displayed an adult and the model playing with a ball, the second showed them playing with a ball and then moving a table, and the third showed them playing with a ball, then moving a table and finally sitting on two rags. Specifically, in the first video, the adult was shown entering a room with the model, wherein a particular toy, a table and two rags were positioned in different places. The adult went to sit on a chair and after a while the model approached him, took him by the hand saying, ‘Let's play’ and led him to that particular toy. They played together for a few seconds. In the second video, when the adult and the model had completed their play the model emitted another social initiation, by approaching the adult, taking him by the hand saying, ‘Let's move the table,’ leading him to the table, and finally moving the table a few meters away. In addition to the content of the second video, the third video also showed the child approaching the adult taking him by the hand saying, ‘Let's sit down,’ and leading him to sit on the rags. Finally, although the fourth video was analogous to the third one in terms of the number of the activities (i.e., three different activities), it was different in terms of the type and function of the activities. Nor was social initiation included and only the child (model) was depicted watering a plant, sweeping the floor, and hanging a jacket. Across a number of conditions, children viewed either the first, second, third, or fourth videos as necessary. Results showed that video modeling was an effective intervention in building a sequence of social behaviors to all of the four children. Also, it was demonstrated that a video clip of three different behaviors was imitated by all children when a history of one or two behaviors had already been established. Whenever an imitative response occurred,

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then all the competing behaviors (e.g., isolated object engagement or challenging behaviors) reduced substantially whereas the levels of reciprocal play increased dramatically. These behavior changes generalized across peers and maintained after a 1- and 2-month follow-up period.

Moreover, during recent years, video modeling has both been incorporated within other instructional formats and been used to address additional sub-areas within the social domain to include, for example, social language and pretend social play skills. As in Dauphin et al. (2004) study, integration of videos into computers was also the focus of the one by Simpson, Langone, and Ayres in the same year. Specifically, they combined video and computer based instruction to teach sharing, following teacher directions, and social greetings to four children with autism. Participants had to discriminate the examples from non-examples modeled by typically developing peers in the video clips. Afterwards, children participated in group activities with peers without disabilities and data were collected for social skill acquisition. Results demonstrated rapid gains in the performance of the targeted social skills and most importantly in a natural environment.

In 2006 Maione and Mirenda examined whether video modeling in combination with video feedback would be effective for teaching a nearly six-year-old boy to use social language with typically developing peers during three play activities. Overall, nine 3-min-videotape vignettes were developed - three for each of the target play activities - and each of them consisted of two unfamiliar adult as models. The models were shown to talk to each other in short phrases (e.g., three to six words) while playing together with the target toys. Each video modeling session ranged from approximately 3 to 9 minutes in duration and always took place prior to the testing with the peers. Although, video modeling increased the child's social verbalizations during the first activity, this did not happen during the second activity. Then, it was felt that the addition of video feedback to the intervention would produce the desirable outcome. During video feedback, the researcher showed the child a videotape of himself and a peer engaging in the play activities, paused the tape occasionally, and asked him to evaluate whether he was

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engaged in “good talking.” This addition resulted in an increase in the frequency of the target behaviors but rather inconsistently. Thus, both verbal and visual prompting was also added to the intervention; all prompts, however, were faded over a few sessions. Data revealed that video modeling alone was sufficient to produce an increase in social language during most of the play activities. For the rest activities, either video feedback or video feedback and prompting were required in addition to video modeling.

Finally, the teaching of pretend play skills to a 4-year-old boy with autism while his sibling acted as a model and play partner was the focus of the study by Reagon, Higbee, and Endicott (2006). Specifically, four different pretend play scenarios were taught to the child using video modeling. These were: a) the firefighter scenario containing 4 scripted statements and 7 actions of approximately 70 seconds in duration, b) the cowboy scenario which was about 25 seconds long and contained 4 scripted statements and 7 actions, c) the about 20-seconds-teacher scenario that contained 6 scripted statements and 5 actions, and d) the doctor scenario which was approximately 30 seconds in duration and contained 5 scripted statements and 6 actions. The participant’s 7-year-old brother served as the model in half of these scenarios whilst 3 other typically developing children were the models in the remaining scenarios. After watching each videotaped scenario, the participant was instructed to play with his sibling with the play materials previously shown in the video. Results showed that video modeling was a successful intervention in teaching a child with autism to engage in four pretend play scenarios. Successful responding generalized across peers and settings and maintained during follow-up sessions.

Concluding this brief exploration of the use of video modeling for teaching complex social skills, it is worth mentioning that in most of the aforementioned studies there were no specific experimenter-implemented contingencies (e.g., reinforcement, prompting, or correction procedures) used, unless these were part of the procedure. That was a significant feature of this intervention because, as mentioned before, children with autism may need continuous adult prompting to complete a sequence of new or even

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already learned activities. Moreover, children with autism could learn equally well from both adults and peers as models. It seemed, though, that the likely success of video modeling procedures was mainly dependent upon the prior elimination of behaviors that interfere with the development of imitation skills (e.g., challenging behaviors).

Is Video Modeling the Only ‘Player in the Game’?

It is important to recognize the significant contributions that operant procedures other than video modeling have offered to the examination and treatment of social deficits in autism. A cursory examination of the behavioral literature leads to a large number of behavioral procedures that have been effective in producing positive changes. Table 1 presents a list of some of these procedures with the tacit understanding that this is not an exhaustive list, which is something out of the scope of the current paper. Alternatively, this list comprises of the latest references to studies in which a sole intervention that addresses the social deficits of children with autism has been examined. Thus, the rather too comprehensive studies on peer-mediated interventions (e.g., Bauminger, 2002; Chung et al., 2007; DiSalvo & Oswald, 2002; Jacklin & Farr, 2005; Kamps et al., 2002; McGrath & Bosch, 2003) had to be excluded. Besides, a variety of critical reviews of methods for increasing the social deficits of children with autism (e.g., Bellini, Peters, Benner, & Hopf, 2007; Chung et al., 2007; Matson & Wilkins, 2007; Matson, Matson, & Rivet, 2007; Scattone, 2007) have recently been published.

It is also equally important to emphasize that, unlike video modeling, most of the procedures in the table have used typically developing peers in a variation of methods and combinations. Indeed, with the exception of script-fading procedure, social stories (in one instance only), tactile prompting device and self-video modeling, all others demand peers (typically developing children or siblings) as integral component of their design. Interestingly enough, the procedures wherein peers are not involved in the intervention process are also regarded as visually-cued instructions as is video modeling.

Although trained peers can be extremely helpful in building social behaviors, children with autism are not always in environments (i.e., mainstream schools) where

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Table 1.

Study	Intervention	Participants	Targeted skills	Peer involvement during training	Main results
Pierce, K., & Schreibman, L. (1997)	Peer-implemented pivotal response training	2 Age 7 - 8	Maintenance of interaction, initiation of conversation, initiation of play	YES	<ul style="list-style-type: none"> Intervention was effective in producing positive changes in the social behavior
Krantz, P.J., McClannahan, L.E. (1998)	Script-fading procedure (for beginning readers)	3 Age 4 - 5	Interaction, scripted interaction, elaboration, unscripted interaction	NO	<ul style="list-style-type: none"> The script-fading procedure enabled participants to converse with adults, to benefit from adults' language models, and to engage in language practice
Stevenson, C.L., et al (2000)	Script-fading procedure (audiotaped)	4 Age 10 - 15	Scripted and unscripted social interaction (conversational social language)	NO	<ul style="list-style-type: none"> Increases in conversational social language for children with autism who are nonreaders.
Garfinkle, A.N., & Schwartz, S. (2002).	Small-group peer imitation training	4 Age 4 - 5.5	Any social interaction or imitation of peers	YES	<ul style="list-style-type: none"> Variability in participants' behavior All participants were able to imitate their peer's behavior Social behavior was not greatly affected by the training protocol during small group
Shabani, D.B., et al (2002)	Tactile prompting device (vibrating pager)	3 Age 6 - 7	Verbal initiation and verbal responses	NO	<ul style="list-style-type: none"> Verbal initiations and verbal responses to peer initiations increased Attempts to reduce the frequency of prompts were partially successful for one participant
McGrath, A.M., et al (2003)	Social skills training involving prompting and shaping	1 Age 4.11	The <i>Behavioral Play Coding Scheme</i> was administered	YES	<ul style="list-style-type: none"> The intervention assisted peers in incorporating the participant into their typical free-play situations

such peers are available (Weiss & Harris, 2001). Inclusion of these children in mainstream school settings has become a considerable option. However, such an important (or terminal) step still seems to be quite far from realization (Gena, 2006). Placement of students with autism in those settings would not necessarily result in social benefits for these students (Harrower & Dunlap, 2001). Unarguably, peer-mediated interventions need to take place, focusing on the effective use of typical classmates for improving the social behavior of students with autism (Kamps et al., 1998). However, what would the situation be when resources for such training in inclusive school settings are restricted? One possible solution would be the combination of peer-mediated

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(Table 1 continued)

Study	Intervention	Participants	Targeted skills	Peer involvement during training	Main results
Delano, M., & Snell, M.E. (2006)	Social stories	3 Age 6 - 9	Appropriate social engagement, seeking attention, initiating comments, initiating requests, making responses	YES	<ul style="list-style-type: none"> ▪ Duration of social engagement increased ▪ Frequency of the target social skills increased
Scattone, D., et al (2006)	Social Stories	3 Age 8 - 13	Appropriate social interaction	NO	<ul style="list-style-type: none"> ▪ Data demonstrated that Social Stories may be used in order to increase appropriate social interactions when used as a sole intervention are limited in their effectiveness
Tsao, L-L., & Odom, S.L. (2006)	Sibling-mediated intervention	4 Age 3 - 6	Joint attention, social initiation, negative social initiation, social response, negative social response, no social behavior	YES	<ul style="list-style-type: none"> ▪ Data supported the effectiveness of the intervention
Bellini, S., et al (2007)	Video self-modeling	2 (preschool-aged)	Unprompted social engagement with peers	NO	<ul style="list-style-type: none"> ▪ Rapid and substantial increases in unprompted social engagement
Owen-DeSchryver, J.S., et al (2008)	Peer-mediated intervention	3 Age 7 - 10	Social initiation and responses to social initiations.	YES	<ul style="list-style-type: none"> ▪ Social initiations and responses to peer initiations generally increased ▪ Trained and untrained peers exhibited very low initiations during at least one session in the postintervention phase.

Table 1. Latest references to studies that examine sole social interventions

interventions with video modeling. Since videotapes provide a permanent product, one video recording of a peer’s actions could undoubtedly reduce the cost of live models (peers) employed in training programs. Also, videotapes can be recorded in a variety of real-world environments (e.g., in a shop, in a restaurant) and then be successfully presented in the school setting. This would further reduce the need of resources (e.g., Haring, Breen, Weiner, Kennedy, & Bednersh, 1995; Alcantara, 1994) making video modeling an efficient and cost-effective tool (e.g., Charlop & Milstein, 1989; please refer to Delano, 2007; Nikopoulos, 2007 for a more detailed description of the benefits of video modeling).

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Certainly, further research is needed to evaluate such a possibility. Another research direction for increasing the success of children with autism in inclusive school settings would be the evaluation of video modeling to promote specific academic and classroom skills (Delano, 2007). Future research could also examine how video modeling might facilitate responding in peer group arrangements, as opposed to the one-to-one context. Another important task would be the systematic examination of both the video components and the behavioral characteristics of students with autism who may benefit most from video modeling interventions. Transferring research findings on best practices to school teachers also demands careful investigation of how teachers can apply video modeling to everyday teaching and instruction. Finally, frequent use of video modeling may also contribute to the development of imitation skills in children with autism. This issue provides an important direction for future research as these children are unlikely to be able to sustain social interactions with their peers for any length of time, in the absence of imitative behaviors (Schopler & Mesibov, 1986).

Concluding Remarks

Although there has been a corresponding explosion of literature regarding the treatment of the social deficits in autism, the establishment of more complex social behaviors still remains a challenge. The natural science of behavior analysis appears to be well suited to address this challenge. Despite the fact that peer-mediated approaches represent the largest and likely the most empirically supported type of social interventions (Bass & Mulick, 2007), a database demonstrating the effectiveness of video modeling is being established. Undoubtedly, by taking advantage of the tendency of children with autism to better follow visual instructions (e.g., Bondy & Frost, 2001; Tissot & Evans, 2003), the use of videotapes could become one promising means for their social training. This possibility may be accelerated by recent advances in video and computer technology such as virtual environments (e.g., Mitchell, Parsons, & Leonard, 2007; Parsons, Leonard, & Mitchell, 2006; Self, Scudder, Weheba, & Crumrine, 2007; Trepagnier et al., 2006).

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