Use of Video Modeling to Increase Generalization of Social Play by Children with Autism

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Abstract

The use of video modeling to increase generalization of social play skills in children with autism is discussed. The possible reasons that have made this procedure so favorable among researchers and practitioners are explored. Two studies are described in which video modeling increased the generalization of social play in 6 children, and critical features of procedure are emphasized. Suggestions regarding the potential mechanisms responsible for the effectiveness of this procedure are discussed relative to basic behavioral theory and research.
Key Words: Video modeling, generalization, social play, autism, children.

Introduction

The development of social skills by children with autism is qualitatively and quantitatively different from that observed in other childhood disorders or in typically developing peers as early as the second year of life (e.g., Ruble, 2001; Wetherby, Watt, Morgan, & Shumway, 2007). It has been suggested that social impairment may be a primary deficit that results in the development of secondary deficits such as communicative disorders or self-stimulatory behaviors (e.g., Baker, 2000; Bellini, Akullian, & Hopf, 2007; Rogers, 2000). For example, in verbal children, both the frequency of language use, even in an echolalic form, as well as the development of novel vocabulary have been demonstrated to increase along with increases in social engagement (e.g., Krantz & McClannahan, 1993; Kuhl, Coffey-Corina, Padden, & Dawson, 2005; Nikopoulos & Keenan, 2007; Stahmer, 1995; Thorp, Stahmer, & Schreibman, 1995). Furthermore, inappropriate behaviors have been shown to decrease during periods of active social engagement (Lee & Odom, 1996; Nikopoulos & Keenan, 2006).

When children with autism have major difficulties in engaging in social interactions they may also have fewer opportunities to initiate social play (e.g., Beyer & Gammeltof, 2000; Koegel, Koegel, Frea, & Fredeen, 2001; Pierce & Schreibman, 1994) or to learn language (Kaiser, Hester, & McDuffie, 2001). Thus, social and communication skills are often studied as an integrated unit since impairments in the entire social communication domain have been acknowledged as a significant part of the symptom-based genetic research in autistic spectrum disorders (Klin, Jones, Schultz, Volkmar, & Cohen, 2002). Indeed, several studies have demonstrated that engagement in social communicative interactions directly affects other behaviors such as stereotyped or self-injurious behaviors even when these behaviors are not significantly targeted by the teaching program (Green, Gilchrist, Burton, & Cox, 2000; Horner, Carr, Strain, Todd, & Reed, 2002; McGee, Morrier, & Daly, 1999; Rogers, 2000; Summers, Houlding, & Reitzel, 2004).

Since social skills are related to the long-term adjustment of and prognosis for both typically and atypically developing children, any program for children with autism must address and promote these valuable skills (Charlop-Christy & Daneshvar, 2003; Hwang & Hughes, 2000). The following sections of this paper will introduce the role of video modeling in promoting social development; describe the reasons for an increasing interest in video modeling among practitioners and researchers; summarize two studies that have examined the ability of video modeling to promote generalization of social skills; and examine elements of video modeling within a behavior analytic framework.

Use of Video Modeling to Enhance Social Skills

Many studies have been conducted to promote the social skills of children with autism by focusing on increasing their social communicative engagement with others (e.g., adults; typical peers) during play situations. Procedures have included *social stories* (Kuoch & Mirenda, 2003; Smith, 2001), *peer-mediated intervention* (DiSalvo & Oswald, 2002; McGrath, Bosch, Sullivan, & Fuqua, 2003), *pivotal response intervention* (Koegel, Koegel, Shoshan, & McNerney, 1999), *self-management package* (Newman, Reineche, & Meinberg, 2000), *script-fading procedure* (Krantz & McClannahan, 1993; Sarokoff, Taylor, & Poulson, 2001), and *tactile prompts* (Shabani et al. 2002) to name a few.

Video modeling has also been used as an effective approach for teaching children with autism socially relevant behaviors (e.g., Apple, Billingsley, & Schwartz, 2005; Gena, Couloura, & Kymissis, 2005; Shipley-Benamou, Lutzker, & Taubman, 2002; Sturmey, 2003). Procedurally, video modeling is a type of modeling in which the model is videotaped (Grant & Evans, 1994). It occurs when one person, the model, performs a videotaped behavior and this performance cues another person, the observer, to imitate that behavior in natural settings (Morgan & Salzberg, 1992). In general terms, video modeling can be considered as a stimulus control procedure in that the behavior of a model becomes a discriminative stimulus for the observer's imitation of a modeled response.

Video modeling has been used to target a wide range of skills within the domains of social development and play. Targets include *conversational skills* (Charlop & Milstein, 1989; Sherer et al., 2001), *perspective taking skills* (Charlop-Christy & Daneshvar, 2003; LeBlanc et al., 2003), *complex play sequences*, *sociodramatic* and *pretend play* (D'Ateno, Mangiapanello & Taylor, 2003; Dauphin, Kinney, & Stromer, 2004; Hine & Wolery, 2006; MacDonald, Clark, Garrigan, & Vangala, 2005; Nikopoulos & Keenan, 2004b; Reagon, Higbee, & Endicott, 2006), *generative spelling* (Kinney, Vedora, & Stromer, 2003), *social skills* (Kimball, Kinney, Taylor, & Stromer, 2004; Nikopoulos & Keenan, 2003, 2004a, 2007; Parsons, 2006; Simpson, Langone, & Ayres, 2004), *play-related statements* (Taylor, Levin, & Jasper, 1999) and *social language* (Maione & Mirenda, 2006).

The behavior gains obtained by children with autism often do not generalize in the absence of specific training (e.g., Charlop-Christy, Le, & Freeman, 2000; Reeve, Reeve, Townsend, & Poulson 2007; Volkmar, Chawarska, & Klin, 2005). However, it has been suggested that video modeling may be an effective treatment to promote generalization (e.g., across different settings and conditions) (see Bellini & Akullian, 2007 for a review). To date, only two studies (Nikopoulos & Keenan, 2004a, 2004b) have examined the use of videos to increase generalization of social play. However, the results of these studies, collectively, suggest that video modeling is not only an effective procedure for promoting social play skills (i.e., social initiation & reciprocal play) but also that it can increase the stimulus and response generalization of target behaviors.

Why Video Modeling?

As noted above, video modeling has been widely used to treat individuals with autism in a variety of different forms, uses, and contexts, in combination with and without other behavioral procedures. What makes this approach so favorable to researchers and treatment providers? Nine reasons have surfaced in the literature. The *first* is that videos are broadly used by typically developing children for leisure and educational purposes. As such, they are perceived as socially acceptable forms of support.

Second, the extensive use of videos in training may stem from the obvious shift in emphasis from language-based instruction to more visual instructional supports for teaching individuals with multiple

disabilities and autism (e.g., Bondy & Frost, 2001; Coucouvanis, 1997; Jolly, Test, & Spooner, 1993; Quill, 2000). Indeed, visual discriminative stimuli have been demonstrated to be remarkably effective for children with autism (e.g., Bernard-Opitz, Sriram, & Sapuan, 1999; Dawson, Osterling, Meltzoff, & Kuhl, 2000; Kamio & Toichi, 2000; Minshew, Goldstein, Muenz, & Payton, 1992; Rao & Gagie, 2006) and especially for learners who cannot process print materials or verbal instructions (e.g., McClannahan, & Krantz, 1999; Quill, 1997).

Third, video modeling can be a powerful tool, both for teaching new behaviours and for improving already acquired ones, allowing the learner to demonstrate new responses without errors (Miltenberger, 2004). Further, these changes in behavior can be produced in a remarkably short period of time, after just a few video-only presentations (prompts). This is important since it is common for children with autism to become prompt dependent, especially when intervention procedures are based on continuous prompting techniques (Lasater & Brady, 1995; Odom, Chandler, Ostrosky, McConnell, & Reaney, 1992; Stahmer & Schreibman, 1992). Moreover, it is a treatment technique that does not require extensive training prior to implementation (e.g., Corbett, 2003; Schreibman, Whalen, & Stahmer, 2000; Nikopoulos & Keenan, 2006).

Fourth, video modeling can serve as an efficient and cost-effective tool. Since videotapes provide a permanent product, one video recording of a model's actions could reduce the cost of live models employed in training programs (Racicot & Wogalter, 1995). Moreover, 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 a training setting. This would further reduce the need of resources (e.g., Haring, Kennedy, Adams, & Pitts-Conway, 1987; Alcantara, 1994).

Fifth, it is common for children with autism to respond to a restricted set of cues in their environment, a phenomenon known as *stimulus overselectivity* (e.g., Lovaas & Koegel, 1979; Rincover & Ducharme, 1987). A video display can bring the relevant cues closer together within a visual frame (e.g., settings, models, stimuli etc.). This can help these children to follow the respective cues and to discriminate the relationship among them for subsequent imitative responding to occur (Dowrick, 1991; Morgan & Salzberg, 1992; Rincover & Ducharme, 1987). Interestingly, literature has shown that children with autism can be taught to "overselect" the relevant cues (e.g., Schreibman, Charlop, & Koegel, 1982).

Sixth, a video can efficiently take advantage of the attentional skills of children with autism to graphical presentations by displaying numerous examples of stimulus and response variations (Garretson, Fein, & Waterhouse, 1990). This suggestion is supported by reports documenting that these children tend to pay selective attention to television and spend extended amounts of their day watching television (Buggey, Toombs, Gardener, & Cervetti, 1999; Nally, Houlton, & Ralph, 2000).

Seventh, the ability to watch videos does not require high levels of social skills. This is particularly important for children with autism, who typically present with social skills deficits. Thus, the use of videos may effectively help these children to attend to modeled behaviours and to concentrate on these behaviors in a way that they would not do if provided with live models (Charlop & Milstein, 1989). Research shows that children with autism look longer and more often at the human figure than at neutral objects when presented in pictures (van der Geest, Kemmer, Camfferman, Verbaten, & van Engeland, 2002) even though they may face major difficulties in orienting to social stimuli (Dawson, Matson, & Cherry, 1998) or in looking at people in real life contexts (Swettenham et al., 1998).

Eighth, individuals with autism exhibit difficulties in situations involving environmental change (American Psychiatric Association, 1994). Schreibman et al (2000) refer to these difficulties as *disruptive transition behavior*. In addition**,** Ferrara and Hill (1980) stated that children with autism could become seriously disorganized when they are not able to predict the sequence of events. Video modeling could

reduce disruptive transition behaviors by (a) exposing children with autism to videotaped models of appropriate transition behavior in environments that are the same as (or similar to) the actual environments in which they will be required to transition; and by (b) helping them to predict the expected or required sequence of events.

Finally, behavioral measurement in training such as recording of sequences or correct responses or assessment of complex behaviors can be easily standardized. The use of video, therefore, strengthens internal consistency and reliability, allowing a more confident comparison of data across learners and sessions (Morgan & Salzberg, 1992; Powers & Handelman, 1984).

Empirical Validation of Video Modeling to Support Generalization of Social Play

Study 1 (Nikopoulos and Keenan, 2004a)

As noted above, only two studies have examined the ability of video modeling to increase generalization of social play in children with autism (Nikopoulos & Keenan, 2004a, 2004b). The overall objective of the first study (Nikopoulos & Keenan, 2004a) was to examine a) whether a video modeling intervention could be effective in promoting social play skills (i.e., social initiation & reciprocal play) in a simplified environment (i.e., in the presence of only one toy at a time) and b) whether potential success with one toy during video modeling training could increase the probability of success with new toys in the absence of video (i.e., generalization of social play).

Three children with autism, ages 7.5 to 10.5 years, served as participants in the study. All had scored within the range of mild-moderate autism on the *Childhood Autism Rating Scale* (Schopler, Reichler, & Renner, 2002). All participants had some speech and displayed limited interactions with other children or adults. Other aspects of their behavior included limited interest in toys, preferring solitary activities, marked impairments in the use of non-verbal behaviors and persistent desire to follow set patterns of behavior during their interactions with others. The study took place in three different classrooms (Rooms 1, 2, & 3) of the participants' school and a multiple baseline design across subjects was employed.

Initially, the participants were taken (individually) to Room 1 to view a 35-s video of a typically developing peer engaged in a simple social activity using a wooden train while interacting with the researcher. The video showed the researcher entering a room with the peer model. The researcher then sat on a chair close to the toy while the model spent a few seconds wandering around the room. Then, the model performed a sequence of behaviors to demonstrate *social initiation*. Specifically, the model approached the researcher, took him by the hand, said "Let's play", and led him to the toy. Together the model and the researcher then continued to interact for 15 seconds to demonstrate *reciprocal play*.

After watching this video sequence once, each participant was taken (individually) into Room 2, which was different from the room displayed in the video. In Room 2, each participant was presented with a number of conditions. In each condition, the researcher engaged in the same behavior shown on the video. No instructions were provided to the participant regarding the video that he or she had just watched. The transition from one condition to another was based on each participant's performance data. (Please see Figure 1, below, which provides a graphical representation of all conditions). Thus, in the first condition (T1), when a participant succeeded in emitting the modeled sequence of behaviors within the first 25 seconds over three consecutive sessions, s/he was transitioned to the next condition (T2). In that condition, a different toy (a ball) was provided, and it was assessed whether the behavioral changes (i.e., social play) that had occurred in the preceding condition would be generalized without the benefit of video modeling in the presence of this different toy (a ball). The three following conditions (T3, T4, T5) were identical to T2 except that the toy was different in each condition ("Hungry Frog" game, set of

tambourines, and trampoline, respectively). In other words, the participants were assessed to determine whether they could engage in social play with the researcher without the benefit of video modeling and in the presence of another toy. In essence, Conditions T2, T3, T4, and T5 were exactly the same as Condition T1 except that no video model was provided and a different toy was used in each condition. If a participant emitted the modeled response in three consecutive sessions, then he/she experienced the next respective condition; otherwise, he or she experienced the preceding condition, just once. This process (of a participant transferring from one condition to another) continued until he or she was assessed with the fifth generalization toy in a row in Condition T5. Each session was scheduled to last a maximum of 5 minutes.

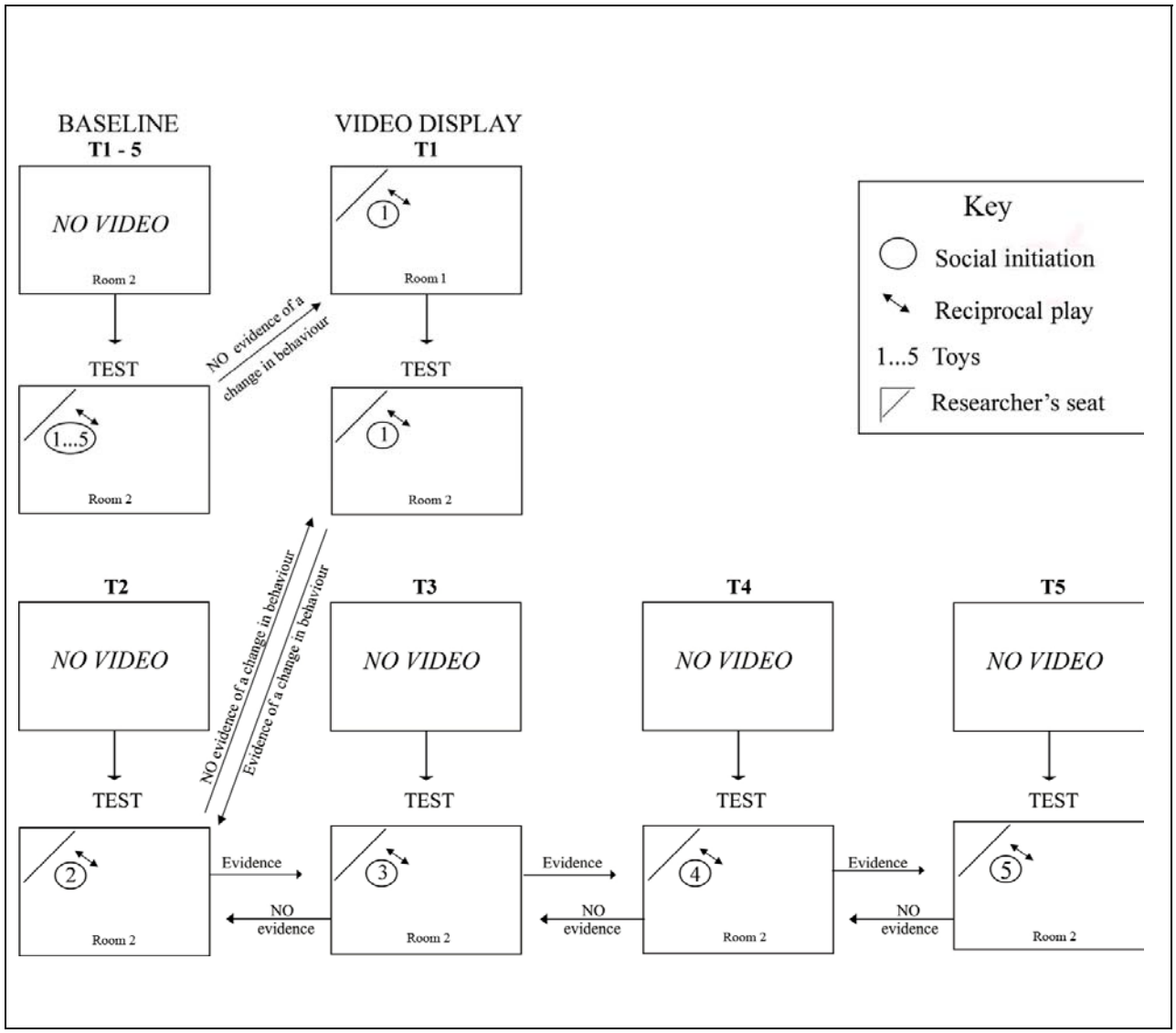

Figure 1.
Procedures applied during baseline, video modeling and generalization across toys for all participants. (Based on "Video modelling and behaviour analysis: A guide for teaching social skills to children with autism" by C.K. Nikopoulos and M. Keenan, 2006. Jessica Kingsley Publishers. Reproduced by permission of the publishers.)

The results of this study showed that, video modeling appeared to increase social initiation, play skills, and generalization of social play across toys for all three participants. Moreover, the participants generalized the target behaviors across settings (in Room 3) and researchers, and they maintained their skills during probes conducted at 1 and 3 months after the completion of Condition 5. The generalization across stimuli during four different conditions (i.e., Conditions T2, T3, T4, & T5) was a remarkable finding since the participants viewed the short video clip only during the first condition (T1) for 3 to 4 sessions.

Study 2 (Nikopoulos and Keenan, 2004b)

Study 1 demonstrated that social play skills which had been demonstrated through video modeling in one condition generalized across four subsequent conditions involving four different toys without the benefit of video modeling. However, only one toy was present in the room during each condition. That is, across sessions, participants had the opportunity to engage in social play with the researcher by using the only one toy that was available each time. Therefore, when that engagement in social play was completed within the time limits of each session, there was not any other toy in the room available for the participants.

Since children typically have access to more than one toy in a natural play environment, the next logical step was to design a video modeling intervention that would promote generalization of social play across different toys available simultaneously (Nikopoulos and Keenan, 2004b). This would allow the generalized effects of the intervention to be assessed in a more natural setting (Kraijer, 2000). However, previous research had indicated that children with autism, if provided with access to more than one toy, might experience difficulties in imitating a videotaped model's behaviors (Nikopoulos & Keenan, 2003). In fact, the study indicated that imitation of videotaped social modeling occurred more often when only one toy was present. A possible explanation for this finding was that the presence of more than one toy in a room could have been distracting. To deal with this potential difficulty, Nikopoulos and Keenan (2004b) presented the participants a video with a reduced number of behavioral components. It was assumed that a simplified videotape would facilitate the acquisition of the target behavior and overcome potential distractions in a room with a variety of toys.

Three boys, ranging in ages from 7 to 9 years, served as participants in this study. Each participant scored within the mild-moderate range of autism on the *Childhood Autism Rating Scale* (Schopler, Reichler, & Renner, 2002), and each presented with a restricted repertoire of social and play skills.

During the study, each participant was taken to Room 1 to view a 35-s video of a typically developing peer, engaged in a toy play activity with the researcher. In the video, the researcher was shown entering a room with the model and going to sit on a chair that had been placed opposite a number of toys (rather than just one toy as in the first study). As before, the model spent a few seconds wandering around the room and then emitted a social initiation by approaching the researcher, taking him by the hand, saying "Let's play", and leading him to a particular toy (i.e., social initiation). This toy (the trampoline) was closer to the researcher's seat than the other toys. The model played with the researcher using this toy for about 15 seconds (i.e., reciprocal play).

As in the first study, each participant was allowed to watch this video sequence just once, and then he was taken into Room 2. In that room, the researcher again engaged in the same behavior as shown in the video while making no reference to the participant about the video just watched. This experiment consisted of four main conditions; T1-a, T1-b, T1+2, and T1+2+3 (see Figure 2). In each of these

conditions the same five toys used in the first study were available on the floor (i.e., wooden train, ball, "Hungry Frog" game, tambourines, and trampoline). In Conditions T1-a and T1-b, each participant was required to engage in social play by using one toy (the modeled; the trampoline). These two conditions were exactly the same except that in Condition T1-b the model videotape was simplified to show only the social initiation segment and not the reciprocal play segment. In Condition T1+2, a participant was required to use two different toys (the modeled and another one) for engaging in social play, whereas three toys (the modeled and two others) were required to be used in Condition T1+2+3. In essence, the generalized effects of video modeling would be assessed during these last two conditions.

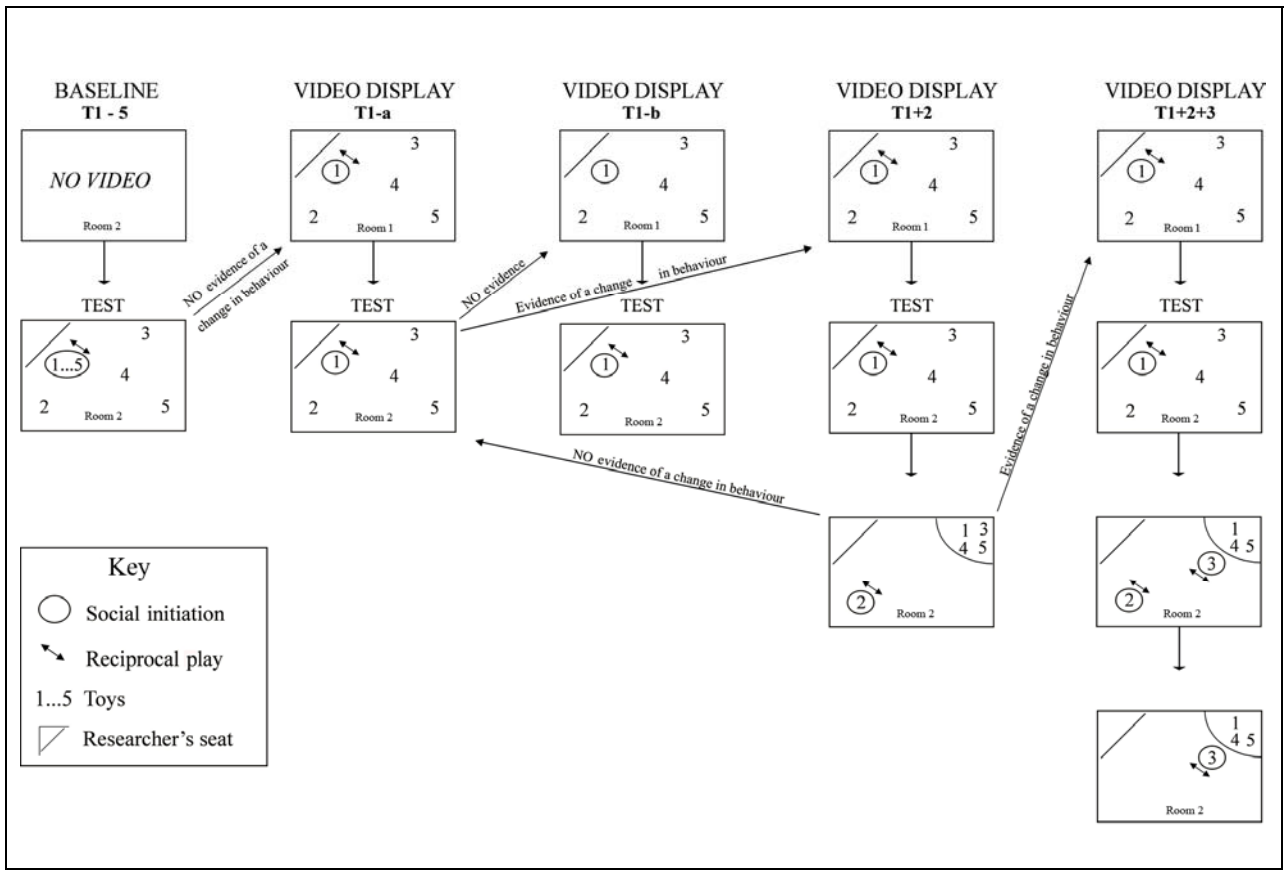

Figure 2.
The general procedure during baseline and video modeling intervention for all participants.
(Based on "Video modelling and behaviour analysis: A guide for teaching social skills to children with autism" by C.K. Nikopoulos and M. Keenan, 2006. Jessica Kingsley Publishers. Reproduced by permission of the publishers.)

As it is the case in any behavioral study, transition from one condition to the next was based on each participant's performance data. Thus, a participant was transitioned from Condition T1-a to Condition T1+2 and then to Condition T1+2+3, when he had met the criterion of emitting one, two or three social initiation responses within the first 25 seconds of any play opportunity in three consecutive sessions, respectively. If a participant failed to meet this criterion, then he experienced the preceding condition, just once. In that condition, if a child succeeded in emitting a social response to the researcher, then he was transferred to the next condition again. There was, however, an exception. During Condition

T1-a, if a participant failed to emit a social initiation in three consecutive sessions, then he experienced Condition T1-b.

For all participants in this study, video modeling appeared to rapidly increase generalization of social play skills across toys, settings and subjects in a more natural setting. Successful responding maintained at one- and three-month follow-up periods. This was achieved by dividing the video display into its two major components (i.e., social initiation & reciprocal play), which eventually facilitated the imitative responding independently of the number of toys present.

Theoretical Issues

Video modeling was described as an effective procedure for promoting the generalization of social play skills in children with autism. Obviously, this generalization occurred because, following the training, responding remained at a high rate in the presence of similar stimuli (toys). This also further strengthens the suggestion that video modeling can be an effective training procedure and therefore children with autism could benefit from the opportunity to observe videotaped models engaging in social interaction towards reciprocal play. Deguchi (1984) suggested that an approach to modeling should not be criticized or justified only by its level of explanation. It should be better judged in terms of its contribution to a science and a theoretical contribution to human development. However, any attempt to explain the possible reasons for video modeling being so effective in these studies would undoubtedly facilitate further advancements in this procedure. These reasons might be better discovered if this procedure was examined as it is derived from the basic behavioral research.

Thus, video modeling was used as an *antecedent strategy* (Cuvo & Davis, 1998; Heflin & Alberto, 2001) which exerted stimulus control over children's performances. It might be a case that the relevant stimuli - toys, model, & researcher - had been captured close enough together in terms of the two-dimensional TV screen, enhancing the acquisition of the stimulus control of the successful imitative responding (Charlop-Christy et al., 2000). However, after a short video modeling intervention children's behavior changed even in the absence of any video display (i.e., all generalization sessions & follow-ups) providing evidence that children's performance was not solely under stimulus control of the video display, but perhaps also by the toy(s) or the researcher or peers. That the frequency of responding remained high in the presence of physically different toys during generalization is perhaps indicative of a *functional equivalence class* (Masia & Chase, 1997; McGuigan & Keenan, 2002).

Following the above assumption that the toy(s) or the researcher/peers could act as discriminative stimuli for responding, the video modeling intervention could be explained within the paradigm of *establishing operations*. The term 'establishing operation' was first introduced by Keller and Schoenfeld (1950) and further explored by Michael (1993, 2000). It refers to those events or conditions that affect an organism by momentarily altering the reinforcing effectiveness of other events and also the frequency of occurrence of that part of the organism's repertoire relevant to those events as consequences. During the baseline sessions in these studies, children did not use the toys in interactive play behavior with the experimenter. However, that behavior did occur after video modeling had been introduced. Consequently, it seemed that the video display altered the reinforcing effectiveness of the toys (e.g., Koegel, Camarata, Valdez-Menchaca, & Koegel, 1998; Stahmer & Schreibman, 1992) and thus, the occurrence of social play remained in the children's repertoire at high rates.

Participants' performance during the video modeling procedures could have been influenced by their reinforcement histories with respect to the same or similar stimulus materials (e.g., toys) or to the modeled responses (e.g., social interaction, reciprocal play). Thus, a history of reinforcement delivered for some behaviors could function to maintain an entire class of imitations (Baer, Peterson, & Sherman, 1967). This is consistent with the suggestion that an imitative behavior cannot be explained just as a

separate stimulus-response relationship but rather as an operant class of responses. That is, as soon as an imitative response of a person is reinforced, then that person will tend to imitate other behaviors, even if they contain no apparent elements in common with the imitative behavior that was reinforced (Martin & Pear, 2006). Even, a history of *intermittent reinforcement* for imitation can be responsible for a learner's imitation of novel behaviors. In fact, Skinner (1953) proposed that a behavior can become stable or resistant to extinction when it has been reinforced intermittently. From that perspective, targets of the video modeling procedures described in the aforementioned studies could be viewed as explicit examples of *generalized imitation.* This occurs when an individual imitates a new response without direct reinforcement (Baer & Deguchi, 1985); so did occur in both studies.

According to Skinner (1957), any rule-governed behavior is under the control of verbal discriminative stimuli. The use of an audio component (i.e., 'Let's play') in the videotapes might have served as a salient cue for the children to pay attention at the modeled behaviors. Thus, the video display could have served as a verbal discriminative stimulus that affected the subsequent responding of the children and video modeling could be examined as an example of *rule-governed behavior*. It is also worth mentioning that although language development was not included in the objectives of any of the studies by Nikopoulos and Keenan (2004a & 2004b) all participants began imitating the verbal components presented on the video. Interestingly, video modeling in these two studies produced quicker changes in the social play behavior in children whose language skills were more developed. This is consistent with the suggestion that abnormalities in social behavior and play are more severe in children with autism with very limited language than in those who have some speech and hence, there may be a relationship between social functioning and language development (Ingersoll, Schreibman, & Stahmer, 2001; Lord & Pickles, 1996).

Conclusion - A step forward

The video modeling procedures applied to both studies by Nikopoulos and Keenan (2004a, 2004b) described in this paper produced significant gains in time spent in social play for the participants by using a variety of toys, which eventually led to a substantial increase in total time interacting with the researcher and peers. Importantly, video modeling was demonstrated to be an effective teaching strategy for rapidly acquiring high levels of generalization and maintenance. The significance of these findings is highlighted by the fact that play with objects is considered the most natural context for the development of social interaction and language development in children with autism (e.g., Sigman & Ruskin, 1999).

The popularity of television and video media relative to books suggests that many people prefer watching and listening to reading. Thus, by taking advantage of the tendency of children with autism to better follow visual instructions, the use of videotapes can become one promising means for their training. Instructional videotapes are easily duplicated and exported and, properly packaged, may be useful to agencies with limited financial resources and technical expertise. Furthermore, carefully constructed computer programs, can gain the attention of children with autism, motivate them, and promote their learning, especially where otherwise one-to-one assistance would be required (e.g., Bernard-Opitz, Sriram, & Nakhoda-Sapuan, 2001; Hetzroni & Tannous, 2004; Wong & Tam, 2001; Williams, Wright, Callaghan, & Coughlan, 2002). Integration of such educational computer programs into classrooms could provide a cost-effective teaching method to supplement current educational practices (Moore & Calvert, 2000). They will contribute to current demands for transferring research findings on best practices to school teachers and families (e.g., Brookman-Frazee, 2004; Ingersoll & Dvortcsak, 2006; Lerman, Vorndran, Addison, & Kuhn, 2004).

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