Video Self-Modeling as an Intervention Tool in Autism

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Abstract

This study tested the teaching effectiveness and impact on self-efficacy of videotaped self-modeling (VSM) against the pictorial schedules of the Treatment and Education of Autistic and Communication-handicapped Children (TEACCH) methodology for children with autism. Eight children aged 5-17 years were matched by severity and randomly assigned. Those with severe autism were given a four-step, mental-age appropriate sequence. Those with High Functioning Autism (HFA) or Asperger's Disorder were taught to fold an origami crane. The number of prompts to criterion (perfection in the absence of intervention) and the number of sessions to criterion were recorded, along with qualitative data. Results suggested the greater effectiveness of VSM within the Asperger's Disorder group, and equal effectiveness in the HFA group. None of the participants in the severe group came to criterion. Videotaped self-modeling evoked improved sense of self-efficacy and self-esteem within the two higher-functioning groups.

Autism is the most complex of the pervasive developmental disorders. Originally identified in 1943 by Kanner, and in 1944 by Asperger, the disorder has baffled experts for many decades. Clinically, autism is characterized in three main areas: by impairment in at least two of four types of social skills, by at least one manifestation of restricted interests or stereotypical behaviors, and by speech abnormalities, such as echolalia or delayed speech development. It is also categorized by level of severity: severe, High Functioning Autism (HFA) or Asperger's Disorder, the least severe form of autism. This last level specifies that the individual in question does not have a speech delay (APA).

Consistencies within the symptomology include motor planning deficits, excellent habit memory, and a strong visual orientation. Motor planning regulates, among other things, the ability to think systematically, to track the course of conversations, and to organize thoughts into a coherent sequence toward an end goal. Habit memory is thought to be at the root of the need for consistency and structure, and the development of restricted interests, along with the superior rote information memory seen in some individuals with autism (Bauman).The strong visual orientation includes the processing of visual image information in such a way that the individual with autism may be able to break down a visual field into segments (Ozonoff, Rogers, and Pennington) and focus on just one segment at a time. Indeed, parents have reported that their children with autism can find objects in a visually confusing environment much better than can their nonautistic children.

Although there is disagreement as to the neurobiological foundation for autism, what is clear is the importance of early intervention in order to take advantage of the natural plasticity of the young brain; new, alternate neural pathways can be reinforced, all in an effort to help the child with autism overcome his neurological deficits. An important clue to effective intervention is that many adults with autism report that they think in pictures, not words. Grandin reports struggling with her language development as a child, partly because she could not create mental picture representations for many words. Her explanation that her memory is best described as a video library has been anecdotally supported by other adults with autism. They remember in scenes, not in still pictures; videotapes and television closely approximate this process.

In 1972, Shopler at the University of North Carolina devised a structured teaching system using the visual strengths and habitual memory of the child with autism. This methodology, called the Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH), uses pictorial schedules to create a structure upon which a child with autism can rely. The intervention is focused on teaching independent work skills, via the

systematic presentation of still pictures in left-right orientation on a chart. Each picture represents a particular step in a work sequence, leading to the end goal. As the child begins each step, the associated picture is removed from the chart, so that when all the pictures are removed, there is the reinforcing visual presentation of the completion of the task or achievement of the goal (Mesibov).

The TEACCH methodology is widely used with children who are nonverbal or who have motor planning deficits. Children are taught to do the simpler tasks associated with categorical tasks (e.g., how to add arithmetic problems); the categorical tasks are then placed on the schedule so that the children work independently for longer periods. Though the methodology calls for eventual fading of this prompt system, many parents and teachers fail to encourage it, leaving children quite dependent upon their pictorial schedule.

Forty years ago, Bandura and his associates conducted experiments on the effect of televised behavior on children's behavior. Their classic "Bobo doll" experiment (Bandura, Ross, and Ross) demonstrated that children learn behaviors from such observation; continued research led to the formation of Bandura's observational learning, or modeling, theory. Further research suggested that the self is the most powerful model (Bandura; Buggey, "Videotaped"; Dowrick, "Review"); videotape lends itself to this process quite nicely. Subsequently, Creer and Miklich demonstrated that videotaped self-modeling (VSM) could be used to successfully change the behavior of a ten-year-old boy. Other efforts taught swimming skills to children with spina bifida, improved selective mutism, and diminished depression in both adolescents and adults (Dowrick, *Guide*).

Videotaped self-modeling is a process in which an individual is videotaped while being taught a sequence of tasks toward a goal. The tape is edited to remove all prompts by the teachers and any mistakes made by the individual during this training. The technique is now widely used to help children overcome behavioral problems and to help athletes identify and understand the changes they need to make to improve performance (Dowrick, *Guide*).

Because children with autism do not readily attend upon demand, it was long felt that VSM would not be an effective intervention tool for them. However, over the last twenty years, this author and others observed many children with autism paying strict attention to images of themselves in reflective surfaces. Not only were the children watching themselves, but they were making minute adaptations to their repetitive, self-stimulating movements and gleaning information from viewing their own movements to improve their visual-spatial sense and gross motor coordination. Also, such children were avid television viewers, probably because the strict consistency and predictability inherent in repetitive videotape viewing gives comfort and because video can be an emotionally safe and socially undemanding source of information about the world. Finally, since video seems to most closely approximate the way in which individuals with autism think and remember (Grandin), sequences of tasks taught via videotape should be remembered more easily and accurately.

Therefore, it seems plausible that children with autism would be responsive to VSM. Indeed, Buggey ("Examination") used VSM to improve verbalizations from children with autism, and later to train responding behaviors in such children (Buggey et al.). Other researchers conducted case studies in the use of VSM in autism, with equally promising results (Krantz et al.). Convinced of the efficacy of VSM, the Kentucky Autism Training Center gave a workshop for parents on the technique in the summer of 2000, teaching them how to make a VSM tape to address problematic sequences of behaviors at home (Lewis).

In addition, research suggests that self-efficacy is increased through the use of VSM, because the edited tapes show only the desired behaviors and give the illusion of success. The viewing of one's potential success raised self-rated levels of confidence and self-efficacy (Buggey, "Videotaped"); the effect was seen in children ranging widely in age and ability level.

Based on these recognitions—that (1) the TEACCH methodology uses a sequence of still pictures to represent the tasks to be done; (2) video is simply a rapid sequence of still pictures, at thirty frames per second, accessing the principle of persistence of vision; (3) video presentations

most closely approximate the way individuals with autism report how they think and remember; and (4) affect is central to the disorder—two research hypotheses emerged. First, VSM would be more effective than the TEACCH system in teaching children with autism to do a specified sequence of behaviors toward a goal, as measured by number of prompts and intervention sessions to criterion (perfect performance in the absence of intervention); this would have implications within home and educational settings. Second, VSM would have positive effect upon self-efficacy and self-esteem, as measured by the participants' self-reports; this would have implication in all areas of their lives.

Method

Six boys and two girls with either severe, High Functioning, or Asperger's Disorder levels of autism, aged 5-17, participated in the study (two of the younger participants with severe autism were dropped). These individuals, residents of small towns in the southwestern United States, were from families involved in a local autism support group.

Permission to use public school facilities was secured. Participants were recruited by members of the local autism parent support group. Data was gathered regarding age, gender, level of severity of autism (severe, HFA, or Asperger's Disorder), whether verbal or nonverbal, favorite candy (for prizes), level of academic functioning (as measured by grade) and special interests. Because there was no set of commonly held diagnostic criteria already existing for the participants, and the researcher was not certified in any of the standardized autism diagnostic tests, a local scaling of the Autism Treatment Evaluation Checklist (Rimland and Edelson) was conducted via parental interview. Its subjective nature proved to be of little value for matching purposes. Therefore, participants were organized by level of severity, then randomly assigned to a treatment condition.

Because of their young age (both chronologically and developmentally), those in the severe autism group were taught their own series of four mental-age appropriate tasks which they already knew how to do and, according to their parents or special education aides, enjoyed doing. Testing took place in classrooms either in the participants' schools or near their homes. Care was taken to minimize classroom decor distractions.

According to Ozonoff and Griffith, there is no significant difference in performance IQ between HFA and Asperger's Disorder. Because the folding of origami requires a specific sequence of tasks which resists modification, and when done creates a visual representation of having achieved the end goal, both of these groups were taught to fold a 31-step crane.

All participants were taught their schedules in one training session, with the researcher demonstrating the crane folding. Those in the VSM group were videotaped during training; those in the severe group were videotaped from a full-front view (so that they later could see themselves doing the tasks) and those in the HFA and Asperger's Disorder groups were videotaped from an over-the-shoulder view (to simulate as closely as possible the view of their hands as they folded the crane during subsequent sessions). The tapes were then captured on the digital editing system, edited to remove researcher prompts and participant mistakes, and then recorded in two renditions. The first rendition showed the entire sequence together, with steps separated by page-turn transitions; the second rendition separated all steps by a moment of black, allowing for ease in cueing by the mothers or the researcher.

In each intervention session, participants were asked to review their schedules in entirety before beginning to work. Then the participants were asked to complete their schedules as independently of prompt as possible. In the TEACCH groups, pictures of the steps that the participants were able to do without referring back to their schedules were either removed or rotated by the mothers or the researcher. In the VSM group, the participants were asked to position themselves two feet from the television screen whenever viewing their tapes. Then the television was rotated out of the view of the participant so that the mothers or the researcher could cue the tape past the steps that the participants had correctly remembered. In this way, only the correct next step was viewed by the participants, as needed.

Participants were put on a continuous reinforcement schedule and given one piece of their candy of choice per correctly remembered step. They were also told that a prize, matching their interests, would be given when they reached criterion. When, after several sessions, those in the HFA group were unable to delay the criterion gratification and maintain motivation to reach criterion, a token economy was instituted. Tokens were given to represent groups of correctly remembered steps; these tokens were traded in at the end of each session for an agreed-upon intermediate prize. This stair-stepped the participants toward the criterion prize.

The total number of prompts and the number of sessions to criterion were recorded. Qualitative data regarding trust, affect, and flexibility were also recorded. All participants were tested in individual sessions.

Results

This research was conducted in a sparsely populated area. The number of participants was too small for statistical analysis. Of the three participants with severe autism, two had to be dropped due to lack of parental support for consistent attendance at intervention sessions. Before that point, the boy was quite trusting, affable and compliant, while the girl was distrustful, sullen, angry at times, and generally noncompliant. Their scores reflected this difference in affect: the boy needed far fewer prompts than did the girl.

The remaining participant refused to watch himself on videotape, whether in a full-front view or an over-the-shoulder view, and hit and kicked his mother and the researcher. Moved to the TEACCH group with a new schedule of tasks, he did not hit or kick, but his prompt scores were very inconsistent, ranging from one-per-task to several-per-task, with no apparent pattern. He never reached criterion.

Of the five participants who folded the origami crane, overall prompt scores ranged from 41 to 128 prompts, with sessions ranging from 6 to 13. VSM prompt scores for those two participants with Asperger's Disorder were 21 to 40 percent better than the sole participant in the TEACCH group. VSM sessions for those with Asperger's Disorder ranged from 6 to 8, with the TEACCH participant achieving criterion in 9 sessions (a 12 to 33 percent difference between the groups). For those two participants who have HFA, the prompt scores were almost identical (128 VSM to 125 TEACCH), though the TEACCH participant achieved criterion in two fewer sessions (11 TEACCH to 13 VSM, a 16 percent difference).

Three interesting results in the HFA group emerged. First, on those sessions when the HFA-TEACCH participant flipped the still pictures as rapidly as she could, while singing a seemingly nonsense song, there was a greater improvement in scores (24, 36 and 64 percent, respectively). Second, neither participant could delay gratification well, and needed to be put on a token economy at what ended up being their midpoints in the number of their sessions. In contrast, those participants with Asperger's Disorder were always compliant and were able to delay gratification concerning the criterion prize. Third, in their criterion sessions, when they had no prompt from either intervention, both HFA participants made the same adaptation to the folding sequence, with the effect that the paper was easier to fold at a critical stage. In contrast, none of the participants in the Asperger's Disorder group made any adaptations.

Discussion

Although there was an insufficient number of participants for statistical analysis, evaluation of the raw data reveals that the first hypothesis was born out in the Asperger's Disorder group. Both VSM participants in that group came to criterion much faster than did their TEACCH counterpart, in both total number of prompts and number of sessions. The percentage difference in their scores lend credence to the need for replication of this study with a much larger sample.

The prompt scores in the Asperger's Disorder group, as compared with the scores in the HFA group, reflect a difference in performance IQ, contrary to the findings of Ozonoff and Griffith. This reflects the continued controversy in the field regarding whether the two levels of severity are actually the same or if they are qualitatively or quantitatively different. The issue may

actually be moot, for researchers are recognizing that autism is actually a spectrum of disorders (Greenspan and Wieder; Greenspan; Ozonoff), with a wide range of severity within each possible subset of dysfunction. It is possible that those with Asperger's Disorder may have greater motor planning capabilities or stronger habit memory systems. However, the role of intrinsic motivation cannot be ruled out.

In the HFA group, the nearly identical total prompt scores and total sessions suggests that VSM may be an equally viable tool. However, the TEACCH participant had her greatest improvements during those sessions in which her initial review of the schedule was conducted in a rapid fashion. The speed of this picture flipping may have caused an approximation of persistence of vision, the principle under which video works, even though the pictures represented minute segments of the process. Thus, at those times she may have been operating more under a VSM method than a TEACCH method. Her counterpart could not speed up the rate of presentation of his schedule on videotape, nor remove the majority of the visual information so presented (to approximate the picture flipping). It remains to be seen whether the visual processing speed of such individuals is actually faster than that of nonautistic individuals or dependent upon less information, or what effect familiarity with the sequence may have had on such processing.

The token economies set up for the two participants in the HFA group were on fixed-ratio schedules in addition to the continuous reinforcement schedule. A token was awarded for a set number of correctly remembered steps; these were subsequently traded in for prizes of graduating value. This gave the participants greater visible representations of progress toward criterion. It also seemed to remotivate them to do their best at folding the crane. The prizes differed according to each participant's interests; for example, the boy in the VSM group earned prizes associated with an outdoor sport. The need for the token economies suggests that those with HFA are not as intrinsically motivated as those in the Asperger's Disorder group, who did not need the token economies.

Since individuals with autism have a difficult time holding a mental image of a goal, breaking down that goal into subgoals, and devising a plan to reach the end goal, it is significant that the two participants with HFA changed the folding sequence at the same place, and in their criterion sessions. Both were able to overcome the above deficit sufficiently to hold a mid-point goal in mind and adapt the folding sequence to allow for greater paper control as they worked toward that mid-point. It would seem that somehow the process of picture representations, no matter if in still or video form, facilitates the overcoming of these motor planning difficulties. It remains to be seen if the effect holds for task sequences that are not tangible. In addition, it is unclear why only those in the HFA group made this adaptation.

Finally, an important qualitative result emerged from the origami group. Those in the TEACCH group, whether having HFA or Asperger's Disorder, expressed relief that they had achieved the goal and that they wouldn't have to come to any more sessions. They were more focused on having earned their criterion prize rather than on having successfully learned a new skill. However, those in the VSM group, while expressing the same relief, had eyes lit up with excitement, increased display of energy, and huge smiles as they exclaimed, "I did it!" They were more focused on their intangible achievement than on the criterion prize. Indeed, they seemed to forget the prize for the moment, in their excitement over their success. Thus, the TEACCH participants did not exhibit an increase in self-esteem and self-efficacy, while the VSM participants did. The second hypothesis held true.

Location of each participant's sessions did vary, because it gave greater assurance that the participants would attend their sessions. This was not considered a serious confound, as those most likely to be affected by location (the severe autism group) were tested in their respective school settings. Even with that, two of the participants in the severe group were dropped for lack of regular attendance.

A confound arose in the severe group. The sole remaining participant's initial aggressive response to viewing himself on videotape was uncommon for him at that time; according to his

mother, the aggression then generalized to the rest of his life. Because of the negative impact of this aggression upon his home and school life, his doctor ordered a higher dose of his aggression medication, coming at about midway through his sessions. There was a decrease in his aggression, but compliance did not consistently improve. In addition, on one occasion when he was initially noncompliant, time given him to play in the room for a while before beginning the session seemed to allow him to calm himself and become compliant. The continuous reinforcement schedule rewards had little effect on his motivation to complete the sequence. However, on those days when trust and compliance did not seem to be issues of concern, he seemed happier, more interested in approaching, trusting and working with the researcher, and he had good performance. On those days when he seemed distrustful of the researcher, he was noncompliant, even though his full-time school aide had reported the opposite during that school day, and his scores were much higher. Thus, the roles of motivation, trust and affect were important factors in his performance, and point to the shortcomings of doing experimental research on children with severe autism.

While the validity of the objective results is suspect, the results do give cause to consider further research along this vein. The sample would need to be more closely matched for type and severity level of dysfunction subsets. The matching process should utilize just one common set of diagnostic criteria, such as the developmental milestones observation chart devised by Greenspan and Wieder. This system reveals the participant's level of motor planning capabilities and his ability to trust and engage in intimate relationships (which is important for motivation and compliance).

Investigation into how swiftly individuals with autism process visual stimuli is also recommended, as is research into how little information presented in a rapid sequence of still pictures is necessary for the comprehension of and ability to apply the information. Further, since autism is an affect disorder, this research should be replicated under conditions of participant familiarity with and trust of the researcher, especially in the severe and HFA groups where trust may be less readily forthcoming.

Finally, research should be undertaken to see if VSM is more effective than TEACCH in teaching routine behaviors such as morning dressing and preparation for school, dishwashing, or other familial routines or duties (so long as privacy issues are addressed), or in the teaching of the school routines in which the TEACCH methodology is commonly used. Focused research in the above areas and more, if respectfully conducted with the affective nature of autism in mind, could hone intervention tools and methodologies to the benefit of individuals with autism, no matter their age, level of severity, unique characteristics, self-image, or self-efficacy.

Works Cited

American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders.* 4th ed. Washington, D.C.: APA, 1994.

Bandura, A. *Principles of Behavior Modification*. New York: Holt, Rinehart & Winston, 1969.

Bandura, A., D. Ross, and S. A. Ross. "Transmission of Aggression Through Imitation of Aggressive Models." *Journal of Abnormal and Social Psychology* 63 (1961): 575-83.

Bauman, M. " Autism: Clinical Features and Neurobiological Observations." In *Neurodevelopmental Disorders*. Ed. H. Tager-Flusberg. Cambridge, Mass.: MIT Press, 1999. 383-99.

Buggey, T. "Videotaped Self-modeling: The Next Step in Modeled Instruction." *Early Education and Development*, 6.1 (1995a): 39-51.

Buggey, T. "An Examination of the Effectiveness of Videotaped Self Modeling in Teaching Specific Linguistic Structures to Preschoolers." *Topics in Early Childhood Special Education* 15 (1995b): 434-58.

Buggey, T., K. Toombs, P. Gardener, and M. Cervetti. "Training Responding Behaviors in Students With Autism: Using Videotaped Self-modeling." *Journal of Positive Behavior Interventions* 1.4 (1999): 205-14.

Creer, T. L., and D. R. Miklich. "The Application of a Self-modeling Procedure to Modify Inappropriate Behavior: A Preliminary Report." *Behavior Research and Therapy* 8 (1970): 91-92.

Dowrick, P. W., ed. *Practical Guide to Using Video in the Behavioral Sciences.* New York: John Wiley & Sons, Inc., 1991.

Dowrick, P. W. "A Review of Self Modeling and Related Interventions." *Applied and Preventative Psychology* 8 (1999): 23-39.

Grandin, T. *Thinking in Pictures: And Other Reports From My Life With Autism.* New York: Vintage Books, 1996.

Greenspan, S. I. "Introduction." In *Clinical Practice Guidelines.* Ed. S. I. Greenspan. Bethesda, Md.: Interdisciplinary Council on Developmental and Learning Disorders Press, 2000.

Greenspan, S. I., S. Wieder, and R. Simons. *The Child With Special Needs.* Reading, Mass.: Addison-Wesley, 1996.

Krantz, P. J., G. S. MacDuff, O. Wadstrom, and L. E. McClannahan. "Using Video With Developmentally Delayed Learners." In *Practical Guide to Using Video in the Behavioral Sciences.* Ed. P. W. Dowrick. New York: John Wiley & Sons, 1991.

Lewis, P. "Videotaped Self-Modeling." Summer Institute, workshop conducted at the Kentucky Autism Training Center, Louisville, Ky., July 2000.

Mesibov, G. (2001). *What is TEACCH?* [On-line]. Available: www.teacch.com

Ozonoff, S. *Treatment of Autism.* Salt Lake City: University of Utah Press, 2000.

Ozonoff, S., and E. M. Griffith. "Neuropsychological Function and the External Validity of Asperger Syndrome." In *Asperger Syndrome.* Ed. A. Klin, F. Volkmar, and S.S. Sparrow. New York: Guilford, 2000. 72-96

Ozonoff, S., S. J. Rogers, and B. F. Pennington. "Asperger's Syndrome: Evidence of an Empirical Distinction From High-functioning Autism." *Journal of Child Psychology and Psychiatry* 32.7 (1991): 1107-22.

Rimland, B., and S. M. Edelson. *Autism Treatment Evaluation Checklist* [On-line]. Available: www.autism.com/ari. 1999