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THE USE OF SELF-MODELING TO IMPROVE THE SWIMMING PERFORMANCE OF SPINA BIFIDA CHILDREN

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The use of edited videotape replay (which showed only "positive" behaviors) to improve the water skills of three spina bifida children, aged 5 to 10 years was examined. A multiple baseline across subjects design was used, and behavioral changes were observed to occur in close association with intervention. One child was given successive reapplications of videotaped self-modeling with continuing improvements. It appears that a useful practical technique has been developed.

DESCRIPTORS: self-modeling, video replay, swimming, skill training, multiple baseline, spina bifida children

This study examined the use of edited videotape replay (self-modeling) to modify behaviors associated with learning to swim. Three spina bifida children took part during the course of their usual class swimming activities.

Overcoming fear of the water is of particular consequence for children who are moderately affected by spina bifida. Most such children suffer some paralysis below the waist, often resulting in an inability to walk. As young children, they will drag themselves with no assistance from their legs, or they will use a wheelchair, or they will be carried. A large percentage will later be trained to use calipers and sticks for greater independent movements. Also, these children register little or no sensation in their legs (Nelson, Vaughan, & McKay, 1969).

Consequently, their usual environmental experiences are quite different from those of other children. In particular, they lack a sense of direct control of their mobility. Therefore, water experiences can be particularly valuable for spina bifida children. In the water they can acquire a degree of independence and mobility comparable to able-bodied children their own age.

However, normal fears experienced by children learning to swim are exaggerated for those with spina bifida. Not only are they disadvantaged by their lack of experience in the control of their mobility, but they are also out of their depth twice as quickly as children who can stand. Therefore, it is not surprising that some of these children experience specific fears associated with the water.

At the Auckland Crippled Children's Society, where this study took place, many physically handicapped children attend the swimming facilities regularly (once per week). Self-modeling with videotape recordings seemed a suitable way to attempt to help these children in their own setting with a minimum of interference.

Self-modeling has been defined as *the behavioral change that results from the repeated observation of oneself on videotapes that show only desired target behaviors* (Dowrick, Note 1). The technique first used to create self-model films was role play (Creer & Miklich, 1970). A more recently developed method is to con-

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trive effects with the camera and to edit the recording before replay (Dorwick, 1978; Dowrick & Raeburn, 1977). Subjects view themselves on frequently repeated (say three to five times per week) replays of the short video films —usually 2 min long.

Thus, self-modeling contrasts with other applications of videotape in training that show replays of actual performances. Complete replay is time consuming and, moreover, the results are equivocal. Positive results usually emerge when additional information (including praise) is given during replay (e.g., Dowrick & Johns, 1976; Schwarz & Hawkins, 1970), whereas small or negative changes are observed in other cases (Jackson, 1974; Torrez, 1974). In situations that can induce anxious behaviors, (e.g., group therapy), methodologically sound studies have shown the video replay component to produce deleterious or mixed results (Danet, 1968; Griffiths, 1974; Martin, 1971).

Previously reported self-modeling studies have investigated a range of target behaviors: for example, socially appropriate behaviors of institutionalized asthmatic children (Miklich & Creer, 1974; Miklich, Chida, & Danker-Brown, 1977), interpersonal skills of an adult (Hosford, Moss, & Morrell, 1976), playing skills of a preschooler (Dowrick & Raeburn, 1977), and a range of motor and daily living skills with physically handicapped children (Dowrick & Raeburn, Note 2). None of these behaviors was reported to be related specifically to fearfulness. However, it would seem a relatively simple matter to edit videotapes so that fear responses were not apparent in the context of the fear-inducing environment. Whether observation of these videotapes would promote behavioral change is the question examined by the present study.

METHOD

A multiple baseline across subjects design (Hersen & Barlow, 1976) was implemented in which the instructor and the observers remained "blind" to the intervention sequence.

Subjects

A swimming instructor (second author) selected two boys and one girl whose progress had apparently reached plateaus. She saw their lack of progress as stemming from fearfulness and lack of actual skills, rather than from their physical handicaps.

The first child (Child 1) was a boy aged 10 years who had taken swimming lessons for nearly 5 years. The other children were a girl (Child 2) and a boy (Child 3) both aged 5 years, whose regular swimming instruction had been ongoing for nearly a year. All children had severe spina bifida lesions. They showed little hesitation to enter the water, and appeared reasonably confident wearing "floaties" (inflatable arm bands). Nonetheless, Child 2 and Child 3 seemed most fearful of getting their faces wet, and Child 1 showed considerable distress when asked to remove his arm bands.

Observations

Four main stages in learning to swim were loosely categorized as: entering the water, gaining confidence with arm bands, submerging head and face, and gaining confidence without arm bands. Subsequently, 35 clearly identifiable behaviors were specified in a loose hierarchy associated with the above categories, for example, "moves from adult to bar at 1 meter," "blows bubbles into water," and "holds onto bar alone." These 35 behaviors were used to compile a "Water Confidence Behaviors Checklist" (available from the first author upon request).

An observer was trained to score the water skills behavior of each child in the study. This simply consisted of marking the occurrence of observed behaviors on the checklist. To determine reliability, another observer later scored from probe videotapes taken during every second session of the study.

The second observer scored the probe session videotapes in a randomized order. Because of the hierarchical nature of the checklist, there were some items that were always observed (e.g., items less than 20 for Child 1) and some that were never scored (e.g., items above 24 for Child 2). Such items were excluded from reliability calculations. For the remaining items the total number of agreements divided by the sum of agreements and disagreements equaled .92.

Videotaping

In the first session (immediately following the observations) all children were filmed in their swimming pool activities. A half-inch portable videotape recorder with hand-held camera was used. During the filming, the children were encouraged to perform their best.

All video films were made from these recordings before any intervention. Four different short films were constructed simply by copying suitable sequences from the available videotape recordings. The first film (X) was 3 min long showing all children in the water but demonstrating only behaviors which were well within the children's capabilities. The film was independently rated, giving Child 1 a score of 4 and the other two children, 3, on the Water Confidence Behaviors Checklist.

The purpose of this film was to provide a television viewing experience that did not contain self-modeling characteristics. Having one film for all children had some practical advantages, but a future replication of this study may well benefit from having a separate film X for each child.

The other films (A, B, and C) showed only one child in each. These were "self-model" films; they were 2 min long, during which each child apparently performed behaviors superior to those previously observed on the checklist. The self-model films could readily show behaviors slightly exceeding the child's ability by such methods as using the camera to exclude support given to the child and by editing. In particular, all evidence of distress was edited out; that is, refusal to participate, grimaces, crying, and visual expressions that seemed to indicate fear.

Procedure

In the first week, each child was observed (session 1) and then videotaped as described. Subsequently (weeks 2 to 9), each child individually watched a videotape three times a week, the swimming observation session following immediately after the third viewing. The child and the first author were the only people to view these films, during which all comments were avoided. In the second week each child saw Film X three times.

Intervention was then introduced. The first child was shown Film A whereas the other children continued to be shown Film X. Two weeks later Child 2 was shown Film B in place of Film X. After another two weeks Child 3 was shown his self-modeling film (C). Up to session 9 each child saw either Film X or his or her own film three times a week except for absences (see Results). Consequently, Child 3 saw his self-modeling film nine times, a total of 18 min self-viewing (Child 2 saw her film 15 times, Child 1, 14 times).

Each observation session was also a swimming lesson in that it provided practice in the skills considered by the instructor to be at about the child's level of ability. Therefore, one would expect a constant practice effect across all sessions. As mentioned, the instructor was independent of the self-modeling and the observations.

An attempt was then made to see if the progress of Child 1 could be continued by successive reapplication of self-modeling. This was effected by recording, editing, and showing a new film (A′) in which Child 1 was seen performing more checklist behaviors than before. (Film watching and observations were discontinued for the other children). Three weeks later Film A″ was made, which replaced A′ for a further 3 weeks. Film watching was then discontinued.

One week later, and ten weeks later, follow-up observations were made for all children.

RESULTS

The first observation session confirmed the different levels of skill demonstrated by the children. Child 1 scored 20 on the checklist (floats unaided except for floaties). Child 2 scored 16 (blows bubbles into water), and Child 3 scored 13 (unassisted in water for 30 sec).

Moderate but clear gains were associated with intervention as indicated in Figure 1. After three exposures to their own films Child 1, Child 2, and Child 3 improved their scores by 5, 4, and 2, respectively. Not only were changes correlated with time of intervention, but little further behavioral change was seen with subsequent exposure to the same films. The behaviors acquired were noted by the experimenters to be comparable to those shown on the video films; however, this was not independently verified.

In the latter part of the study (sessions 10 to 15), the data from the two reapplications of self-modeling indicate successive and comparable further changes for Child 1 (cf. changing criterion design of Hartmann & Hall, 1976). The first reapplication netted an increase of four on the checklist (session 12 compared with session 9). On the second reapplication, a further increase of five was observed over three more sessions. At follow-up all children demonstrated a maintenance of water skills.

Some absenteeism from swimming lessons occurred because of susceptibilities in health not uncommon with spina bifida children. In most cases absenteeism, designated "a" in Figure 1, resulted in the absent child's missing one video

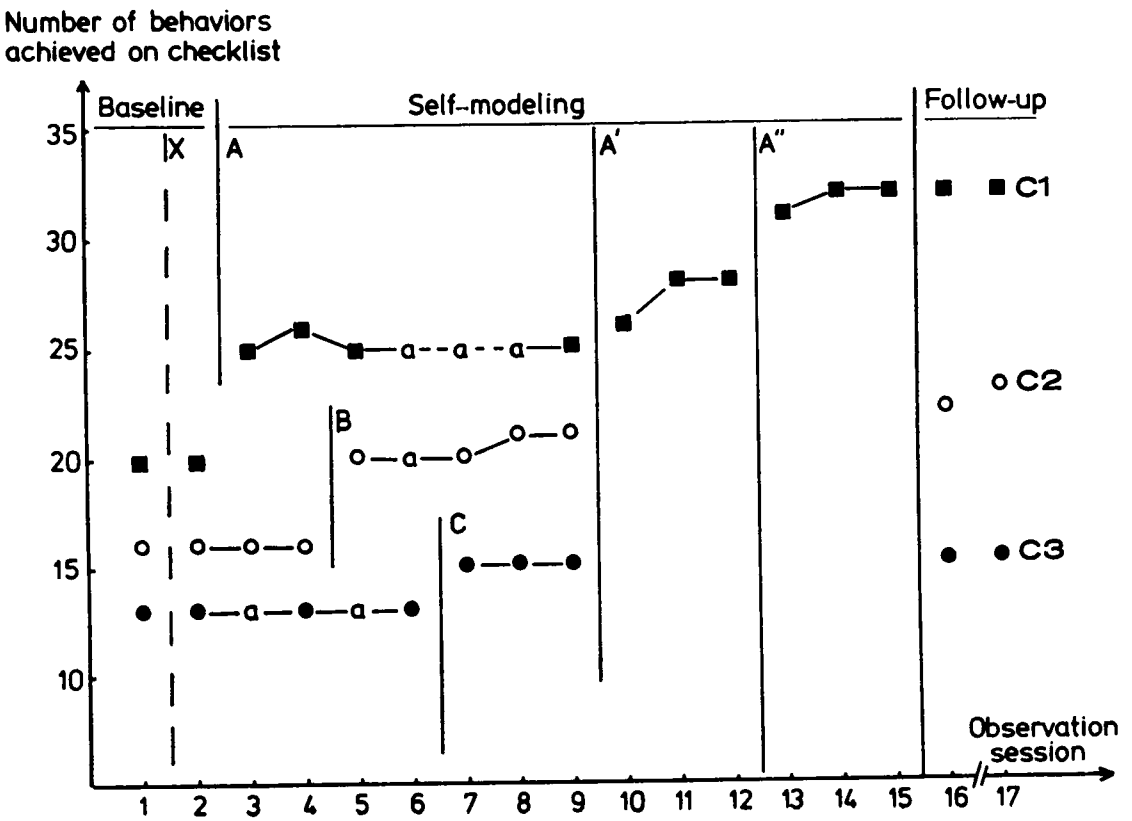

Fig. 1. Observed swimming performances at weekly intervals of three children (Child 1, Child 2, Child 3), with multiple baseline intervention. X, A, B, C, A′, and A″ indicate the videotapes viewed by children prior to the swimming observation session. Absenteeism is indicated by "a."

replay and one observation session. In two exceptional weeks (7 and 8) Child 1 saw no films and attended no lessons. No changes were observed subsequent to absence.

DISCUSSION

This study appears to demonstrate that self-modeling may provide a facilitatory component in the swimming training of children with spina bifida. It has been proposed that the application is of importance because of the value of water skills (and also the difficulties in attaining them) in the development of physically handicapped children.

The actual gains made by the children, relative to total swimming independence, are considered to be moderate. However, the intervention procedure used was of modest proportions. In particular, the time spent with video replay was 2 min three times per week. Furthermore, interventions were delayed in the course of the multiple baseline design; for example, Child 3 had to wait until the seventh week of the study before seeing his self-model film. Nonetheless, changes in behavior took place rapidly following intervention. Reapplications with Child 1 subsequently every three lessons proved comparably effective. The maximum observed achievement by Child 1, item 32, was to tumble into the pool without arm bands and swim one width (6 meters).

There exists a possibility that video self-observation has peculiar value to children with the type of disability studied here. That is, the videotapes may provide the child with information which is usually lacking because of the loss of sensory function in the lower part of the body. Benefits may accrue, therefore, for children with spina bifida that are less important to other children. However, this is speculative, and pilot studies carried out by the authors indicate similar responses by cerebral palsy children. The application of this technique to a wider population of aspiring swimmers needs further investigation.

Finally, one may speculate upon the mechanisms involved. It has been argued elsewhere (Dowrick, Note 1; Miklich & Creer, 1974) that self-modeling is a form of observational learning. To date, there have been no reports comparing peer versus self-observation on videotape. This would seem to be an important area for further research. However, it seems reasonable to suppose that the self factor is of importance. If so, it may simply be that the child observes crucial behaviors more attentively, and attention is a crucial prerequisite for observational learning to take place (Bandura, 1969). Perhaps self-observation induces covert rehearsal that can be an effective behavior modifier (Corbin, 1972), or maybe it alters self-statements to produce behavior change (cf. Meichenbaum & Goodman, 1971).

Considerably more research is necessary before theorizing becomes more than speculation. In the meantime it is hoped that a useful empirical technique has been devised that is simple and practical to implement.

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