The Use of Tactile and Vestibular Stimulation to Reduce Stereotypic Behaviors in Two Adults With Mental Retardation

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In this study, two institutionalized adults with mental retardation were treated twice weekly over a 7-month period with activities that provided tactile and vestibular stimulation for the purpose of reducing stereotypic behaviors. Statistically significant treatment effects were demonstrated, but the target behaviors continued at a high and variable rate. Greater treatment frequency may be necessary for therapeutic benefit to occur in adults. Future single case studies need to be completed, with each variable manipulated systematically and with closer adherence to previous studies.

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Several researchers have investigated the application of tactile and vestibular stimulation in reducing stereotypic behaviors in adults with mental retardation. Such behaviors include rocking (Bonnadonna, 1981) and self-injury (Bright, Bittick, & Fleeman, 1981; Wells & Smith, 1983). Tactile and vestibular stimulation have also been used with mentally retarded adults in such areas as the hastening of overall development (Clark, Miller, Thomas, Kucherawy, & Azen, 1978) and sensorimotor development (Huff & Harris, 1987). The use of tactile-vestibular stimulation has compared favorably to operant methods for increasing frequency of vocalization in developmentally disabled adults (Brody, Thomas, Brody, & Kucherawy, 1977). More studies are needed, however, to identify the treatment format and frequency necessary to produce changes and to identify those persons most likely to benefit from treatment techniques that use tactile-vestibular stimulation.

Literature Review

Stereotypic behaviors occur in as many as two thirds of institutionalized persons with mental retardation (Kaufman & Levitt, 1965). Because self-injurious behavior can involve tissue damage, the justification for the treatment or reduction of this behavior seems evident. Justification for the reduction of other stereotypic behaviors may include social inappropriateness and interference with occupational or educational activities (Gorman-Smith & Matson, 1985; Lovaas, Newsom, & Hickman, 1987).

Numerous studies have been reported, primarily within the psychology literature, that demonstrate the varying effectiveness of several intervention techniques aimed at the reduction of stereotypic and self-abusive behaviors in persons with mental retardation. Most of these techniques use various forms of behavior management; programs describing restraints, punishment, or aversive conditioning have also been reported. The success of these techniques has been inconsistent (Gorman-Smith & Matson, 1985; LaGrow & Repp, 1984).

Many studies dealing with stereotypic behaviors lack long-term follow-up, but some have indicated that control of these behaviors for some persons frequently does not occur outside of the treatment setting and that the stereotypic behaviors increase after the treatment program has ended. The need for an alternate method for dealing with stereotypic behaviors continues, particularly when behavior-management techniques are ineffective. Although most treatment approaches are based on the theory that stereotypic behaviors are learned, an alternative concept is that these behaviors may stem from an internal sensory need (Buyer, Berkson, Winnega, & Morton, 1987;
Edelson, 1984; Lovaas et al., 1987). Few intervention programs based on this concept, however, have been published in the psychology literature. In the occupational therapy literature, such programs are more evident (e.g., Bonnadonna, 1981; Bright et al., 1981). If clients are provided with increased opportunities to receive sensory stimulation from their environment, then they will no longer seek this stimulation, because the need will be reduced or eliminated (Bright et al., 1981).

On the basis of results from some small studies, tactile-vestibular stimulation may be applicable to persons with mental retardation in some situations, but the parameters of those situations and the optimal format for therapy are not defined. Three studies that demonstrated the reduction of stereotypic behaviors with severely impaired adults used a tactile-vestibular stimulation treatment approach. Bright et al. (1981) used tactile-vestibular stimulation to reduce 1 subject's self-injurious behavior. The procedures included “slow, rhythmic vestibular and firm but light tactile stimulation” (p. 170). In another study (Bonnadonna, 1981), 3 subjects with severe mental retardation were treated. Vestibular stimulation alone was provided in four positions (prone, supine, seated on a rocker board, and seated in a hammock). Rocking behavior was subsequently reduced. Wells and Smith (1983) used “slow, repetitive vestibular stimulation and firm, deep tactile stimulation” (p. 664) to reduce self-injurious behavior in 4 subjects with mental retardation.

In literature and workshops on tactile-vestibular stimulation, a common method for constructing a treatment plan is, as stated by Knickerbocker (1980, p. 75), to “feed the need” (see also Hanft, Guiffrida, & Pettit, 1984). The therapist should provide activities that students desire, especially in terms of the tactile or vestibular stimulation received from that activity. The assumption is that students craving tactile or vestibular stimulation need this input to normalize their nervous systems (Burpee, 1987). This would lead to the therapist's providing, in a structured therapeutic situation, the stimulation that the students may have been seeking persistently from their environment. Those persons most in need of this kind of therapy may be those who most often seek this kind of stimulation.

Although only a few studies used tactile and vestibular stimulation to reduce stereotypic behaviors in adults with mental retardation, several studies suggested that this area warrants further investigation. Tactile-vestibular stimulation with adults has been used in various circumstances (Angelo, 1980; Baker-Nobles & Bink, 1979; Knickerbocker, 1980) as well as with developmentally disabled adults. Resman (1981), for example, improved eye contact in a profoundly retarded adult through the use of tactile and vestibular stimulation. In addition, Brody et al. (1977) found that the gains in quantities of vocalization made through a tactile-vestibular stimulation treatment program with profoundly retarded adults were greater than the gains made through operant conditioning. Stereotypic behaviors have also been reduced with these techniques: MacLean and Baumeister (1982) demonstrated reduced stereotyped behavior in developmentally delayed children through the use of vestibular stimulation. All of these studies provided treatment five times weekly, instead of in a more economical twice-weekly format.

Of the six studies of developmentally disabled adults that produced significant results with the use of tactile or vestibular stimulation, five used both tactile and vestibular input. It appears justified, then, to use both tactile and vestibular stimulation to produce maximal treatment effects, especially if the subjects are selected largely because of behaviors that suggest a craving for both tactile and vestibular stimuli.

In summary, the literature suggests that (a) it is desirable to reduce stereotypic behaviors and (b) a program employing tactile and vestibular stimulation techniques may reduce these behaviors. The present study was designed to investigate the usefulness of tactile-vestibular stimulation in the reduction of stereotypic behaviors in two adults with mental retardation. I hypothesized that the use of tactile-vestibular stimulation would significantly reduce the frequency of the selected behaviors over the course of the treatment.

Method

Subjects

The 2 subjects in this study were selected from a population of approximately 50 ambulatory adults living in a developmental center. The supervisory staff person in each of three classrooms completed a behavioral checklist (see Figure 1) for each client. I selected the behaviors included on this checklist from published lists of behaviors thought to be associated with tactile and vestibular dysfunction (Ayres, 1976; Ayres & Tickle, 1980; Bauer, 1977; Goven, Faber, Prins, & Mangold, 1984; Montgomery & Richter, 1977). I assigned the weighted scores for the behaviors.

The medical record of those clients scoring 10 points or more on the behavior checklist were reviewed, and the 2 subjects were selected with the following criteria:

1. The frequency of tactile-vestibular behaviors (must be observed consistently during a 25-min observation period). The frequency of be-
haviors in the selected subjects varied from zero to nine times per minute.

2. The manageability of the client's behaviors in the treatment setting (i.e., the client could not exhibit aggressive behaviors on a daily basis).

3. Age. The client had to be under 35 years of age.

The 2 subjects selected were men with Down syndrome whose functioning, according to reports of psychological testing, was within the profound range of mental retardation. It is recognized that the behaviors exhibited by these subjects may not reflect tactile or vestibular dysfunction, given the diagnoses of profound mental retardation and Down syndrome. Subject A was 33 years old; Subject B, 28 years old.

Subject A typically sat near a window in his classroom, performing constant stereotypic activity, which included touching his face and then waving his hand through his visual field from center to periphery; rubbing his face and hair; masturbating; placing his finger in his mouth while moving his hand in a rotary pattern; making guttural noises, and regurgitating, followed by smearing this product on his face and hair. He generally chose to remain seated, but when not seated frequently walked in circles. He also enjoyed rocking in a rocking chair. Materials such as a pegboard or puzzle were often available to him on his table, but he used them only occasionally and then only with staff assistance.

Subject B was more sociable than Subject A and was at times annoying to staff and other clients. He enjoyed and pursued many activities that appear to provide tactile, proprioceptive, and vestibular input. Whenever someone entered his classroom, for example, he would approach the person and request a handshake, a pat on the shoulder, a pat on the face, or occasionally, a pat on the head. If a comb or brush were available, he might instead ask a staff member to comb or brush his hair. When walking in the hall, he would consistently approach both familiar staff members and strangers, requesting this type of touching. When he perceived that there were no probable sources available for this input, he would intermittently engage in stereotypic behaviors. The most consistent of these behaviors was hitting his head with the heel of his right hand above his right ear. At the initiation of the present study, there was an open wound above Subject B's right ear caused by his repeated head hitting. He seemed to hit his head for various reasons. He would often do so to protest a staff member's refusal of his request for a handshake or shoulder pat, but sometimes he would stop an apparently enjoyable activity just to hit his head.

Other classroom behaviors in which Subject B frequently engaged included holding firmly onto a table and bouncing his head and trunk up and down (while standing or seated); masturbating; rubbing his saliva or liquid soap around his mouth; pounding on a table; pressing a finger against his gums firmly and repeatedly; pounding on his chest; and a making a "whooping" vocalization with several variations.

Data Collection

After the 2 subjects were identified, pilot classroom observations were begun to document a behavioral repertoire for each subject and to determine the frequency of each behavior. During pilot classroom observations, the behaviors that occurred most consistently during a 25-min observation period were recorded. For Subject A, the final behavior selected to be tracked was face and hair rubbing (which he most frequently did with one continuous motion, beginning on his face). For Subject B, the selected behavior was head hitting.

To establish baselines for these behaviors, data were collected during 10 classroom observation sessions over a 4-week period. The rates of the selected behaviors were variable, but there was no trend in the

Figure 1. The Tactile-Vestibular Behavioral Checklist.
direction of predicted treatment effects. Accordingly, treatment was begun. Data collection on the representative behaviors continued weekly in the classroom throughout the study.

Interrater reliability based on session scores as described by Hartmann (1977) was established in the classroom setting at the beginning of the 7-month treatment phase. Another occupational therapist and I served as the raters; we observed each subject simultaneously while individually recording occurrences of the selected behaviors. Our percentage of agreement was 87.5% for Subject A and 92.6% for Subject B. I provided all subsequent data collection as well as treatment.

**Treatment Procedures**

The treatment area consisted of a large room containing equipment and supplies commonly found in occupational and physical therapy clinics that serve persons with developmental disabilities. These items were a mat table, floor mats, bolsters, wheelchairs, large and small therapy balls, and a frame with a suspended platform. The storage cupboards, which were readily accessible, contained a variety of fine motor, tactile, and perceptual motor materials. Other staff members or clients were in the room approximately 50% of the time. Both subjects participated simultaneously in treatment activities for 50 min twice weekly.

The treatment activities provided a wide variety of tactile, proprioceptive, and vestibular stimulation and were varied in accordance with each subject's interests and needs. Because the goal of therapy was to reduce the subjects' constant need for tactile and vestibular stimulation, limited emphasis was placed on each subject's producing an adaptive response.

The subjects were engaged in the following treatment activities: alternating rotations (every 2 sec) on the platform swing; lying in an inverted prone position over a therapy ball while being moved by the therapist; kneeling and bouncing against a large therapy ball; being rocked on a large rocker board while in various positions (prone, supine, sitting); finding objects in a box of plastic foam beads; being pulled on a scooter board or turned in circles in a wheelchair; straddling a large bolster while it was being rocked; rolling in a blanket; sitting on a small therapy ball or lying prone over a wedge or bolster while performing an activity; lying prone on a mat with a therapy ball or bolster placed on top of the body; and receiving self- or therapist-applied tactile stimuli including a feather duster, lotion and powder, a clothes brush, a dish mop, a terry-cloth towel, and a vegetable brush. Other implements used were a hair dryer (on the cool setting), a vibrator, rubber exercise bands, a battery-operated rotating brush, and a maraca. The subjects pursued most of these activities independently or I provided them, but attempts at cooperative and interactive tasks were made, such as sharing the platform swing, pushing and pulling on each other's arms while seated on the mat, and pushing a ball back and forth on the mat.

Treatment occurred over a period of 7 months, totaling 47 treatment sessions.

**Results**

The rates of the selected representative behaviors for each subject throughout the study are shown in Figures 2 and 3. Subject A demonstrated a slight decrease in the rate of the representative behavior (face and hair rubbing) over the course of the treatment sessions. With the split middle method (Ottenbacher, 1986), a celeration line was determined from the baseline data and extended into the treatment phase (see Figure 2). By consulting the binomial chart (Ottenbacher, 1986, p. 184), I determined that there was a statistically significant change (decrease) in the rate of this subject's behavior.

Figure 3 shows Subject B's head-hitting behavior.
during the course of treatment. Again, the computation of a celeration line demonstrated a statistically significant treatment effect.

**Discussion**

Although a data analysis with the celeration line indicated a significant change in the frequency of the selected representative behaviors, the data were difficult to interpret because of the variability of these behaviors and the limited length of the baseline. I do not believe, therefore, that the results are clinically significant.

There are many possible explanations for the lack of strong treatment effects demonstrated in the data from this study. One such explanation is the frequency of treatment. The studies that have successfully used tactile–vestibular stimulation with adults have included therapy at least four times per week (Baker-Nobles & Bink, 1979).

The studies demonstrating treatment effects with the use of tactile–vestibular stimulation with lesser treatment frequencies were all conducted with children. Admittedly, far more studies demonstrating treatment effects have been completed with children. The few successful studies completed with adults, however, suggest that some treatment effects were possible. Because a lesser treatment frequency in a format that involves more than one person would be more cost-effective than daily individual treatment, the possible effectiveness of such a format requires continued evaluation through systematic study.

Another limitation of this study was the possibility of examiner bias, because I collected all of the study data. In addition, reliability checks should have been completed monthly throughout the study to eliminate the possibility of observer drift (i.e., the tendency of observational data to become distorted over time). Also, the point-to-point method (Ottenbacher, 1986) would have been a more accurate way to compute reliability, rather than the total percentage agreement method that was used.

Perhaps some clearer treatment effects did occur, but in areas not measured by the selected data recording system. The representative behaviors used for data collection did not consider the frequency of other behaviors that also suggested tactile or vestibular dysfunction. A reduction in the total time spent engaging in tactile or vestibular behaviors could have occurred. Practicality demanded, however, that frequency be the primary criteria for selection of the representative behaviors, which had to be observed consistently during a 25-min classroom observation session.

**Conclusion**

Twice-weekly treatment with the use of tactile–vestibular stimulation may not be adequate for the reduction of stereotypic behaviors in adults with developmental disabilities. The results of the present study do suggest, however, that tactile and vestibular treatment may have a positive effect. Because successful studies that have used these techniques with adults have provided treatment at least four times weekly, studies providing a higher treatment frequency are recommended to determine whether this treatment can consistently be effective in the reduction of stereotypic behaviors suggestive of tactile and vestibular dysfunction. Future studies that use the single-case-study framework are needed, in which each variable is manipulated systematically and closer adherence to previous successful studies is maintained. Additionally, given the variability of the behaviors under study, longer baselines may be helpful. More work is also needed to develop a valid and reliable instrument for the identification of developmentally disabled adults who would benefit from tactile and vestibular stimulation.

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