Perceived Behavioral Changes Observed with Adaptive Seating Devices and Training Programs for Multihandicapped, Developmentally Disabled Individuals

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The purpose of this study was to assess, by analyzing survey responses, the perceived behavioral changes that were observed when adaptive seating devices and training programs were provided to multihandicapped, developmentally disabled individuals. Results for 41 clients were analyzed. Statistical analysis revealed that significant changes in social interaction, positioning, tracking, grasping, and self-feeding were perceived by parents, guardians, or trainers. The necessity of a prospective study to analyze data about the influence of behavior programs used with adaptive seating devices is discussed.

Key Words: Behavior, Handicapped, Self-help devices.

The need for adapted seating devices and the construction of these devices are described extensively in the literature. According to McCormick, "The importance of dynamic, therapeutic seating cannot be overemphasized. Children with limited postural control who have difficulty maintaining a stable sitting posture, spend more time trying not to fall out of their chairs than attending to academic or pre-academic tasks. As well, as soon as they attempt to use their hands or other body parts, their total body postural stability is lost."

Gendreau states that "positioning is probably the single most important consideration in preparing the student for lunch and optimum positioning usually entails the adaptation of special seating equipment." Larsen suggests that posture is the starting point for the process of normal developmental experiences.

"This means finding and maintaining correct furniture and equipment. Correct positioning can reduce and prevent further deformity. It can reduce primitive reflexes that interfere with visual attention . . . visual perception will be enhanced. Good postural conditions for the floppy child will reduce potential for scoliosis and sometimes free up arms and hands that have been too long employed in basic support. Stabilizing a child who is in constant motion of an athetoid type can improve communication skills, verbal and nonverbal, and feeding."

A review of the literature and two computer searches (MEDLAR and TRIC) revealed references to beneficial effects of positioning including improved sitting balance, visual stimulation, social interaction, and community acceptance; however, no specific data were found. There have been no published studies that evaluated behavioral changes in multihandicapped, developmentally disabled individuals using specialized seating devices. Larsen has suggested that adaptive behavioral changes result from the use of seating devices that stabilize the individual in an optimum position. Wisely et al have further suggested that when the adapted seating device is mobile, the individual's social interaction and community involvement increase.

The purpose of this study was to assess, through a survey, the perceived behavioral changes that occurred when adaptive seating devices were used by multihandicapped, developmentally disabled individuals. The behaviors evaluated were in the areas of...
social interaction, positioning, eye/hand coordination, and self-feeding and other self-care activities.

METHOD

Survey

A mail questionnaire format was used, modeled on work by Dillman. Direct observation and face-to-face interviews were considered, but owing to limited resources and distribution of clients throughout a large area (Montana comprises 147,138 square miles), these were not feasible. Telephone interviews were also considered but not used because of difficulties in reaching the clients by phone.

The questionnaire was designed to assess the level of client functioning perceived by parents, guardians, trainers, or teachers before and after use of the adaptive seating devices. It did not request objective information regarding a client's improvement over time. The intent of the questionnaire was to collect information, based on parents or guardians retrospective perceptions, on 1) the client's functioning before contact with the program and 2) the client's functioning after the equipment and the services were provided. The questionnaire consisted of demographic information—name, age, type of equipment used, length of time the equipment was used, and training programs used—and behavior information—social interaction, positioning, eye/hand coordination, and self-feeding and other self-care activities. Check lists were used to relate type of equipment to training programs used. Rating scales were used to report on behavior, allowing for statistical analysis of the descriptive information (Appendix).

Three preliminary drafts were disseminated to evaluate the usefulness of the individual questions in the survey. The drafts were sent to a small sample of families of current clients, to physical therapists, and to occupational therapists. Feedback on the first two drafts helped determine what items to include in the final draft. Feedback on the third draft indicated that items chosen were clear and concise.

Subjects

Questionnaires were mailed from October 1980 to January 1981 to all past clients of the Montana Adaptive Equipment Project who were identified through sponsor agency records. Initially, questionnaires were sent to parents or guardians of clients. If no response was received from them after a follow-up postcard, a questionnaire was then sent to a second contact person. The second contact person was a physical or an occupational therapist, a home trainer, or a teacher who had direct contact with the client.

One hundred thirty questionnaires were sent out, and 105 (80.8%) were returned. Of the returned questionnaires, 60 clients had received seating devices; however, 19 of these had received items of adaptive equipment in addition to the seating device and were excluded from the study so as not to confound the results. Forty-one clients received adaptive seating devices only. These clients ranged in age from 1 to 67 years, with a mean age of 11.68 years. Twenty-six (63%) were spastic, 2 (5%) were athetoid, 7 (17%) had mixed cerebral palsy, and 6 (15%) had other disorders such as hypotonicity, spina bifida, and hydrocephalus.

Statistical Analysis

Tests were conducted on sets of rating scale scores for the clients before and after their involvement in the program. Behavioral changes perceived in social interaction, positioning, eye/hand coordination, and self-feeding and other self-care behaviors were analyzed. Although a total of 41 clients who received adaptive seating devices returned questionnaires, the sample sizes varied for a number of questions because some items were not applicable to some clients. The data on duration of equipment use, types of training programs used, age, and sex were analyzed descriptively for frequencies and central tendencies.

RESULTS

Seating Devices

Wheelchairs, travel chairs, and strollers, all with custom-made adaptations, constituted 33 (80%) of the 41 seating devices provided. Four wheelchairs without modifications and four travel chairs without modifications were also used.

Length of Use

Forty-four percent of the adaptive seating devices were used four or more hours per day, 29 percent two to four hours per day, and 27 percent one to two hours per day. Sixty-five percent were used one or more years, and 42 percent were used two or more years.

Training Programs

Training programs were provided for sitting, self-feeding, eye/hand coordination, and sensory stimulation. In conjunction with using the adaptive seating devices, 28 (68%) clients were in sitting balance programs, 20 (49%) in feeding programs, 13 (32%) in eye/hand coordination programs, and 11 (27%) in sensory stimulation programs. Twenty-six clients were in more than one program: 12 clients were in
two programs, 5 in three programs, 8 in four programs, and 1 in five programs. Four (10%) clients reported that no programs were offered with the adaptive seating device they were using. Programs were conducted by the adaptive equipment specialist (a PT or an OT), the home trainer, or the teacher and were implemented by the parent or guardian in most cases. The questionnaire did not assess the consistency with which the programs were carried out or the results obtained from the programs.

**Social interaction.** Caretakers reported that clients spent significantly more time involved with someone else during the day after use of the equipment \((t = 3.07, df = 33, p = .004)\). Before receiving the equipment clients spent an average of 50 percent of their time with someone else, whereas after they received the equipment they spent an average of 58 percent of their time with someone else. It was also reported that clients went to significantly more new places in the community after using the equipment. Seven clients reportedly went to stores, and they had not done so previously. Six clients went to schools, two to movies, two to parks, two to restaurants, and one to a recreation center; none of these clients had gone to these places before. In addition, caretakers reported a significant improvement in ease of taking clients to places outside the home after using the adaptive seating devices \((t = 1.97, df = 36, p = .01)\). On a scale from −3 (more difficult) to +3 (easier), the average score reported was 2. No significant difference was noted for clients going out of the home more often after using the equipment \((t = 1.97, df = 35, p = NS)\).

**Positioning.** Positioning improved significantly with the adaptive seating devices. Time spent lying down significantly decreased from a mean interval of 8 to 10 hours before the equipment was used to a mean interval of 6 to 8 hours after \((t = 5.52, df = 28, p = .001)\). Sitting time increased from a mean interval of 2 to 4 hours to a mean interval of 4 to 6 hours \((t = 3.95, df = 29, p = .001)\). The client’s ability to sit upright rather than lean to one side or the other significantly improved \((t = 6.20, df = 33, p = .01)\). On a scale of −3 (much worse, more leaning) to +3 (much improvement, no leaning), the average score reported was 1.3. The clients spent more time sitting and less time in the bedroom after they used the adaptive seating device \((t = 2.70, df = 23, p = .01)\); the average interval of waking hours in the bedroom decreased from an interval of 6 to 8 hours to an interval of 4 to 6 hours. No significant increase in time spent in the kitchen \((t = 1.30, df = 20, p = NS)\) or living room/family room \((t = .94, df = 23, p = NS)\) was reported. Clients were reported spending an average interval of 2 to 4 hours in the kitchen and 4 to 6 hours in the family/living room both before and after using the equipment.

**Eye/hand coordination.** The ability to track a moving object by turning the head improved with the use of the adaptive seating devices \((t = 4.51, df = 31, p = .01)\). On a scale of −3 (much less movement, no head turning) to +3 (much more movement/shoulder to shoulder), the average score reported was .8. No significant improvement was reported in the clients’ ability to reach for objects \((t = .64, df = 30, p = NS)\). On a 7-point scale from 1 (doesn’t try) to 7 (does on own), improvement was from 4.1 to 4.3. Improvement in the clients’ ability to grasp objects more independently improved significantly \((t = 3.25, df = 29, p = .003)\). On a 7-point scale from 1 (doesn’t try) to 7 (does on own), reported improvement was from 4.1 to 4.6.

**Self-care.** Caretakers reported significant improvement in the clients’ methods of feeding themselves, from being fed or finger feeding to using a spoon \((t = 3.04, df = 28, p = .005)\). On the other hand, there was no significant change in the methods used to drink liquid \((t = 1.55, df = 28, p = NS)\). Nineteen of the clients were fed most of the liquid both before and after the equipment was used. Thirteen respondents gave no information on drinking. Six clients who previously had been fed most of the liquid held a cup and drank with assistance. Other self-care behaviors reported on were dressing and bowel and bladder independence. Caretakers perceived no significant change in dressing independence \((t = 1.58, df = 27, p = NS)\) or in bowel and bladder independence \((t = 1.19, df = 27, p = NS)\).

**DISCUSSION**

The results reported from this questionnaire assessed the caretakers’ retrospective perceptions of the clients’ behavioral changes after use of adaptive seating devices and participation in training programs.

The adaptive seating devices were used primarily by nonambulatory individuals with multiple handicaps who had not previously used specialized chairs. The mean age of the clients was 11.68 years, past the optimum age when rapid and major behavioral changes are often thought to occur. Significant changes were noted in specific behavioral areas in spite of the relatively advanced age of the clients. The authors hypothesize that the age of the clients in this study reduces the possibility that the observed behavioral changes were primarily due to developmental progression or maturation that would naturally occur in younger children with no equipment.

The seating devices were used consistently for one or more years, indicating prolonged usefulness of this specialized, often expensive piece of equipment. All of the chairs were used for one to two hours per day; 44 percent were used four or more hours per day. The authors believe that the consistent use of the equip-
ment was essential to its having postural and inhibiting effects.

At home, the clients using adaptive seating devices spent less time in the bedroom and more time in various other places, such as the kitchen, living and family room, and community; however, no one place showed a significant increase in time spent there. Caretakers reported easier access to community facilities and that new places were visited, although the before and after responses for the item concerning taking the clients into the community did not show statistical significance in most cases. It could be hypothesized that the equipment did not greatly change the amount of time the caretakers had available to be out of the homes, but that through positioning it did facilitate travel and therefore made it easier to take the clients to a greater variety of places.

The clients spent more time sitting each day, and their ability to sit upright improved with use of the adapted seating device. With adequate support and stabilization provided by the seating devices, the clients could maintain a midline position rather than leaning to one side or the other or going into a stereotypic, static posture controlled by primitive reflexes. With optimum trunk stabilization and improved sitting posture, the clients' abilities to track moving objects by head turning improved as did their independence in grasping objects. Postural stability was artificially produced by the adaptive seating devices and allowed more controlled movements of distal body parts, such as the head and hands moving off the stabilized trunk. Independence in reaching did not show a significant improvement. This finding is puzzling in view of the significant improvement of head control, reaching, and grasping. Further study is needed to determine the validity of this result.

The behaviors of sitting upright, tracking, reaching, and grasping are usually seen as precursors of more complex activities of daily living such as self-feeding, dressing, and bowel and bladder independence, and gains were noted in three of the four basic behaviors. Significant improvement in self-feeding was reported. Changes occurred not only in the level of assistance needed but also in the manner in which the client ate, for example, from using a spoon with assistance to using a spoon independently. Self-feeding follows head control, reaching, and grasping in the developmental sequence, and this sequence was reflected in the behavioral changes in the clients after the adaptive seating devices were used. Changes in method used to drink fluid were not statistically significant. It would be interesting to know if lip closure, tongue movement, and swallowing patterns changed. Eating and drinking programs were not separated in the program analysis. Direct observation of each in further studies is recommended.

Dressing and bowel and bladder independence did not significantly improve. No dressing or bowel and bladder programs were listed as being used with the adaptive seating devices. These are at a more advanced level of motor control than the other behaviors assessed, and they are activities not usually performed using adaptive chairs; it was therefore not surprising that no change was seen.

CONCLUSIONS

The authors do not intend to imply that the adaptive seating devices alone were directly responsible for the perceived behavioral changes. The chairs positioned the clients so that the clients could use skills they had developed, and the chairs stabilized key body parts to allow development of more distal skills by specific training programs offered in conjunction with the equipment provided. The chairs also may have acted as a catalyst by increasing the time caregivers (parents, teachers, and home trainers) spent with the client, and they may have increased the ease with which training programs could be carried out. In addition, personal acceptance of the clients by the caregivers and the community may be improved when the multihandicapped, developmentally disabled individuals are in a more normal position.

Based on groundwork established during this retrospective study, a second project is now underway to analyze prospective data using 1) a questionnaire before equipment is used and direct observation to assess behavior without the seating device and training programs, and 2) a questionnaire after the equipment is used and direct observation after the equipment and programs have been used 6 to 12 months. A more specific analysis of the types, duration, and consistency of programing used with the adaptive seating devices is also being incorporated.

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REFERENCES


APPENDIX

Sample Survey Questions Used to Assess Behavioral Activity Areas

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<tr>
<th>Behavioral Activity</th>
<th>Sample Survey Questions</th>
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| 1. Social interaction | a. How often does the client go out of the home? 
| | every 3 months | every month | 2-3 times a week | daily |
| | b. In your opinion has the ease of transportation into the community changed since receiving the adaptive equipment? 
| | more difficult | no change | easier |
| 2. Self-feeding | a. Describe how the client eats since receiving the equipment. 
| | uses knife and fork...independent/needs assistance | uses spoon...independent/needs assistance | finger feeds | is fed majority of meal |
| | b. Before receiving the equipment what position was the client in when awake? 
| | Lying: 
| | 0-2 | 2-4 | 4-6 | 6-8 | 8-10 | 10-12 | more than 12 |
| | Sitting: 
| | 0-1 | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | more than 6 |
| 3. Positioning | a. In your opinion has the client’s ability to sit upright changed with receipt of the adaptive equipment? 
| | much worse | no change | much improved |
| | more leaning | leaning | no leaning |
| | b. In your opinion has the client’s ability to turn his/her head to follow a moving object changed with receipt of the adaptive equipment? 
| | much less movement | no change | much more movement |
| | no head turning | shoulder to shoulder |
| 4. Eye/hand coordination | a. Since receiving the adaptive equipment, the client can grasp an object. 
| | doesn’t try | with some help | with much help |
| | b. In your opinion, has the client’s ability to turn his/her head to follow a moving object changed with receipt of the adaptive equipment? 
| | much less movement | no change | much more movement |
| | no head turning | shoulder to shoulder |
| 5. Self-care | a. Mark each as it applies now: 
| | 1) Dressing—needs assistance 
| | never | sometimes | always |
| | 2) Bowel and Bladder—needs assistance 
| | never | sometimes | always |