Effects of Functional Mobility Skills Training for Adults with Severe Multiple Disabilities

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Abstract: This study investigated the effects of a functional mobility program on the functional standing and walking skills of five adults with developmental disabilities. The Mobility Opportunities Via Education (MOVE) Curriculum was implemented using a multiple-baseline across subjects design. Repeated measures were taken during baseline, intervention and maintenance phases for each participant. All participants demonstrated progress in time standing and number of reciprocal steps during intervention. Skill gains were maintained or improved two years following intervention. Results for each participant are discussed as well as implications and future directions for research.

Many adults with developmental disabilities spend at least part of their day in segregated adult care facilities. These facilities have made considerable advancements in recent years in safety, medical care for clients, and concern for the dignity of the individual. However, there is still room for more improvements. Adults with developmental disabilities are spending too much time in passive, nonfunctional activities (Parsons, Rollyson, & Reid, 2004; Reid, Parsons, & Green, 2001). Many programs provide limited opportunities for age-appropriate activities (Singh et al., 2004), limited choice making opportunities (Antaki, Finlay, Walton, & Pate, 2008; Reid, Green & Parsons, 2003), and infrequent community integration and leisure activities (Metzel, Boeltzig, Butterworth, Sulewski, & Gilmore, 2007; Wilson, Reid & Green, 2006).

In recent years there has been growing support for more optimistic programming for adults with developmental disabilities. Research describes two essential variables for effective programming. The first variable is the availability of functional, age-appropriate activities (Kleinert & Kearns, 1999; Parsons et al., 2004; Reid et al., 2001). For example, instead of looking at children’s books or playing with children’s toys, adults should be provided opportunities to participate in adult activities (e.g., cooking, shopping, attending a music class, etc). The second related variable is the degree to which programs promote “active” participation within life activities (i.e., on-task or engaged time) in contrast to spending time in non-purposeful or off-task behavior (Carr & Sheppard, 2003; Mansell, Elliott, Beadle-Brown, Ashman, & Macdonald, 2002; Parsons, et al.; Reid & Green, 1998). For example, instead of sitting in a recliner holding a favorite object for leisure, active participation might include being in functional, upright postures to access adaptive switches while making a snack of one’s choice. Instead of being pushed in a wheelchair on a community outing, active participation could include going up to the counter to make a purchase.

Inclusion of activities that promote active participation and functional skill use within life activities has become a best practices indicator for adult habilitation programs (Parsons et al., 2004; Reid, Green, & Parsons, 2003; Verdonschot, de Witte, Reichrath, Buntinz, & Curfs, 2009). However, many adults with developmental disabilities who participate in...
these programs continue to spend their days in passive, non-purposeful situations (Parsons et al.; Reid et al., 2001). This negative situation is even more evident for non-ambulatory adults with complex disabilities who typically require extensive support from others.

Because most studies that have analyzed programming for adults with developmental disabilities have focused mainly on individuals with less complex disabilities who are ambulatory (Reid et al., 2001), little emphasis has been placed on the programming needs of non-ambulatory adults with more complex disabilities. This is possibly due to limited expectations for improvement. Many of these non-ambulatory individuals spend large portions of their days sitting passively in recliners or wheelchairs or laying on mats on the floor. Over time, health deteriorates and secondary conditions develop making active programming even less likely.

In recent years there has been support from various fields suggesting the need for more optimistic programming for adults with severe physical disabilities. The field of motor science has demonstrated that strength training can improve strength and walking skills for adults with CP without increasing spasticity (Andersson, Grooten, Hellsten, Kaping, & Mattsson, 2003). Other studies have shown that motor skills can be learned after years of disuse (Page, Gater, & Bach-Y-Rita, 2004; Podgorski, Kessler, Cacia, Peterson, & Henderson, 2004). Research in the field of physical therapy indicates that activity-based, task-oriented therapies have shown significantly greater promise over older deficit-focused approaches in improving mobility skills of adults (Damiano, 2006; DeJong, Horn, Conroy, Nichols, & Healton, 2005; Thomson, 2005). Additional from the field of biomechanics there is evidence of motor relearning for individuals with motor impairments (Krishnan, 2003). These findings would suggest that programs for adults with severe physical disabilities should focus more on true habilitation with expectations of improvements rather than maintenance and caretaking.

**MOVE® Programming**

The **MOVE®** (Mobility Opportunities Via Education) Curriculum is a program that was developed to teach functional mobility skills to children with severe disabilities in daily activities and routines within everyday environments (Kern County Superintendent of Schools, 1999). The **MOVE** Curriculum uses an ecological, activity-based programming approach to help individuals with severe, multiple disabilities improve their quality of life. Programming focuses on priority outcomes for the individual rather than deficits identified through a hierarchical developmental approach. A team process is used to develop activity-based programs to teach critical functional mobility skills to support active participation within life activities. The “MOVE team” includes the individual with disabilities, family members/caregivers, and professionals who work collaboratively through a six-step process to identify meaningful life outcomes, barriers to participation, priority mobility skills to be addressed, and physical and environmental supports to facilitate participation. With this information, programs are developed that promote mobility skill practice within meaningful life activities (for additional information on the **MOVE** Curriculum see Bidabe, Barnes, & Whinnery, 2001). The **MOVE** Curriculum has been described as a task-oriented approach that emphasizes functional movement and improved quality of life (Thomson, 2005). This program has been shown to be effective in increasing functional mobility skills and improving quality of life for preschool and school-aged children (Barnes & Whinnery, 2002; van der Putten, Reynolds, Vlaskamp, & Nakken, 2004; Whinnery & Barnes, 2002).

Based on the success of the **MOVE** Curriculum for children, many facilities for adults with developmental disabilities began to informally adapt the children’s program with positive results. This led to requests for the development of a **MOVE** program appropriate for adults. Funding was obtained to conduct a study to determine if the core principles of **MOVE** programming are effective for adult populations. It was additionally hoped that this study would lead to the creation of the **MOVE** for Adults Program. To determine program effectiveness, this study asked the following questions: Do functional mobility skills in adults with severe multiple disabilities improve as a result of direct training using...
MOVE programming? Do functional mobility skills in adults with severe multiple disabilities maintain as a result of direct training using MOVE programming?

Method

Participants

Five adults with severe, multiple disabilities between the ages of 36 and 49 were selected to participate in this study. All five participated in a day habilitation program for adults with developmental disabilities provided by a not for profit 501(c)3 human service agency located in a rural, northeastern community. The day habilitation program consisted of leisure and daily living activities at a central location with occasional community outings. Individual Support Plans (ISPs) were developed for each adult outlining his or her specific program. Prior to intervention, ISP goals typically included: one-to-one attention, manipulating objects (e.g., string, blocks), rolling/crawling on the floor, daily walks (i.e., pushed in wheelchairs), and community outings once per month. Day program staff included an administrator, supervisors, nurses, a part-time physical therapist, and direct support professionals (DSPs). The staff to adult participant ratio was 1:4. All participants lived in group homes operated by the previously mentioned not-for-profit agency.

The following criteria were used to select participants for the study: (a) diagnosis of a developmental disability including a severe physical impairment, (b) informed consent by a legal guardian, (c) medical eligibility to be in a fully or partially weight-bearing standing position, and (d) no prior involvement with the MOVE program.

None of the five participants used mobility equipment other than hand propelled wheelchairs, and only one participant was able to independently propel her wheelchair. None of the five stood (with or without assistance) to participate in daily activities nor walked as a means of mobility. However, one participant would occasionally stand for a few seconds and take a few steps while being supported in standing by another person, but she typically refused to do this. Four of the five participants required lifting and the remaining participant could partially assist to transfer in and out of her wheelchair. All participants spent the majority of the day in their wheelchairs.

For ease of comparison, two multiple baseline conditions were established. The criterion was weight-bearing characteristics based on expected differences in rate of change due to differing disability complexities. The first condition included two participants who were non-weight bearing prior to baseline, and the second condition included three participants who were able to bear at least partial weight prior to baseline.

Non Weight-Bearing Participants

Carla. Carla was a 36-year-old female diagnosed with a significant cognitive disability, spastic diplegia, and hydrocephalus. Although Carla had been able to walk with a wheeled-walker, sit in a regular chair, and was independent in toileting approximately 10 years earlier, she had lost all these skills due to a medical complication. Prior to MOVE programming, she did not bear weight to stand, walk, or transfer out of her wheelchair. She was lifted onto a changing table for toileting and was dependent upon staff to move from one location to another. Because of her lack of head control, the staff was considering the use of a neck brace to keep her head from constantly lagging forward.

Julia. Julia was a 49-year-old female diagnosed with a significant cognitive disability, Seckel Syndrome, microcephaly with dwarfism, and spastic quadriplegia. Julia did not bear weight to stand, walk, or assist with transfers. She was lifted in and out of her wheelchair and onto a changing table. She spent the majority of her day in a specially molded wheelchair (due to significant scoliosis) with some opportunities to sit in a beanbag or lay on a mat on the floor for a position change. Julia rarely interacted with others or her environment and spent a lot of her day whining and crying.

Weight-Bearing Participants

Maria. Maria was a 36-year-old female diagnosed with a significant cognitive disability, spastic diplegia, and myopia. She could...
stand for 3 or 4 seconds while holding onto a stable object or another person and had even taken a few steps in the past. However, she was very unsteady and preferred crawling on the floor. Maria was lifted onto a changing table for diaper changes. Maria was considered unsafe in a regular chair because she would slide out or bang violently against the back of the chair. She spent the majority of her day in her wheelchair or on the floor. Maria would often yell and rock excessively in her wheelchair throughout the day.

**Andrea.** Andrea was a 39-year old female diagnosed with a significant cognitive disability, spastic diplegia and a seizure disorder. It was reported that Andrea had shown the ability to stand briefly while supported in an adaptive walker, but this was not a typical part of her day. Andrea spent her day in her wheelchair or sitting on the floor or a couch. She did not sit in a regular chair because she would unsafely rock and bang the chair. She had no opportunities for standing or walking. A two-person lift was used for transfers, and she was lifted onto a changing table for diaper changes. Staff reported that Andrea often became upset and would bite herself.

**Francie.** Francie was a 46-year old female diagnosed with a significant cognitive disability, spastic quadriplegia, obesity, and impulsive behavior disorder. Approximately seven years earlier, Francie was able to stand while holding a stable object and could independently transfer out of her wheelchair and onto a toilet. At that time she was continent and took care of her own toileting needs. However, after a series of short-term medical issues and subsequent weight gain, she became reliant on others for self-care. At the time of the study, Francie refused to bear any weight in standing or participate in transfers resulting in the use of a mechanical lift. She no longer used the toilet and was lifted to a changing table for diaper changes. Although Francie had the ability to sit in a regular chair, difficult transfers resulted in her spending the majority of her day in her wheelchair. Staff reported that she had become withdrawn, easily upset and aggressive towards others and had begun to experience health complications due to her increased weight.

**Setting**

The study was conducted at the Day Habilitation Center during typical daily activities. This Center includes administrative offices, a general gathering room that consists of a variety of leisure activities, a plant atrium, a kitchen, a beauty salon, a tv/computer area, an outdoor recreational area, and men’s/women’s bathrooms. MOVE programming occurred during the morning/afternoon leisure times and/or toileting times throughout the day. During leisure times participants could select from a variety of adult leisure activities (e.g., preparing snacks, painting, outside walks, bowling).

**Independent Variable**

The independent variable was the MOVE Curriculum which consists of six steps: (a) Testing, (b) Setting Goals, (c) Task Analysis, (d) Measuring Prompts, (e) Reducing Prompts, and (f) Teaching the Skills. In Step 1, the Top-Down Motor Milestone Test (TDMMT) is administered to identify the amount and type of support needed to facilitate functional sitting, standing or walking skills (Kern County Superintendent of Schools, 1999). The TDMMT is administered as an interview process in which the learner, family members, and direct service providers answer questions about the learner’s current use of mobility skills. The focus is to identify “functional use” of mobility skills, defined as consistent use of a skill in at least one daily activity. The TDMMT has been shown to be a reliable tool for determining motor functioning in a functional context (van der Putten, Vlaskamp, Reynders, & Nakken, 2005).

During Step 2: Setting Goals, priorities are identified and daily activities are selected based upon information gathered during the TDMMT and a Step 2 learner/family interview. The Step 2 interview includes questions related to the learner’s/family’s current and future desires and barriers affecting the learner’s participation in typical daily activities. If an individual is unable to respond, a proxy respondent (e.g., family member) provides answers based on his or her knowledge of the individual.

In Step 3: Task Analysis, component steps
and related mobility skills are identified for the daily activities identified in Step 2. Although a number of mobility skills may be associated with a daily activity, the goal is to focus on the few critical skills that are identified as priorities to encourage intensive, repeated skill practice.

In Step 4: Measuring Prompts, the amount and type of physical support needed to increase active participation in the selected activities is determined. A critical component of MOVE programming is the provision of physical prompts to support functional mobility and participation within an activity. Levels of support differ based on an individual’s needs and on the requirements of the activity.

In Step 5: Prompt Reduction, physical support is faded as appropriate based on skill level increases and safety factors. Physical prompts are reviewed regularly and reduced when possible. The reduction of physical prompts differs for participants according to their individual rates of progress. All prompt reduction decisions are made by the MOVE team which includes a physical therapist.

During Step 6: Teaching the Skills, instruction of skills is embedded into typical daily activities in order to provide meaningful and frequent practice of sitting, standing, transition (e.g. moving from sitting to standing), and walking skills. An important component of Step 6 is the identification of practice activities that are relevant and motivating to the individual to encourage active participation.

For this study, minor adaptations were made to the MOVE Curriculum to address the unique needs of the adult participants. First, the family interview from Step 2: Setting Goals was replaced with a person-centered interview in which the adult participant answered questions to identify priorities and interests for goal development. In cases where the adult participant did not have a reliable means of communication, a proxy respondent (typically the Day Program Direct Support Provider) answered based on his/her knowledge of the adult. No participants had family involvement at the time of the study. Second, Step 5: Prompt Reduction was modified from a main focus on reducing prompts to a prompt review process that recognized that adults with long-standing disabilities may require more intensive and ongoing support. However, prompt reduction continued to be addressed as appropriate.

**Dependent Variables**

The dependent variables were (1) the number of reciprocal steps and (2) the number of seconds standing. Standing was defined as “weight on feet with balance support provided by another person or a stable object as needed (may include partially flexed hips and knees).” A reciprocal step was defined as “from a standing position, move one foot forward and shift weight onto that foot within 15 seconds.”

**Staff Training**

Prior to the study, the Director, Assistant Director, and DSPs from the Day Habilitation Program participated in one day of training on single-subject data collection procedures. During the baseline phase, staff from the day and residential programs participated in two-day MOVE International Basic Provider course on how to implement the MOVE Curriculum. The Basic Provider course consisted of 16 hours of instruction on the six steps of the MOVE Curriculum including hands-on instruction in assessment, goal setting, and use of adaptive equipment. A one-day follow-up training on developing activity-based programs was provided to the Day Habilitation Program staff. Additionally, ongoing consultation related to data collection, implementation of the MOVE program, and the development of activity-based programs was provided by the authors throughout the study.

**Materials and Equipment**

Within MOVE, physical supports and adaptive equipment are used for instruction of new skills rather than to substitute for missing skills with supports faded as individuals learn new skills. Thus, mobility equipment was selected based on this criterion. The Rifton Pacer gait trainer, Dynamic Stander, and Support Station (Rifton Equipment, 2004), the Altimate Easy Stand (Altimate Medical, 2004), and a platform walker (Follo Industries A/S, 2004) were used during intervention. The Pacer, also known as a front leaning walker, provides...
support for an individual to learn to take reciprocal steps. Typical positioning in the Pacer includes weight bearing on forearms to provide support and develop upper trunk strength. The Pacer is designed to provide a range of support from total support for individuals just beginning to weight bear in standing to support for balance only. The Dynamic Stander is a wheeled stander that supports varying degrees of weight-bearing and is designed to encourage self-propelling. The Support Station is a standing-support designed for upright hygiene care and transfers on and off a toilet. The Support Station can accommodate individuals with full to no weight-bearing ability. The supports (e.g., trunk support, forearm supports, and hip positioner) on the Pacer, Dynamic Stander, and Support Station can be removed as individuals gain strength and skills thus requiring less support. The Easy Stand is a sit-to-stand mobile standing frame that uses a pump actuator handle to move the device from a sitting to a standing position. Although the Easy Stand does not allow for the reduction of support, it was used initially with some of the previously non weight-bearing participants to prepare them to transition to the other mobility equipment. The platform walker is an aluminum framed walker with a padded flat surface to support forearms. Additionally, environmental adaptations typically used with individuals with physical disabilities were used as appropriate for support (i.e., grab bars, counter tops).

Experimental Design and Procedure

A single-subject, multiple-baseline across subjects study was employed to evaluate the impact of MOVE programming on functional mobility skills. The study was conducted over a 15-month period. Following data collection, MOVE programming continued independent of the researchers. Two years following the end of the intervention phase, maintenance data were collected over a two-week period.

Baseline

During the baseline phase, repeated measures of time standing and number of reciprocal steps were taken twice a week. Baseline measures occurred within the participants’ typical day program environments. For each data collection opportunity, participants were given a verbal prompt to “stand” or “walk.” No measures were taken using mobility training equipment because this was not a normal part of programming and was considered to be part of the intervention.

For standing, each participant was given the least amount of adult assistance for balance only (i.e., one or two hands held or support at trunk with independent weight bearing). For walking, participants were given adult support for balance only. No additional assistance was provided for taking reciprocal steps. For participants who were unable to weight bear independently or with support for balance, a zero was recorded.

Intervention Phase

The intervention consisted of the implementation of the six steps of the MOVE Curriculum for each participant. For this study, the MOVE team consisted of the adult participant, direct support providers (DSPs), the Day Habilitation Program administrator, nursing staff, and the physical therapist. Using the information obtained during the Step 1 TDMMT interview, the MOVE team identified each participant’s consistent use of mobility skills. Priority activities and target mobility skills were identified for each participant in Step 2: Setting Goals and Step 3: Task Analysis. Activities included those already in the daily routine and some additional age-appropriate activities added to increase options and address specific preferences (individual participant activities are described in a later section). Physical supports including mobility training equipment were identified for each selected activity based on the requirements of the activity and the mobility needs of the participant (Step 4: Measuring Prompts). Monthly prompt review schedules were established to determine opportunities for reducing physical supports (Step 5: Prompt Reduction). During Step 6: Teaching Skills, participants practiced mobility skills during one standing and one walking activity per day. All activities occurred during the morning/afternoon leisure times and/or toileting times at the Day Program Center. As is prescribed in MOVE programming, identified activities
were adjusted as participant’s preferences and needs changed.

Measurements of time standing and number of reciprocal steps were taken twice a week. The participant’s assigned DSP gave the verbal cue and the Day Program administrator recorded the data. Measurements were taken at the first standing or walking opportunity during each selected activity.

For standing, each participant was given assistance for balance only (i.e., stability from an adult or stable object) to independently weight bear. As each activity began, the participant was assisted into position and given a verbal cue to “stand to do the activity.” If the participant did not bear her own weight, a zero was recorded.

For walking, each participant used mobility equipment with the least amount of physical prompts needed to bear weight in standing. As each activity began, the participant was assisted into the mobility training equipment and given a verbal cue to “walk to do the activity.” If the participant did not take reciprocal steps within 15 seconds of the verbal cue a zero was recorded. If the participant paused longer than 15 seconds, data collection stopped. Once data collection ended, participants were given additional time to complete the activity. Specific supports for standing and walking for each participant are described in a later section.

**Maintenance Phase**

After a period of two years during which MOVE programming continued independent of the researchers, maintenance measures were taken on dependent variables for all participants. Data were collected during two regularly occurring daily activities for each participant (one for standing and one for walking). Some adults were participating in different activities than during the intervention phase due to changing interests and/or were using different levels of support due to skill gains.

**Fidelity of Treatment**

Three techniques were used to ensure fidelity of treatment. First, consultation was provided to staff through weekly conference calls between the MOVE team members and the researchers and with periodic visits by the researchers to provide support and feedback. Second, after the initial training, the researchers completed implementation checklists during 2 on-site visits and provided oral and written feedback after each visit. Third, 33% of trials for baseline, intervention, and maintenance were randomly selected for interobserver agreement checks (IOA). The Assistant Director of the Day Habilitation Program independently completed these reliability checks for each participant. Percentage of agreement was calculated for each participant by dividing the total number of agreements by the sum of agreements and disagreements and multiplying that number by 100 (White & Haring, 1980). Agreement for time standing was defined as the agreement within 1 second (allowing for speed of stopping and starting the stopwatch) and averaged 100% in baseline, 89% (range 83-95%) in intervention, and 100% in maintenance for all participants. Agreement for the number of reciprocal steps was defined as exact agreement and averaged 97% (range 90-100%) in baseline, 99% (range 97-100%) in intervention, and 100% in maintenance for all participants.

**Results**

Data were analyzed using visual analysis of graphs including changes in means, levels, and trends as well as percentage of overlap across phases (Alberto & Troutman, 2006; Horner et al., 2005; Kazdin, 1982). For non weight-bearing participants, performance for baseline, intervention and maintenance are presented in Figures 1 and 2. For weight-bearing participants, performance for baseline, intervention and maintenance are presented in Figures 3 and 4.

**Non Weight Bearing Participants**

Carla. A stable baseline with a mean and range of 0 was observed for standing. Carla’s standing data collection activity during intervention was purchasing a soda from the vending machine using a platform walker, a highly preferred daily activity. The mean for intervention phase was 61.48 seconds with a range from 0-488 seconds. There was an 8% overlap of data points (9 of 109 data points) from
baseline with a 61.48-point increase in the mean. There was an upward trend in time standing with considerable variability (see Figure 1).

A stable baseline with a mean .06 and a range of 0-1 was observed for walking. During intervention, Carla's data collection activity for walking was completing a daily chore (e.g., collecting paper to be recycled, watering the plants) while walking in the Pacer. The mean for intervention phase was 3.92 reciprocal steps with a range from 0-23 steps. There was a 32% overlap of data points (35 of 109 data points) from baseline with a 3.86-point in-

Figure 1. Standing progress for previously non weight-bearing adults for baseline, intervention, and maintenance.

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crease in the mean. There was an upward trend in number of steps with considerable variability (see Figure 2).

During the maintenance phase, the mean for seconds standing was 23.20 with a range of 13-38. This was a 23.20-point increase in the mean number of seconds with a 0% overlap of data points from the baseline phase to the maintenance phase. For walking, there was a mean of 10.80 steps with a range of 4-29 steps. This was a 10.74-point increase in the mean number of steps with a 0% overlap from the baseline phase to the maintenance phase. 

Julia. A stable baseline with a mean and a range of 0 was observed for standing (see Figure 1). Julia’s standing data collection ac-
tivity during intervention was socializing with her DSP. Initially, she required support from two people (one at each side), but eventually was able to stand while placing forearms on a flat surface for balance only. The mean for intervention phase was 105.67 seconds (range 0-583 seconds). There was an 8% overlap of data points (8 of 104 data points) from baseline with a 105.67-point increase in the mean. There was an upward trend in time standing with considerable variability.

A stable baseline with a mean of .09 and range of 0-2 was observed for walking (see Figure 2). Julia’s walking data collection activity during intervention was going to a leisure activity of choice using the Pacer. The mean for intervention phase was 1.18 reciprocal steps with a range from 0-3 steps. There was a 95% overlap of data points (84 of 88 data points) from baseline with a 1.09-point increase in the mean. There was a slight increase in number of steps with some variability.

During the maintenance phase, the mean for seconds standing was 153 with a range of 110-203. This was a 153-point increase in the mean number of seconds with a 0% overlap of data points from the baseline phase to the maintenance phase. For walking, there was a mean of 1.60 steps with a range of 1-3 steps. This was a 181.62-point increase in the mean number of steps with a 0% overlap from the baseline phase to the maintenance phase.

**Weight Bearing Participants**

**Maria.** A stable baseline with a mean of 8 and range of 0-19 seconds was observed for standing (see Figure 3). Initially data collection for standing during intervention occurred while Maria was standing in the sensory room holding a stationary object. When it became apparent that Maria was no longer interested in the sensory room, her data collection activity was changed to washing snack dishes while leaning against the counter. The mean for intervention phase was 259.81 seconds with a range from 15-705 seconds. There was a 1% overlap of data points (1 of 104 data points) from baseline with a 251.81-point increase in the mean. There was an upward trend in time standing with considerable variability.

A stable baseline with a mean of 6.58 and range of 0-28 steps was observed for walking (see Figure 4). Maria’s data collection activity during intervention for walking was moving between leisure activities of choice using a platform walker. The mean for intervention phase was 88.37 reciprocal steps with a range from 1-202 steps. There was a 13% overlap of data points (13 of 104 data points) from baseline with an 81.79-point increase in the mean. There was an upward trend in number of steps with considerable variability.

During the maintenance phase, the mean for seconds standing was 246.20 with a range of 108-409. This was a 238.20-point increase in the mean number of seconds with a 0% overlap of data points from the baseline phase to the maintenance phase. For walking, there was a mean of 188.20 steps with a range of 153-242 steps. This was a 181.62-point increase in the mean number of steps with a 0% overlap from the baseline phase to the maintenance phase.

**Andrea.** A stable baseline with a mean of 4.04 and range of 0-27 seconds was observed for standing (see Figure 3). Andrea’s initial data collection activity for standing was announcing the arrival of the vans while standing at the window using a platform walker. Mid-way through intervention this activity was discontinued due to the participant’s change of preference. From that point, standing data were collected during participation in leisure activities. The mean for intervention phase was 123.69 seconds with a range from 0-558 seconds. There was an 11% overlap of data points (11 of 101 data points) from baseline with a 119.65-point increase in the mean. There was an upward trend in time standing with considerable variability.

A stable baseline with a mean of 2.51 and range of 0-8 steps was observed for walking (see Figure 4). Andrea’s data collection activity during intervention for walking was delivering clean linens to the linen closet using a Pacer. The mean for intervention phase was 24.61 reciprocal steps with a range from 1-70 steps. There was an 18% overlap of data points (18 of 101 data points) from baseline with a 22.10-point increase in the mean. There was
an upward trend in number of steps with considerable variability. During the maintenance phase, the mean for seconds standing was 109.20 with a range

Figure 3. Standing progress for previously weight-bearing adults for baseline, intervention, and maintenance.
of 40-246. This was a 105.16-point increase in the mean number of seconds with a 0% overlap of data points from the baseline phase to the maintenance phase. For walking, there
was a mean of 58 steps with a range of 35-78 steps. This was a 55.49-point increase in the mean number of steps with a 0% overlap from the baseline phase to the maintenance phase.

Francie. A stable baseline with a mean of 4.33 and range of 0-29 seconds was observed for standing (see Figure 3). Francie’s initial data collection activity during intervention was standing holding a grab bar to announce the arrival of the vans. This activity was changed within a short time period, due to participant preference, to standing at the bathroom mirror holding the handles on the Support Station to have make-up applied. The mean for intervention phase was 150.16 seconds with a range from 18-312 seconds. There was only a 5% overlap of data points (5 of 98 data points) from baseline with a 145.83-point increase in the mean. There was an upward trend in time standing with considerable variability.

A stable baseline with a mean and range of 0 steps was observed for walking (see Figure 4). Francie’s data collection walking activity during intervention was walking to a leisure activity of choice using a Pacer. The mean for intervention phase was 16.48 reciprocal steps with a range from 0-87 steps. There was a 5% overlap of data points (5 of 98 data points) from baseline with a 16.48-point increase in the mean. There was an upward trend in number of steps with considerable variability.

During the maintenance phase, the mean for seconds standing was 147.80 with a range of 60-182. This was a 143.47-point increase in the mean number of seconds with a 0% overlap of data points from the baseline phase to the maintenance phase. For walking, there was a mean of 68.40 steps with a range of 16-107 steps. This was a 68.40-point increase in the mean number of steps with a 0% overlap from the baseline phase to the maintenance phase.

Discussion

The current study investigated the effects of the MOVE program on the functional mobility skills (i.e., standing and walking forward) of five adults with severe multiple disabilities who participated in a day habilitation program for adults with developmental disabilities. The results of this study provide support for the use of the MOVE program with adults who have severe, multiple disabilities. The use of a single-subject research design suggested a relationship between the target behaviors and the implementation of the MOVE program. Additional studies will be needed to further validate the program and determine specific components responsible for changes in target behaviors.

Prior to the introduction of the MOVE program no participants were able to demonstrate functional use of mobility skills (i.e., consistent use in at least one daily activity). After the MOVE program all participants made gains in standing skills within target activities. Staff interviews revealed that these skill gains were considered functional because they reduced the need for one-on-one support from DSPs for mobility and encouraged more meaningful and active participation in daily activities. Prior to intervention, none of the participants used standing skills in their daily routines. The non weight bearing participants did not have opportunities to have their feet touch the floor or to take partial weight. At the beginning of intervention, Julia would not lower her legs to let her feet touch the ground when placed in the Pacer. The Easy Stand and Dynamic Stander were used to provide opportunities for partial weight bearing with maximum support. With continued programming, she eventually supported her weight in standing and for transfers. Once Julia began to bear her own weight with the use of the Pacer, she often stood on one foot due to a leg length difference. As programming progressed, however, she began to put both feet to the ground. At the start of the study, Julia was using a wheelchair specifically molded to accommodate her severe scoliosis. However, by the end of intervention, Julia did not fit into the wheelchair because the curvature in her spine had lessened.

Maria, Andrea, and Francie were able to bear partial weight prior to the study but chose not to use these skills, typically preferring to drop to the ground and crawl. As these participants gained standing and walking skills, the behavior of dropping to the ground was discontinued.

Staff interviews revealed the significance of improved standing transfer skills (i.e., sit-to-stand and stand-to-sit). Prior to MOVE, partic-
Participants required two-person lifts or the use of mechanical aids to be moved from one position to another. This was considered cumbersome and time-consuming and resulted in few opportunities to get out of wheelchairs. Additionally, two-person lifts to the changing table were physically difficult and previously had resulted in some staff and client injuries. Even small gains in standing skills (e.g., standing for 10-15 seconds) allowed for easy transfers to chairs, mobility equipment, and the toilet with minimal staff assistance. By the end of the intervention phase, three participants could independently stand while holding an object and two participants could stand with one or both hands held for balance.

During maintenance staff reported that standing skills were used regularly during daily activities increasing opportunities for meaningful engagement. Participants used standing skills during leisure activities of choice (e.g., cooking class, art activities, dance/exercise class, etc.), during hygiene (e.g., transferring on/off the toilet, grooming, to have make-up applied, etc.), and for other daily activities (e.g., making purchases from vending machines, standing at sink to wash dishes).

Newly gained standing skills resulted in increased opportunities to use mobility equipment, a greater variety of postures that encouraged participation, and opportunities to use regular or adapted toilets rather than being lifted to a changing table. Staff reported that with these increased opportunities to use the toilet, all five adults were voiding regularly on a toilet or adapted toilet with four of the five participants remaining clean and dry throughout the day. Additionally, two of the five adults transitioned out of adult diapers and into regular adult underwear.

During intervention all participants showed improvements in their walking skills. Of the previously non weight bearing participants, Carla made the greatest gains. By the end of the study she was walking wherever her daily chore required using the Pacer with forearm supports. By the end of the study, Carla’s head control had improved significantly and a previously considered neck brace was never used. Julia required time to adjust to being in an upright weight bearing position. When placed in the Pacer she would draw up her legs and refuse to weight bear. Progress was also delayed due to the challenge of positioning Julia in the Pacer because of her scoliosis. Gradually she began experimenting with pushing with her feet and taking a few individual steps. By the end of intervention, anecdotal reports from staff indicated she was able to walk at least 25 feet to and from leisure activities without assistance with multiple pauses greater than 15 seconds.

For the previously weight-bearing participants, Maria may have made the greatest gains in walking. She would use the Pacer to walk to any preferred leisure activity, limited only by the distance to the location or activity. Francie and Andrea also used walking regularly to move among available leisure activities at will. When MOVE was first implemented, Francie showed resistance to using the Pacer and would sometimes become upset. After a gradual introduction to the Pacer, she began to use it regularly to access preferred leisure activities. Later in the study, she would request the Pacer as soon as she arrived at the Center becoming impatient if she had to wait to use it.

Staff interviews during maintenance revealed that all participants typically used their walking skills to go to the kitchen to prepare snacks, to take leisure walks outside, to go to and from the bathroom, and to move between available leisure activities. These newly gained walking skills made community outings more successful because the participants could more actively participate and could express preferences using mobility. A significant milestone for Andrea was her outing to the shoe store. She walked out of the store in the Pacer wearing her new walking shoes.

Staff interviews revealed that these newly gained mobility skills were considered valuable because participants were able to stand and walk independently with the use of mobility equipment reducing the need for physical support from staff and reducing work-related injuries. Additionally, it was reported that adult learners participated more actively in daily activities and used mobility to make choices and express personal preferences by moving to and from activities. During maintenance, practice of standing and walking skills increased as mobility became a regular part of the participants’ routines throughout the day.

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Limitations

A major limitation of this study is the operational definition used for reciprocal steps. A reciprocal step was defined as “from a standing position, move one foot forward and shift weight onto that foot within 15 seconds.” While this definition had worked well in previous mobility studies with children, it proved to be limiting and restrictive for adults. Frequently staff reported that once data collection was stopped after a 15 second delay between steps, many of the participants would then resume walking and sometimes complete the activity with several delays of over 15 seconds. Although some informal data was collected on additional steps taken after the time limit, the results only reflect data collected based on the original operational definition. This may have resulted in an underreporting of mobility gains.

A second limitation of this study is that the length of time of an activity or the distance to an activity sometimes limited the data collection. MOVE is an activity-based program and all measurements during intervention and maintenance occurred within meaningful activities. In some cases, natural completion of the activity limited the number of seconds for standing or steps for walking (e.g., once Julia reached the salon chair in the beauty salon, the opportunity for additional reciprocal steps ceased). However, active participation in a meaningful activity rather than seconds standing or steps taken is considered the end goal of MOVE programming.

Another limitation is the variability of the data that makes interpretation of treatment effects difficult. The variety of influences in the natural environment and the characteristics of adults with severe disabilities (i.e., frequent illnesses, medical complexities, etc.) typically result in variations in the data. While traditional research methods consider variability to be a weakness, researchers studying the multiple factors affecting skill development advocate for the preservation of variability because it provides valuable information about behavior changes with applied research (Kamm, Thelen, & Jensen, 1990; Kratochwill & Williams, 1988).

A final limitation is related to the selection of activities for data collection. In order to maintain reliability, specific standing and walking activities were identified for data collection for each participant based on personal preference. As the participants gained mobility skills and experienced more life activity options, interests and preferences often changed. A data collection activity was changed only if an adult participant was no longer willing to participate in the original activity. For others, the original activity was maintained throughout the study. Although this addressed consistency, it may have resulted in an underreporting of skill gains for some participants who were beginning to satiate on original activities. Further, this was not fully congruent with MOVE programming that stresses the importance of motivation within practice situations.

Implications for Practice

Mobility training. This study supports the value of providing mobility training to adults with long-standing physical disabilities. Instead of a focus on maintenance and caretaking, programming should include mobility training that occurs in typical daily activities. In MOVE, mobility training occurs during daily routines which allows for frequent practice in motivating contexts. Physical supports like adaptive equipment are used to teach mobility skills rather than simply for postural positioning. As individuals gain skills, physical supports are reduced. In this study, all adults acquired independent functional sitting, standing, and walking skills with or without the use of adaptive equipment. For example, adults who previously required a two-person lift or mechanical lift to transfer in and out of their wheelchairs had learned to transfer themselves with minimal support. The ability to actively transition from a seated or reclined position is a critical skill needed for active participation. The more difficult and cumbersome it is for an individual to be transferred, the less likely they will be moved, consequently reducing participation opportunities. As the adults gained strength and endurance in standing, they had a new mobility option for participating in daily activities. Whereas previously adults were always seated or reclined, they could now stand with support (e.g., using mobile standers, leaning on coun-
ters, or holding stationary objects) for activities like washing dishes at the sink, preparing clothing before and after toileting, and purchasing a drink or snack from a vending machine. With the use of gait trainers or adaptive walkers, the adults could walk freely to and among the activity options available at the day program without having to rely on someone else for mobility.

Active participation. This study demonstrated that improved functional mobility can increase opportunities for active participation. Prior to the study, the limited mobility of the participants typically resulted in passive participation that often included stereotypical behaviors like rocking, repeated vocalizations, and mouthing fingers with little active engagement. As participants gained mobility skills, they were better able to actively engage in daily routines and activities. Newly gained mobility also enabled participants to explore new activities. Whereas previously participants engaged in a limited number of activities, they now were able to independently move to and among a variety of activities based on preference.

Additionally, the use of an interview process to identify preferred rather than generic adult activities for mobility practice encouraged active participation. Although adults could choose from a selected menu of activities prior to MOVE, there was little to no effort to expand or personalize activity options based on the adults’ preferences. The interview in Step 2 of MOVE provided a mechanism for identifying preferred life activities that were personally meaningful and motivating to the participants. Options expanded to include activities like cooking, making coffee, watering plants, delivering messages and supplies throughout the day program, having hair and nails done in the salon, and a variety of community outings to parks, stores, and restaurants. As the focus shifted to adult preferences, participants began to communicate preferences by walking to an activity and/or gesturing or verbally communicating a preference. Programming goals shifted from caretaking and maintenance to mobility practice and active engagement in preferred activities.

This study supports the importance of programming that emphasizes mobility training with expectations for skill gains for adults with long-standing mobility disabilities. This is in contrast to common practices that focus more on caretaking than habilitation (Parsons, Rollyson, & Reid, 2004).

Future Directions

According to Horner et al. (2005), the use of single subject studies to document evidence-based practice involves multiple single subject studies (a minimum of five studies) conducted by at least three different researchers across three different geographical locations on a total of at least 20 participants from the related studies. This study compliments an earlier study investigating the use of MOVE with children with developmental disabilities (Barnes & Whinnery, 2002). Future research documenting a functional relationship between MOVE programming and an increase in functional mobility skills for individuals with developmental disabilities is needed.

The core concepts of MOVE programming argue that mobility is not the end goal. Rather, functional mobility should provide access to life activities, increase active participation, and improve quality of life. Although not experimentally evaluated, anecdotal data from the study suggested some relationships that should be investigated in future research. For example, nursing notes indicated a possible connection between increased mobility and health improvements. Over the course of the study there was a significant reduction in the incidences of constipation, the use of constipation medication, and the incidences of skin break down in the hygiene area for all participants. Furthermore, as participants experienced improvements in toileting (i.e., voiding in the toilet), administrative data indicated a reduction in the number of diapers ordered monthly resulting in cost savings.

Additional data gathered from nursing notes, progress reports and staff interviews suggested a relationship between improved mobility and other health benefits. Prior to the implementation of MOVE, one adult participant was diagnosed with obesity and hypertension. Previous efforts (a controlled diet) had not resulted in weight loss for more than a two-year period. Nursing records indicated that over the course of this intervention pe-
period and with no additional interventions, this adult lost 30 pounds.

For another adult participant, a DEXA scan bone density test was performed prior to the study based on physical therapy and nursing recommendations to determine safe participation in the MOVE Program. A post-intervention DEXA scan indicated a 25.5% improvement in bone density (i.e., pre-intervention T-score of -4.4 to a T-score of -2.9 post-intervention). Although these data were not part of the formal data collection process, it suggests there may be a connection between increased mobility practice from the MOVE Program and an improvement in bone health. This appears to support previous research linking active weight bearing to improved bone mineral density for individuals with disabilities (Chad, Bailey, McKay, Zello, & Snyder, 1999; Jaffe, Timell, Elolia, & Thatcher, 2005).

Additionally, anecdotal data suggested a relationship between mobility and a reduction in interfering behaviors. Pre/post staff interviews revealed that prior to the implementation of MOVE four of the five participants regularly exhibited behaviors that were harmful and/or limited social interactions (i.e., hitting, yelling, mouthing fingers, biting self, and excessive rocking). After intervention, all previously observed interfering behaviors were eliminated without any additional behavioral interventions. Staff interviews also described that as mobility skills increased task engagement improved and interfering behaviors reduced. It was also noted that social interactions increased and community outings were more frequent and more manageable. Based on the informal findings of this study, future research should systematically study the impact of functional mobility skill gains on health and social behaviors for adults with developmental disabilities.

References


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