

Early Hand Development

HAND FUNCTION SERIES

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What Children Need for Future Adult Performance

By Rhoda P. Erhardt

Those of us who work with children do not always have the privilege of watching them grow up. Because of program constraints, family relocations, or our own job changes, we "lose" many of them to therapists in other programs or other cities. When we are fortunate enough to maintain contact with some families over time, we can gain valuable perspectives about the relevance of our shared goals and the efficacy of our interventions. Then we can apply this knowledge to other cases, and share what we have learned, to improve the decision-making process.

A child named Patrick provided me with one of my best learning experiences, spanning a period of 18 years. He had a diagnosis of cerebral palsy, athetoid quadriplegia with spasticity. The attending physician at his birth considered him a "vegetable" and urged his parents to institutionalize him. Instead, they made sure that he received intensive and ongoing OT, PT and speech services, despite the family's many moves around the country.



I first evaluated Patrick at age 3, to help plan and supervise his home program, which focused on the boy's arm and hand function within typical childhood occupational roles in activities of daily living, work/education, and play/leisure. As he matured, these activities broadened within his expanded school and community environmental contexts. Today, at age 21, Patrick is a high school graduate. He is almost fully independent in self-care, has a part-time job in computer data entry, and enjoys a variety of leisure activities.

One of my first evaluation tools was The Erhardt Developmental Prehension Assessment (EDPA), which measures both involuntary and voluntary components of hand function, such as approach, grasp, manipulation, and release in supine, prone, and sitting. The theory of inappropriate prehension patterns described in my book *Developmental Hand Dysfunction* (available from Therapy Skill Builders, San Antonio, Texas) compares normal, delayed, and atypical hand patterns. It provides a method of analysis based on the assumption that many atypical patterns are compensations for inadequate postural stability due to important missing developmental components. Therefore, intervention is designed to provide those components and teach appropriate points of stability for efficient mobility of arms, hands and fingers.

We combined this traditional developmental approach with current motor control theory, which suggests that people learn new skills best by actively organizing goal-oriented tasks within specific environmental contexts, exploring new strategies, selecting optimal ones, and then practicing them to the point of competency.

Patrick's initial evaluation revealed that some of his difficulties with hand skills were related to insufficient head control and shoulder stability, which also affected his ability to sit securely without support, and prevented him from standing and walking independently. Total flexor synergies and compensatory patterns of shoulder elevation and retraction, especially on the right side, interfered with achievement of symmetry and selective, graded midrange control of arm, hand, and finger movements. Figure 1 shows Patrick watering flowers (home management, a work/productive activity). Figure 2 shows him grasping a ball (play, a leisure activity). Figure 3 shows Patrick using a spoon for self-feeding (activity of daily living).

Patrick's intervention program was based on developmental theory combined with realistic functional needs. We examined normal developmental sequences and analyzed them for missing components to target for intervention. Our concerns about future adult independence helped keep us on track to introduce and adapt functional activities very early in his therapy program in consideration of his transition from childhood toward adulthood.

Three important components of early hand development that Patrick was missing were bilateral symmetry, tactile awareness, and the

poking forefinger. Photographs of his occupational therapy program spanning a period of more than 10 years illustrate the use of therapeutic purposeful activities as part of regular life routines in the context of his occupational roles.

Our goals and treatment priorities included:

- * to improve symmetrical arm use for approach, grasp, and manipulation skills, in different anti-gravity positions, with appropriate support to prevent excessive effort and resultant atypical patterns. Figure 4 shows the subject playing a game with a rolling pin and plastic container, designed to improve head control and bilateral arm approach in prone. Figure 5 shows how grasp of a stationary dowel stabilizes the right arm in a forward position while drawing in a seated position (an educational productive activity). Figure 6 shows the subject one year later, maintaining bilateral grasp on the steering wheel of a battery-operated toy car (functional mobility, an activity of daily living), with improved head and trunk control and decreased shoulder elevation and retraction.
- * to increase tactile awareness and flexibility in hand and fingers, especially the right, using children's clay. Figure 7 shows Patrick's first attempts to manipulate the clay (play/leisure activity) with his fistled hands.
- * to improve disassociation of individual fingers, especially the index finger, in preparation for poking and pincer grasp. Figure 8 shows Patrick operating a calculator (work/productive activity), with the distal joint hyperextended because of joint instability.

At age 16, Patrick was able to stand and walk independently, but used a motorized scooter in the community because of limited endurance. His hands were extremely functional, and he was independent in most activities in home, school, and community environments. He had achieved the selected treatment goals during functional activities.

Figure 9 shows bilateral manipulation with tactile awareness and finger flexibility during pottery activities (play/leisure activity). Figure 10 shows Patrick driving the garden tractor with symmetrical, selective, graded midrange control of arm, hand, and finger movements as he and his brother load firewood from the backyard to bring into the house (activity of daily living). Figure 11 shows Patrick using his poking forefinger to type (work/productive activity).

Patrick was always an active, voluntary participant in activities that were directed toward his own goals. The meaning of each activity was unique, influenced by his age, life experiences, roles, interests, and situational contexts within family and community, and used therapeutically to facilitate his ability to function in daily occupations.

First, we considered his interests and current occupational roles. Each selected activity was then analyzed to identify skills needed to perform task components in specific contexts. The therapists' challenge was to synthesize this information before and during the treatment process, so that activities could be adapted, graded, and modified according to his dynamic responses. Changing the process (sequence, duration, or procedures), materials and tools (size, shape, weight, or texture), positioning (patient, therapist, adaptive equipment), and other environmental factors facilitated successful performance.

The ultimate goal was to empower this young man and his family to learn appropriate strategies for enhancing quality of life. In other words, by ensuring that meaningful occupation is the central focus of the therapeutic partnership, the therapist relinquishes what has traditionally been perceived as control of the intervention program. Patrick's dignity is respected as he guides his own process of adaptation, benefits from the organizing and integrating effects of occupation, and realizes his potential capabilities through mastery of tasks he considers important.

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