Classroom Aids for a Child With Severe Upper Limb Deficiencies

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The literature includes several examples of adaptive equipment designed and made for persons with severe limb deficiencies. Mauger-Côté (1973) used a long-handled double hook with a suction cup and transverse projections to assist a child with limb deficiencies in lower extremity dressing. The child held the hook between her adducted phocomelic digits and chin to push down or pull up her pants. This device would be difficult to manipulate for patients with no available grasp and would be dropped often during use. Angliss (1974) reported another approach to lower extremity dressing. Children with bilateral limb deficiencies were able to manage a fly zipper using a stick with an “S” hook and to pull up their pants using a stick adapted with dowels placed at intervals.

White and Dallas (1977), an occupational therapist and a clothing designer, collaborated to design two test garments which enabled a girl wearing bilateral upper extremity prostheses to dress by herself. The clothing adaptations related to sleeves, closures, fasteners, and fit. Friedmann (1980) surveyed the toileting self-care methods available for bilateral high-level upper limb amputees, including clothing adaptations and devices to assist with dressing, toileting, and personal care. Weiss-Lambrou, de Sart, Moreau, & Duquette (1985) designed a device to aid this population in independent toileting. Marker (1977) and Poole and Parkinson (1980) designed self-care equipment for adults with traumatic bilateral shoulder disarticulations. In a case report, Garza (1986) described an acute treatment program for a patient with traumatic bilateral shoulder disarticulations.

Although these examples provide interesting and useful adapted equipment, they do not meet the self-care and leisure needs of the school child placed in a regular second-grade classroom with 2 hours of daily resource room instruction.

The Child

A 7-year-old boy with amelia (complete absence) of the left upper extremity and proximal phocomelia (forearm and hand attached directly to the trunk) of the right upper extremity, was referred to the school occupational therapist for prosthetic training, self-care skills training, and adaptive equipment fabrication. The right extremity was approximately one third the length of a fully developed arm with an elbow joint, wrist joint, and two joined phocomelic digits. No independent movement or grasp was possible with the digits. The child was able to carry a light object by holding it against his chest or chin, and he could explore his face and mouth with his phocomelic arm.

The child had been fitted with a left shoulder disarticulation prosthesis, which was attached to a
plastic corset. Using the prosthesis, he was able to stack blocks, remove pegs from a board, and feed himself using a swivel spoon held in the terminal device. The child had difficulty tolerating his prosthesis because of excessive perspiration and the overexertion necessary to complete simple tasks. He also was without the prosthesis for periods of time because it required frequent repairs and refittings.

Further evaluation revealed that the child, as is often the case with severe upper limb deficiencies, had developed excellent foot skills, hip range of motion, and standing balance. These skills enabled him to complete many functional tasks with his feet when he was not wearing his prosthesis. He was able to remove and don his slip-on shoes and socks. He could don his pants (except for closures), but could not remove them without help with the closures. He could don a front opening shirt adapted with Velcro, but could not unfasten the Velcro closures using his phocomelic arm or his feet. He was able to remove his underwear because it was difficult for him to get anything up and down over his hips. He could remove a pullover shirt using his feet, but he could not don the shirt because he was unable to pull it down over his head with his foot or phocomelic arm.

When the child was wearing his prosthesis, his mobility, agility, and standing balance were decreased because of the weight of the prosthesis and the design of the plastic corset. As a result, when wearing the prosthesis the child needed assistance with all dressing tasks except with removing and donning his shoes. With or without his prosthesis, he required assistance in performing toileting activities.

Because of this child's high level of motivation and available skills, an attempt was made to help him maximize his independence in daily living activities using his foot and prosthetic skills alone or in tandem with technical aids. Six technical aids were designed to help him accomplish this goal.

The Six Aids
The child used an electric typewriter to keep up with his classmates when writing was required in class. This required bending down to the keyboard to strike the keys with his phocomelic arm and returning to an upright position to check the letter produced. To enable the child to maintain an upright position while typing, a typing aid was made by rolling a 3 cm X 26 cm piece of softened, low-temperature thermoplastic material into a dowel. A small finger loop was attached 12 cm from the end of the dowel for ease of manipulation, and a neck piece was molded to keep the aid in position during use (see Figure 1a). The child increased his word production and achieved a degree of bilateral functioning when using the typing aid with the prosthesis.

**Figure 1**
Child Using Classroom Aids: (a) Using Typing Aid, (b) Using Reading Aid, (c) Writing on Chalkboard, (d) Using Adapted Dressing Stick to Fasten Pants, (e) Placing Shirt on Pullover Shirt Aid, and (f) Preparing to Throw Ball
To allow the child to adjust the typewriter carriage to the correct line using his right foot without leaving his seat, a long extension was made by molding one end of a 3 cm × 46 cm rolled thermoplastic dowel around the right carriage knob with the dowel extended toward the right of the seated child. This extension did not impede the typewriter's function in any way.

Because the child sat back from his desk to use his right foot to turn the pages, a reading aid was made to help him scan one printed line at a time. A 3 cm × 46 cm thermoplastic dowel with a finger loop and neck piece similar to the typing aid was designed. A 15 cm horizontal bar of flattened thermoplastic material was attached to the far end of the dowel to serve as a line guide. The child used this device primarily with large storybooks and workbooks (see Figure Ib).

A chalkboard aid was designed at the child's request to enable him to complete work at the chalkboard like his classmates. Like the reading and typing aids, this 3 cm × 46 cm thermoplastic dowel also had a finger loop and neck piece for better control. The piece of chalk was fastened to the far end of the aid with a rubber band (see Figure Ic).

To permit the child to fasten and unfasten his pants while dressing or toileting, the snap was replaced with Velcro, and a ring was attached to the zipper to make manipulation easier. A standard dressing stick was shortened to 36 cm, and consecutive thermoplastic finger loops were added to improve coordination. Using the loops on the dressing stick, the child could vary his hold and manipulate the pants fasteners (see Figure Id). The child also used the adapted dressing stick to push down and pull up his underwear.

The daily use of the prosthesis necessitated frequent pullover shirt changes because of excessive perspiration. A pullover shirt aid was made with a triangular wooden base (23 cm each side, 8 cm deep) and three 76 cm dowels secured in each corner (see Figure Ie). A small thermoplastic hook was placed 30 cm from the top of one of the dowels to prevent the shirt from coming off the aid while the child pushed his head up through the neck opening.

To use the aid, the child sat in a chair and placed the shirt over the dowels using his feet, catching the bottom edge of the shirt on the hook. The child then stood up, placed one foot on the triangular base, ducked under the shirt, and pushed his head up through the neck opening while coming to a full standing position. He was able to release the shirt from the top of the dowels after placing his phocomelic arm through the left sleeve. The triangular design of this aid created a large opening for easy access.

A ball thrower was requested by the child and his mother to enable the child to throw and catch a small ball. It was made with the child's slip-on sneaker and a cup-shaped piece of thermoplastic material (10 cm × 13 cm). A 6 cm piece of loop Velcro was sewn to the canvas of the upper part of the sneaker, and a hook portion was glued to the underside of the ball thrower (see Figure If). Using his left foot, the child secured the ball thrower to his right sneaker.

Summary

Six adaptive aids were designed and fabricated to improve the classroom functioning of a 7-year-old boy with severe upper limb deficiencies. Most aids were lightweight and easily stored in the child's classroom desk. The pullover shirt aid, the largest device, was stored in an adjoining playroom area. Because these aids were inexpensive to fabricate, duplicates were made as needed for use at home. These aids could easily be modified by other therapists to meet the needs of patients with congenital or acquired limb deficiencies.

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References


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