

Autumn 1964

Artificial Limbs

*A Review of
Current Developments*

COMMITTEE ON PROSTHETICS
RESEARCH AND DEVELOPMENT

COMMITTEE ON PROSTHETIC-
ORTHOTIC EDUCATION

**National Academy of Sciences
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COMMITTEE ON PROSTHETICS RESEARCH AND DEVELOPMENT
COMMITTEE ON PROSTHETIC-ORTHOTIC EDUCATION

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Collaboration for Rehabilitation

MARY E. SWITZER¹

I WELCOME the opportunity to express my appreciation for the wonderful cooperation and assistance that the Vocational Rehabilitation Administration has enjoyed in our many close relationships with the National Academy of Sciences—National Research Council. Our associations with the Committee on Prosthetics Research and Development and the Committee on Prosthetic-Orthotic Education have been long and fruitful, and the contributions of these committees have been substantial in the development and coordination of the research and informational programs for the fields of prosthetics and orthotics.

VRA is glad to be associated with the National Institutes of Health—which is another agency of the Department of Health, Education, and Welfare—and with the Veterans Administration in supporting the CPRD program; and, naturally, we look with special pride on the CPOE program since we are its primary support.

In our search for the judgment of the most knowledgeable people in each field which we support, the members of our National Advisory Council on Vocational Rehabilitation and the consultants on our Medical Advisory Committee have come to respect the professional competencies of the engineers, physicians, therapists, prosthetists, and orthotists who serve on CPRD. The professional advice and recommendations available to the Academy—Research Council on this basis assure impartial excellence in judgment and accessibility to professional skills that are not readily available from any other source in this country.

I have been particularly impressed with the extensive informational program that CPOE has developed, especially the brochures, films, and slides for use in schools of medicine, physical therapy, and occupational therapy and for the work that has been initiated in the development of new amputee clinics in several of our State programs.

There are special reasons why the functions of the Committees continue to hold special significance to our total rehabilitation program: State-Federal, research and demonstrations, and training activities.

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A recent study was made of the 120,000 persons who were rehabilitated in the State-Federal program during 1964, and it was found that the classifications of amputations, absence of extremities or other orthopedic deformities, accounted for a total of 42,352 persons rehabilitated. Approximately 35 per cent of the total group, therefore, were orthopedic rehabilitants. Thus, it is obvious that, even with the changing emphases in disability groups needing service, the thread of orthopedic disabilities runs through the entire program of rehabilitation, and orthopedic cases are almost four times as large as the next largest category of disability.

The VRA program of research and demonstrations, which began with a trickle ten years ago, has broadened into a flow of new ideas, methods, and patterns of service to facilitate and improve the restoration of the disabled to worthwhile lives. There have been approximately 850 VRA research projects approved during the period 1955-1964, and about seven per cent of these projects have been for studies primarily concerned with problems caused by or related to orthopedic disability. Thirty-one universities, hospitals, or rehabilitation centers have sponsored 55 research projects relevant to this field of work.

During fiscal year 1964, VRA awarded research grants to 13 new projects relating to the orthotic-prosthetic field and an additional 14 ongoing projects received continuation grants.

Some of the most imaginative and creative work in our total program is going on in this field of research, and we are constantly aware of the dramatic advancements that are taking place. The collaboration of medical rehabilitation and engineering with some of the discoveries in the space program should bring a whole new dimension to the war on disability.

So naturally we are pleased that CPRD has followed our recommendation to hold a conference on the Control of External Power in Upper-Extremity Rehabilitation so that leading engineers, physicians, and scientists can come together to formulate and coordinate their programs and assist us in developing future plans for support of their efforts.

Our training program, which continues to pour a steady stream of new professional rehabilitation workers into the ranks, has expanded so that professional training in all of the fields that contribute to rehabilitation has been influenced by VRA training grants: medicine, nursing, physical therapy, occupational therapy, rehabilitation counseling, social work, speech pathology and audiology, rehabilitation of the blind and deaf, the mentally ill and the mentally retarded, and recreation for the ill and disabled.

Since 1953, over 600 short-term courses in prosthetics and orthotics with a total enrollment of about 9,500 trainees have been attended by physicians, surgeons, therapists, counselors, prosthetists, orthotists, and related rehabilitation personnel. Last year alone, over 1,500 persons were enrolled in 90 courses which were a part of the extensive offerings in upper- and lower-extremity prosthetics and orthotics, management of the juvenile amputee, and

general orientation courses for these fields. The work of the University Council on Orthotic-Prosthetic Education has done much to achieve a more uniform approach in curriculum offerings, teaching materials and methods, and evaluation procedures for the courses.

The semester courses at UCLA and Northwestern, the Associate in Arts courses proposed at Cerritos College and Chicago City Junior College, and the undergraduate curriculum at New York University—all these attest to the professionalism that is developing in prosthetics and orthotics.

CPRD's and CPOE's paramount asset to us is a technical proficiency while ours is a resource of public funds and a wealth of experience which we try to combine through the State-Federal partnership and our research and training projects into a comprehensive program for helping the disabled to reach their physical, economic, social, and personal goals. Our task, as public servants, is to administer these Federal funds as wisely as we can, always bearing in mind the true function of the law and purpose of our program: to convert dependency into competence and independence. As we work together along the paths of rehabilitation, exchanging our knowledge and our resources, perhaps we can all share in the conviction expressed on the seal of the Department of Health, Education, and Welfare which reminds us constantly that Hope is the Anchor of Life.

The Münster-Type Below-Elbow Socket, an Evaluation¹

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SHORT stumps have always presented fitting problems in both upper- and lower-extremity amputation sites for the obvious reasons of small attachment area and a lack of useful range of motion. In an attempt to alleviate these problems for upper-extremity amputees, Drs. O. Hepp and G. G. Kuhn (*1*) of Münster, Germany, developed fitting techniques for the below-elbow and the above-elbow amputee, respectively, that provide a more intimate encapsulation of short stumps.

For the below-elbow amputee, the general characteristics of this technique (Fig. 1) are:

1. The elbow is set in a preflexed position (average 35 deg.). Because of the reduced range of useful motion, the socket is flexed so as to position the terminal device in the most generally useful area.

2. A channel is provided at the antecubital space for the biceps tendon to avoid interference between socket and biceps tendon during flexion.

3. The posterior aspect of the socket is fitted high around the olecranon, taking advantage of this bony

prominence to provide attachment and stability to the socket.

For the above-elbow amputee, the characteristics of the technique are:

1. The socket is fitted high on the acromion, utilizing this bony structure to retain the socket in position and provide stability.

2. The axillary section of the socket conforms closely around the tendons of the pectoralis major and latissimus dorsi muscles to enable the patient to exert the force of these major muscles in moving his prosthesis.

In an earlier study (*4*), amputee clinics reported a favorable experience in fitting preflexed arms (that is, arms bent to provide a certain amount of preflexion) to children with short and very short below-elbow stumps. Since the Hepp-Kuhn technique seemed to represent an improvement in fittings of the preflexed type, New York University initiated a preliminary investigation of the procedure for adult amputees of this type. This study took place in the early part of 1961 and was limited to two short-below-elbow subjects. This exploratory study yielded generally positive outcomes in terms of function and comfort. One short-above-elbow amputee was also fitted with encouraging results.

The present evaluation is an extension of the initial study with major emphasis given to below-elbow fittings. Concurrently, further exploration of the above-elbow fitting technique was undertaken and is continuing, although not reported in this article.

For lack of a better term, the fitting procedures employed in this study are referred to as the "Münster-type" techniques. It should be emphasized that no claim is made that the techniques are identical to those followed by Drs. Hepp and Kuhn, New York University

¹ Based upon *The "Münster" Type Fabrication Technique for Below-Elbow Prostheses*, published by Adult Prosthetic Studies, Research Division, School of Engineering and Science, New York University, New York, N.Y., in June 1964 (*3*). The study reported was conducted under the auspices of the Subcommittee on Evaluation of the Committee on Prosthetics Research and Development, National Academy of Sciences—National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418. The research was sponsored by the Vocational Rehabilitation Administration, Department of Health, Education, and Welfare.

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