

CLINICAL EXPERIENCE WITH THE SCAMP HAND

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Following the initial prototype clinical evaluations with the SCAMP hand (1), a clinical trail was carried out using the small size by the Prosthetic/Orthotic unit of the national Centre for Training and Education in Prosthetics and Orthotics, The University of Strathclyde, Glasgow.

During this trial, eight SCAMP hands were fitted to users in the age range 11 months to six years. The group included children with transcarpal, transradial and shoulder disarticulation absences.

The paper also reports on early clinical experience with a further group of children who were fitted with the larger SCAMP hand. This hand has been designed for the age group between three and five years of age. There were 14 children in this group and five clinical centres took part in this programme.

The University of Strathclyde operates a prosthetic clinic at the Southern General Hospital in Glasgow. As part of its Paediatric service programme a number of children have been fitted with the smallest size of the Steeper SCAMP hand. This group included males and females, they had age range of between 11 months to six years. The total experience at the time of this presentation was in excess of 45 weeks. Previous prosthetic experience was most limited to cosmetic prostheses although some had been provided with cable operated devices.

The hands were generally found to be useful and appropriate for the children selected for the trial. Potential problems noted in North America related to the limit of hand opening were not reported by this group. In two cases children who displayed noticeable behavioural disturbances during previous clinical experiences and had rejected the use of prostheses changed to all day wearers when fitted with the SCAMP. The change was attributed to the lightness of the hand, the combination of function, cosmesis and ease of use and the ability to grasp in the absence of the control signal. It was reported that one child switched from the low use pattern to the point where his mother had to wait until he was asleep before removing it at night. We are not of course suggesting the SCAMP is a device for social control.

For some years, it has been the general practice in many countries (2) (3), when fitting very young children, to use a single muscle control configured to provide an opening signal. When this is absent a closing signal is provided automatically. With older children it has been usual to use a two muscle control as it has been felt that the ability to control in both directions is more usable.

The hypothesis on which the trial of the larger hand is based proposes that the ability of a user to use a myoelectric hand is influenced more by the speed of the hand than the control strategy adopted. The SCAMP hand system uses a single muscle V/O control for both sizes.

Although the cohort of children in the older group had a variety of prosthetic experiences, several had been fitted with a Systemtechnik hand using a two muscle control system. These children were timed whilst carrying out six defined tasks under supervised conditions. The hands were then exchanged for SCAMP hands (the wrist units being common). One sensor, usually on the medial side, was disconnected but remained fitted. The other was connected to the SCAMP connector cable. The children were then given a brief period of unstructured but supervised training and were allowed to take the prostheses home. They were recalled in four weeks and the timed tasks were repeated. In addition to the data collected during this test the children and parents were asked for their subjective views of the research prostheses. In several cases it was noted that the usage of the hands was reported to have increased.

It should be noted that the specification of the two hands used in this trial are quite different. The Systemtechnik had has a thumb which approaches the fingers directly. It weighs some 220 gm and has a closing time from fully open of about 0.8 seconds. It normally uses a two muscle control scheme. The equivalent SCAMP hand is over 30% lighter, uses a single muscle to control opening and a tension spring to control closing. The thumb approaches the fingers at 45 degrees. It has a closing time from fully open of 0.35 seconds.

Some children were fitted with a single Otto Bock 13E125 electrode/amplifier in preference to the Steeper component. Other children in this group were fitted with these hands without prior Myo experience. One child with a trans humeral loss had been fitted with a small SCAMP hand at 20 months, using a traction switch as a control. She was fitted with the larger hand at age 4, with a myo control over her upper head of biceps. Another had experience with the small SCAMP, a Systemtechnik hand and an Otto Bock system 2000. Some of these children were also time tested and the results are included in the data presented.

Within the constraints of the limited time schedule and the small number of children fitted, it is apparent that the results obtained from the SCAMP timings are slightly better than the Systemtechnik trials. The children/parents classified the hand better on all subjective measures on a one to five scale. All indicated that they wished to retain them in preference to the previous prescription.

A trial over a longer period is desirable to assess factors such as long term service reliability, the effects of position proportional against threshold and the effect of weight in positioning and compliance. It would appear from the preliminary results that not only is the SCAMP an acceptable and cost effective hand for children in both the age groups reported but there is evidence to support the idea that when a prosthetic hand is fast and the grip is compliant, the grasp pattern does not need to include the fine motor skills of positioning. The effects of precision grip will be tested when some

of these hands are converted later in the trial to operate in a position proportional mode. It would appear that Single Muscle Voluntary opening controls are all that is required so long as the grip provided is adequate for the task undertaker. Grip is a combination of the available force, the geometry of the hand and the adaptiveness and compliance of the gripping surfaces. Other benefits of adopting a single muscle control may include the ease of training. There is no evidence from this trial that any child experienced difficulty or confusion in going from a two site control to a simpler system. However, it is worth noting that some frustration was experienced with certain bilateral activities which were related to low pinch force. The hands tested were not fitted with the finger palp design envisaged for final production. These tasks will be a useful indicator for the effectiveness to this detail.

REFERENCES

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