# Use of prosthetic prehensors

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# Abstract

Estimates are given of the type and number of prosthetic prehensors — both hooks and hands — used in the USA, United Kingdom, West Germany and Sweden by upper limb amputees. Implications are made for differences between countries and for thorough assessment of amputees before clinical fittings.

## Introduction

The first record of an artificial hand is an iron hand fitted to a Roman general who lost his own hand during war about 200 BC (AAOS, 1960). At some point Captain Hook and other "pirates" were using hooks. In the later years of knights and armour, various prosthetic hands were fashioned out of metal. In the 1890's, D. W. Dorrance developed the split hook which survives today. And, of course, prosthetic hands have improved greatly with significant work undertaken more recently in the USA, West Germany and elsewhere.

Besides the obvious need for function in hand prostheses, amputees have other needs which sometimes are not as well identified and recognized. Appearance and body image are important to most amputees, although cosmetic considerations are not always addressed directly. Also, there are social/cultural needs depending upon the country (Alpenfels, 1955). In some cultures, the right hand is used for "clean" activities and the left for "dirty" activities. In other cultures, the hand assumes great significance because thieves lose their hands as punishment for crimes, and to be without a hand subjects one to suspicion. So, there are many considerations - functional and otherwise - that enter into the assessment and selection of prehensors for arm amputees.

Currently, the most popular prosthetic prehensors are hooks, mechanical or electrical active hands, and passive hands (Fig. 1).



Fig. 1. Top split hook. Hosmer-Dorrance 5XA with rubber bands for spring closing and voluntary opening. Centre, mechanical hand. APRL voluntary closing and spring opening type which would be worn with a cosmetic glove. Bottom, passive hand. In this case with a foam core inside and cosmetic glove outside.

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# Estimated use of prehensors

The use of the various types of prehensors varies significantly around the world. Estimates of use in a few major countries are shown.

Country	Active hands	Passive hands	Total hands	Total hooks
United States (1)	21%	7%	28%	72%
United Kingdom (2)	16%	60%	76%	24%
West Germany (3)	66%	22%	88%	12%
Sweden (4)	20%	50%	70%	30%
Notes: 1. Driver	(1986	) Ed	wards	(1986

Table 1. Estimated use of prehensors

Hendrickson (1986). 2. Cooper (1987)

3.

Boenick (1988), Hendrickson (1987). Lymark (1987).

4.

#### **Estimated numbers of prehensors**

These numbers are difficult to arrive at and should be considered as rough estimates. However, it may be of interest to put the numbers in perspective relative to use among countries and among other rehabilitation devices.

Table 2. Estimated numbers of prehensors

	Prehensors	Upper-limbPrehensors		
Country	per year (1)	prosthesis users	per amputee (2)	
United States	10,000	50,000 (3)	one every 5yrs	
United Kindom	7,500	12,500 (4)	one every 1–2/3 yrs	
West Germany	(5)	14,000 (4)	(5)	
Sweden	500	1,500 (6)	one every 3 vrs	

## **Implications**

European countries have much the same technology available as in the USA but apply it differently. Cultural and psychosocial factors play a big role on the way technology is used in clinical practice.

Notes:	1.	These numbers come from estimates of				
		the number of prehensors sold per year				
		by manufacturers.				

- 2. These numbers reflect, in part, the frequency of replacement and in part the number of prehensors provided per amputee.
- LeBlanc (1973).
  These numbers are scaled to the national using the population in each country using the same incidence of amputation and prosthetic use in the USA.
- 5. Figures not available.
- 6. Lymark (1987).

Recognizing the differences in application of technology and the need to fit "the whole person" as well as the missing arm stresses the importance of a complete and thorough assessment of the amputee before prescribing and fitting a prosthesis. It is even more important as (1) more options in components and techniques become available, (2) cost containment is prevalent in the medical field. and (3) amputees are becoming more informed consumers.

The statistics show (1) very high use of hooks and a very low use of passive hands in the USA, (2) high use of passive hands in the UK and Sweden, and (3) very high use of active hands in West Germany. One can provide one's own explanations on this matter. The author's theory is that in the USA function and getting the job done is emphasized; the population is not terribly bound to culture and customs; it is accustomed to using tools; the Nation is very "out front" about disabilities: there is some natural bias and precedent towards the split hook because it was developed there. By contrast, people in Europe have more history and customs, less assertive attitudes on disability, and more romanticism in art and culture - all of which make prosthetic hands a more popular choice. As for the high use of active hands in West Germany, this seems consistent with their industriousness, efficiency and inventive spirit. Also, some of the active hands in West Germany are being worn passively, i.e. they are mechanical hands with manual opening rather than cable/harness opening.

# Conclusion

This article is intended to show, as a matter of interest, the differences in use of hooks and hands in the USA and a few other countries for comparison. However, the point with which the author would like to leave the reader is the necessity of a thorough assessment before prosthetic fitting to take into account each amputees's functional, psychosocial. and cultural needs which will influence acceptance and use of the prosthesis.

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