

## **A review of employment patterns of industrial amputees— factors influencing rehabilitation**

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### **Abstract**

More than 1,000 industrial amputees at the Ontario Workers' Compensation Board were reviewed. The study investigated the current employment status of amputees and the factors that influenced successful return to work post-amputation. The data obtained from a mailed questionnaire was analysed by the Statistical Analysis System. The results revealed that 89% of amputees returned to work after an amputation. The average follow-up post-amputation was 14 years with a range of one to 64 years. At the time of review the current employment status of amputees was as follows: 51% full time employed, 5% part-time employed, 25% retired and 8% unemployed. The remainder were engaged in a vocational activity, still recovering or were not seeking work. The data revealed that amputees typically changed jobs when returning to the work force. Amputees returned to jobs that were less physically demanding, but required greater intellectual skills in occupations such as clerical and service industries. Factors including prosthetic use, vocational services, and a younger age at the time of amputation were identified as being positively associated with a return to work. Those factors that were negatively related to successful employment included stump and phantom limb pain and multiple limb amputations. The study concluded that the majority of the amputees reviewed were successful in returning to work. The authors suggest that amputees benefit from treatment programmes that include medical, prosthetic and vocational services.

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### **Introduction**

The Amputee Clinic at the Ontario Workers' Compensation Board, Downsview Rehabilitation Centre in Toronto serves Ontario workers who have sustained an amputation as a result of a work related accident. On an annual basis the Amputee Clinic provides more than 1,000 patients with medical, prosthetic, psychosocial and vocational services. One of its objectives is to restore injured workers as completely as possible to their pre-accident level of function and a return to employment is considered an important element of successful rehabilitation.

The purpose of this study was to determine the employment status of amputee workers who were treated at the Amputee Clinic and to examine the factors which affect the amputee's ability to return to work so that future treatment programmes could be directed accordingly.

To provide a common basis for the discussion of successful rehabilitation, the definition of rehabilitation presented by the 1969 World Health Organization Expert Committee on Medical Rehabilitation was accepted. Rehabilitation is thus defined as "The combined and co-ordinated use of medical, social, educational and vocational measures for training or retraining the individual to the highest possible level of functional ability" W.H.O. (1969).

### **Literature review**

The literature specific to amputees and amputee rehabilitation primarily addresses topics such as the importance of early prosthetic fitting and the benefit of the team approach in amputee care. In terms of the former topic

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Malone et al, (1979) reported on the benefit of an accelerated rehabilitation approach with lower limb amputees. They suggested that significant financial and therapeutic benefits accrue from the application of an immediate post-operative prosthesis. In terms of the team approach in amputee care, the "total care concept" has been identified as the most effective means of reintegrating the worker with assistive devices into the labour force (Cooper, 1977; Bender, 1974; Palmer, 1980). While emphasizing the need for co-operation between medical, vocational and social services, this approach recognizes the importance of an individualized rehabilitation programme. Programmes which gradually re-introduce the amputee to the world of work and provide an opportunity to use the prosthesis in a simulated work situation enhance successful vocational re-integration.

The literature focussing on the physically disabled population and employment reveals that the disabled encounter many difficulties in returning to work. Levitan and Taggart, (1977 a,b) reported on the difference between males and females in terms of employment. Their results, indicated that males return to employment more frequently than females. Other factors such as a younger age and a higher level of education were also identified as positively affecting successful employment. It was also noted that disabled individuals who do return to employment experience frequent work interruptions.

#### Patients and methods

A questionnaire was designed and pre-tested with in-patients admitted to the Amputee Clinic. The multidisciplinary treatment team at the Amputee Clinic consists of a physician co-ordinator, nurse, prosthetist, physiotherapist, occupational therapist, remedial gymnast, social worker, research associate, vocational rehabilitation counsellor, secretary and the medical director of the clinic who is an orthopaedic surgeon. The revised questionnaire was mailed to every person who had an amputation as a result of a work related accident, deemed compensable by the Ontario Workers' Compensation Board, between 1917 and 1981. A total of 1683 questionnaires was mailed; 96 subjects were subsequently eliminated for reasons such as address unknown

or deceased. Of the remaining 1587 subjects, completed questionnaires were received from 1010, representing a response of 64%.

The information was coded and analysed using the Statistical Analysis System (Ray, 1982). Work was defined as a binary variable and a series of multiple regression and contingency table analysis was performed to determine the level of significance of several variables. Although not a predictive study, the variables that were associated with return to work were accepted at a level of statistical significance of  $P < 0.05$ .

A random sample of the subjects who did not return the questionnaire was examined. There was no statistically significant difference in the distribution of amputation level between a 10 per cent random sample of the no-response group and the respondents.

Table 1. Amputation level

Upper limb	No.	%
Thumb	8	1
Finger	127	24
Partial hand	99	18
Wrist disarticulation	46	9
Below-elbow	161	30
Elbow disarticulation	3	1
Above-elbow	71	13
Shoulder disarticulation	15	3
Forequarter	5	1
TOTAL	535	100
Lower limb	No.	%
Toe	6	2
Partial foot	27	7
Syme's	31	9
Below-knee	171	48
Knee disarticulation	17	5
Above-knee	94	26
Hip disarticulation	9	2
Hemipelvectomy	3	1
TOTAL	358	100
Multiple limb	No.	%
Bilateral		
Upper	49	42
Lower	46	39
Combination	13	11
Triple	8	7
Quadruple	1	1
TOTAL	117	100

## AGE DISTRIBUTION AT REVIEW BY AMPUTATION LEVEL

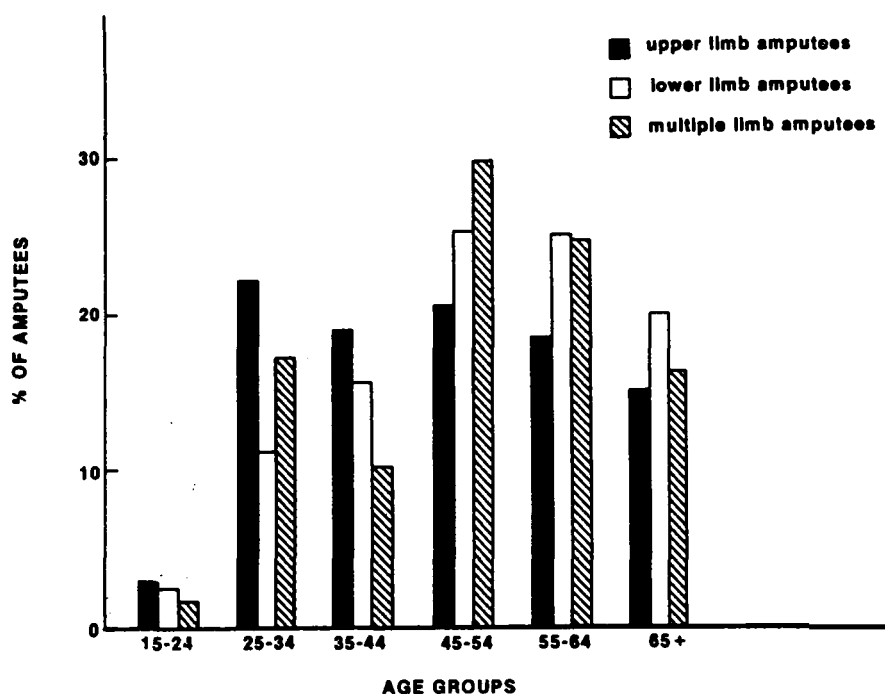


Fig. 1. Age distribution at review by amputation level.

**Results***Demographic profile*

The demographic characteristics revealed the following profile of the amputee population surveyed: 95% were male and 5% were female; they ranged in age from 14 to 64 years (mean 35 years) when their amputation was sustained, and at the time of this review they ranged in age from 18 to 83 years (mean 49 years). The study was conducted from one to 64 years post-amputation (mean 14 years).

The breakdown of the amputee population according to level of amputation was as follows: 53% of the patients were upper limb amputees; 35% were lower limb amputees and the remaining 12% comprised individuals having sustained multiple limb amputations (Table 1). Two thirds of all amputees underwent amputation surgery on the same day as the work-related accident occurred.

Fifty-six per cent of upper limb amputees had their dominant side affected. At the time of review, upper limb amputees were the youngest sub group as 45 per cent were under 45 years of age.

Twenty-nine per cent of the lower and multiple limb amputees were less than 45 years of age. (Fig. 1).

Female patients more frequently sustained upper extremity amputations; 94% of female amputees had upper limb involvement, with multiple limb amputations occurring more frequently than in the male population.

*Employment status of amputee subjects*

The data revealed that most amputees returned to employment. An average of 89% of respondents reported a return to employment after their amputation. Analysed by level of amputation, the rate of return to work was: 93% (473/508) for upper limb amputees; 87% (289/332) for lower limb amputees and 74% (83/112) for multiple limb amputees. The differences noted were found to be significant as unilateral amputees were more successful in returning to work than multiple limb amputees.

At the time of this review the employment status of the amputees was as follows: 51% employed on a full time basis; 5% employed on a part-time basis; 8% unemployed, but seeking

employment and 25% retired. The remainder were engaged in a vocational activity such as upgrading, retraining and training on the job, were still in a recuperative phase or did not intend to seek employment.

The employment of the amputee subject population was compared to the employment of the general population. However, as various definitions of the terms "employed" and "unemployed" exists in the literature, comparison was difficult. The rate of unemployment depends on the definition selected.

According to the definition used by Statistics Canada (1981) individuals working full or part time are defined as employed and only those individuals actively seeking work are defined as unemployed. Using this definition, approximately 88% of the amputees sampled were employed or involved in a job preparation activity. This compared favourably with the 70% employment of disabled Ontarians reported in the Ontario Manpower Commission (Ministry of Labour, 1982). It did not appear as favourable as the 92% employment, adjusted for sex, of the general population of Ontarians during the same time period (Labour Force Survey Division, 1981). Amputees reported a lower rate of unemployment than other disabled groups, but a higher rate than able-bodied workers.

When the amputees who described themselves as not seeking employment were defined as unemployed, the employment rate was reduced to 84%. When the amputees who

described themselves as retired prior to age 65 years were also included in the definition of unemployment, the employment rate was further reduced to 74% (Table 2).

#### *Employment patterns post-amputation*

The shifts in employment patterns of subjects post-amputation followed identifiable trends. Using the guidelines of the Canadian Classification Dictionary of Occupations (Department of Employment and Immigration, 1971), pre and post-amputation jobs were evaluated according to three dimensions; occupation group, physical demands and required educational level.

In terms of occupation group, there was a marked change as more than 75% of the population changed occupation groups following amputation. Prior to their accident, amputees were employed in four primary occupation groups; machining, processing, product fabrication and construction. Following amputation, service, clerical, sales and managerial occupations predominated (Fig. 2).

The physical demands of the jobs to which amputees returned also changed in a predictable fashion. Whereas only 1% was employed in a sedentary job prior to injury, 16% secured a sedentary job post-amputation. Only 7% returned to a heavy job following amputation (Fig. 3).

Post-amputation jobs were generally more complex with a requirement for a higher level of general educational development than pre-

Table 2. Employment rate of amputees\*

	Employed†	Unemployed <sup>1</sup>	Unemployed <sup>2</sup>	Unemployed <sup>3</sup>	Employment <sup>1</sup> rate %	Employment <sup>2</sup> rate %	Employment <sup>3</sup> rate %
Upper limb amputees	331	46	63	98	87.8	84.0	77.2
Lower limb amputees	191	25	36	76	88.4	84.1	71.5
Multiple limb amputees	55	7	14	32	88.7	79.7	63.2
Total	577	78	113	206	88.1	83.6	73.7

\* Amputees retired after 65 years and still recovering are excluded.

† Includes amputees working full time, part-time, retraining.

<sup>1</sup> Includes amputees seeking work.

<sup>2</sup> Includes amputees not seeking work.

<sup>3</sup> Includes amputees retired prior to age 65.

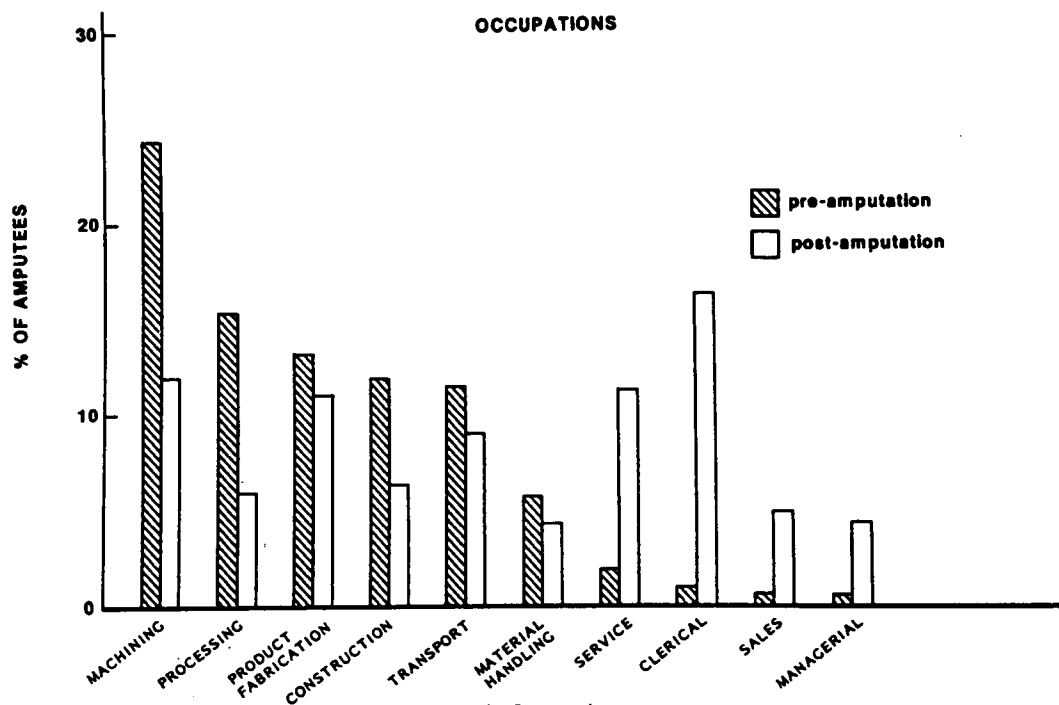


Fig. 2. Occupations

accident jobs. A trend emerged as about 75% of employed amputees returned to a job that was less heavy than their former job, but required greater intellectual ability (Fig. 4).

Although 65% of the amputees reported that the accident employer had offered continuing employment, only 21% actually returned to their pre-amputation job. Forty-two per cent returned to a modified job.

Amputees reported other changes in employment post-amputation. More than half of the subjects identified negative repercussions of their amputation including reduced potential for salary increases and fewer opportunities for job promotion. Forty-four per cent reported that job security was adversely affected by amputation. One quarter of the amputees employed at the time of this review noted that they had experienced periods of unemployment lasting more than six months since the amputation.

#### *Unemployment patterns post-amputation*

Three groups of unemployed amputees were identified, each group reporting a different reason for unemployment. The first group, those subjects who were not working but were attempting to find employment, most frequently

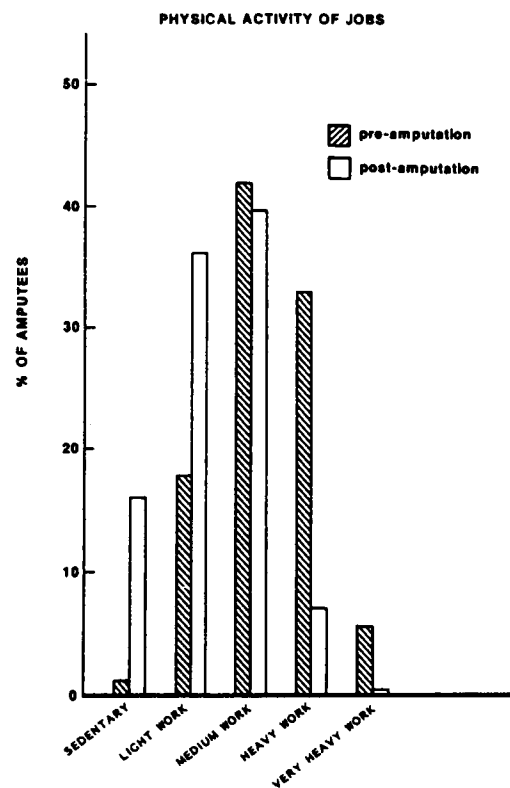


Fig. 3. Physical activity of jobs.

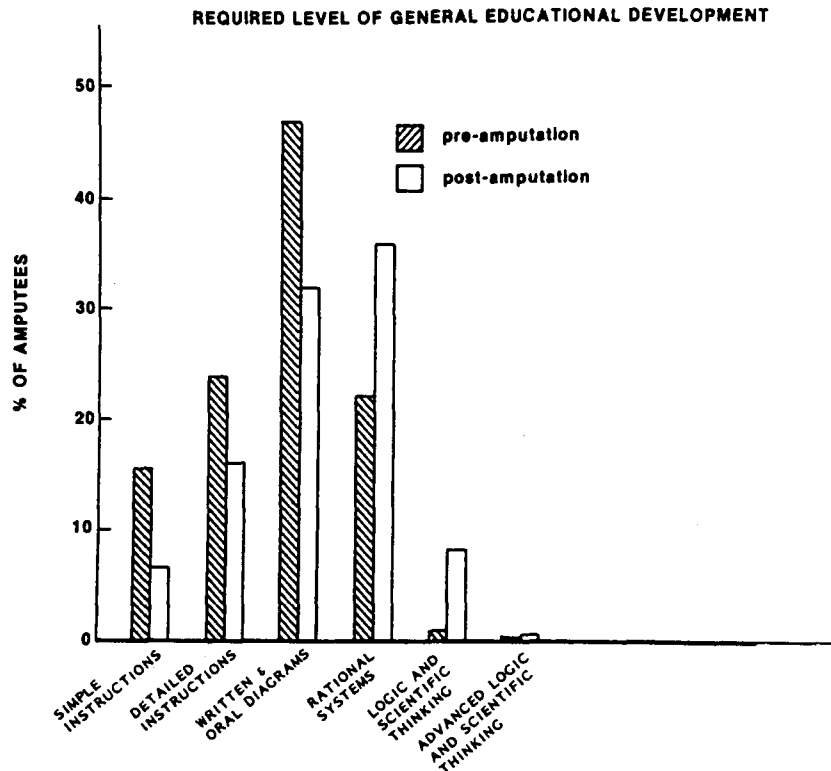


Fig. 4. Required level of general educational development.

cited difficulties related to the current poor labour market as the reason for their unemployment.

The second group, those subjects who were unemployed and did not intend to return to work, identified health problems both related and unrelated to their amputation as the principal reason for their unemployment.

The third group, those subjects who retired either immediately following amputation or sometime thereafter, reported health problems as the factor which led to their retirement.

At the time of review, one quarter of all the respondents indicated that they were retired. Within this group, 63% (157/250) retired after 65 years of age. Seven per cent (70/1010) of all subjects retired immediately following amputation.

Different retirement rates were noted among the subjects according to amputation level. Within the multiple limb amputee group 34% were retired. Within the lower limb and upper limb amputee groups, the rate was 29% and 20% respectively. These differences among the

upper, lower and multiple limb amputees were significant.

#### *Factors influencing return to employment*

Several variables were examined so that those factors which influence successful reintegration to the work force could be identified. Demographic factors such as sex and age at the time of amputation were found to have an effect on employment. Female subjects had an unemployment rate 2.5 times greater than male subjects. Age was influential in so far as subjects who were older at the time of their amputation were less successful in their return to employment. When those subjects who retired prematurely and those who were not looking for work were defined as unemployed, the unemployment rate for amputees under 45 years of age was 22% compared to 48% for those over 45 years of age (Fig. 5).

When the effect of level of amputation was examined, variations in the unemployment rates were noted. Within the upper limb group, partial hand amputees had an unemployment



Fig. 5. Amputee unemployment rate by age at amputation.

rate of 18% whereas below-elbow amputees had an unemployment rate of 10% and above-elbow amputees had the highest unemployment rate of 22%.

Within the group of lower limb amputees, the unemployment rates were: 16% for partial feet; 11% for below-knee and 8% for above-knee amputees.

When the definition of unemployment included only those amputees presently seeking work, upper limb amputees had an unemployment rate of 12.2%. The unemployment rate for lower limb amputees was 11.6% and 11.3% for multiple limb amputees. However, the data revealed that when the term unemployed included those not seeking work and early retirement amputees, the multiple level amputees had a significantly higher rate of unemployment than the other groups. Including these individuals changed the unemployment rate to 22.8% for upper limb amputees, 28.5% for lower limb amputees and 36.8% for multiple level amputees (Table 2).

The rate of prosthetic use was examined as a factor which could influence successful employment. Lower limb amputees were the most frequent users of their prosthesis followed by the upper limb amputees and then the multiple limb amputees (Fig. 6). Those subjects who reported frequent prosthetic use were more likely to be employed than less frequent prosthetic users.

When the influence of stump and phantom limb pain was examined, the data revealed that there was a high incidence of both kinds of pain. Their incidence was reported by 63% of upper limb amputees, 74% of lower limb amputees and 73% of multiple level amputees. Stump and phantom limb pain were identified as variables that were negatively associated with successful employment as subjects reporting higher levels of pain were less likely to be working.

Dominance was a variable that did not influence return to employment. There was no difference in the rate of unemployment for upper limb amputees who had lost a dominant

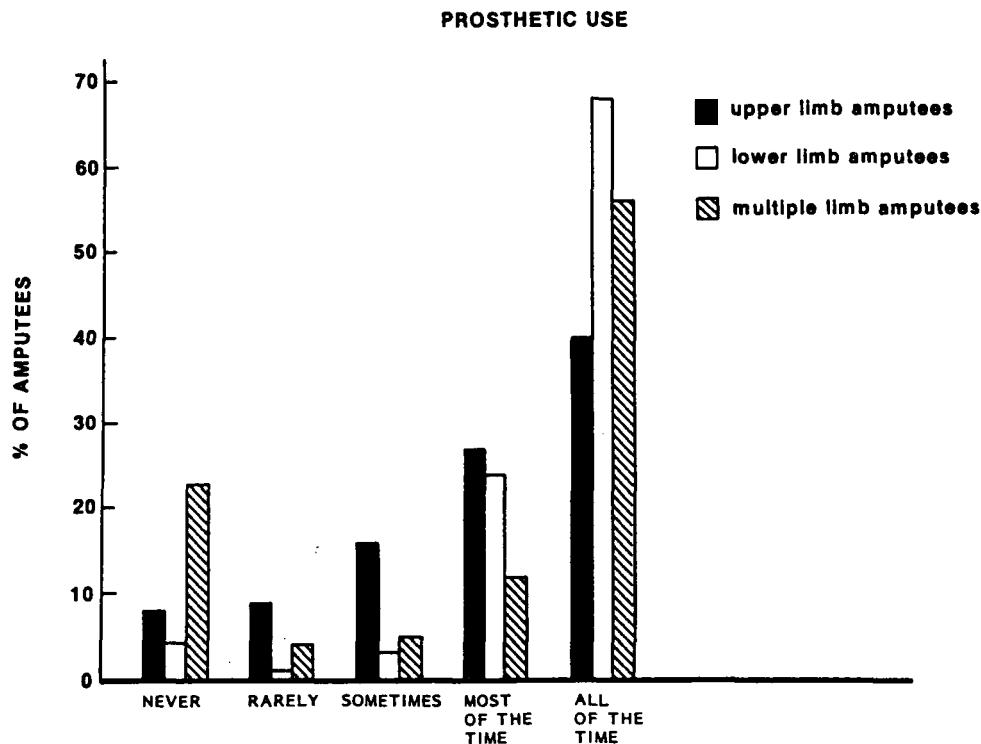


Fig. 6. Prosthetic use.

hand compared to those upper limb amputees who had lost a nondominant hand.

A small group of amputees reported that they had participated in an educational upgrading, retraining or training-on-the-job programme post-amputation. As one might have predicted, those amputees who were suitable for training on the job had a higher rate of return to work than those amputees who required more extensive vocational preparation.

When the subjects were asked to specify the factor that they believed had most influenced their successful return to employment, they overwhelmingly identified their own attitude.

The second most frequently reported response was their own skills (Fig. 7).

### Discussion

Successful rehabilitation as defined at the outset, was achieved with the majority of the respondents in this study. Using a return to employment as a measure for rehabilitation, the data revealed that the employment rate post-amputation for the subjects in this study compared favourably with other groups of disabled individuals. However, as previously

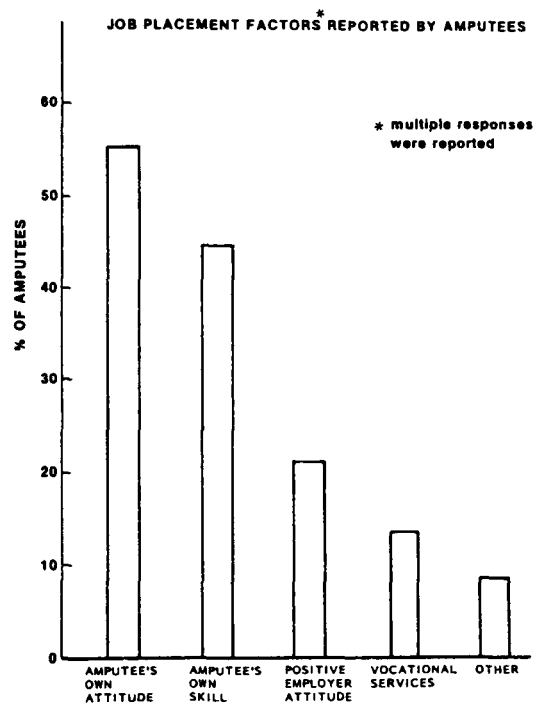


Fig. 7. Job placement factors reported by amputees.



cautioned, the unemployment rate depends on the definition of the terms employed and unemployed. In this study, the average unemployment rate ranged from 11.9% to 26.3% based on whether the unemployed group included only those subjects seeking work, or those subjects who were not working and without the intention of working or those subjects who retired prior to 65 years of age (Table 2).

Demographic factors including the amputee's sex and age were demonstrated to have an impact on rehabilitation. Although the treatment team cannot alter these factors, it is important to be aware of their potential effect. Women have a much higher unemployment rate than men. Similarly, patients who sustained their amputation at 45 years of age or older were less successful in their return to work.

Amputees who reported wearing their prosthesis frequently were more likely to be employed. One might speculate that the same positive attitude and motivation that is required for successful prosthetic use results in successful return to work. Prosthetic use allows an amputee to achieve a higher level of function and this in turn may increase the likelihood of achieving a better vocational opportunity.

Amputation level had a significant impact. Those amputees who sustained multiple limb amputations experienced significantly more difficulty returning to the work force and a higher percentage of these subjects chose early retirement. Further studies of partial hand and feet amputees may reveal why these specific groups report higher unemployment rates than amputee groups with a higher level of amputation. One can only speculate as to the reasons for these findings. One hypothesis might be that partial hand and feet amputees cannot accept an amputation to a higher level despite pain and lack of function. They may be holding onto their partial hand or foot for psychological or cosmetic reasons rather than functional reasons.

The incidence of stump and phantom limb pain should also be considered by the health care professional. Stump and phantom limb pain proved to be widespread amongst amputees. Although many subjects reported returning to work despite the continuing experience of these pains, the data suggested that those patients who

presented with stump and phantom limb pain were less likely to have returned to work. Further exploration of these kinds of pain, unique to the amputee, must be undertaken so that their impact can be better understood.

As the data revealed distinct changes in occupation, typically to a more sedentary and intellectually sophisticated job post-amputation, the necessity of vocational services is evident.

The authors suggest that the identification of variables that influence rehabilitation is an important means of developing effective treatment services. However, it must be noted that these factors are not intended to be criteria which lead to the provision or withholding of services. Each patient should be offered every service available, despite the presence of factors which may make their rehabilitation more difficult. It is also noted that the presence of one factor in and of itself, is not a sufficient predictor of rehabilitation outcome. It is the combination of factors that each patient brings to his rehabilitation, together with the multiple services that are deemed necessary, that will lead to success.

The individual's psychosocial circumstances were beyond the scope of measurement in this study. However, it is assumed that the amputee's psychosocial circumstances prior to and following amputation, affect rehabilitation.

The opinion of the treatment team in this study, although unverified by objective measures, but repeatedly noted in daily experience, is that the amputee is typically eager to return to a lifestyle that matches as closely as possible, his pre-amputation state.

### **Conclusions**

The findings of this review of more than 1000 patients provide direction to the vocational rehabilitation of amputees. The majority of amputees reviewed successfully returned to work and were using their prosthesis. It is suggested that given the identification of factors that influence reintegration to the work force, amputees benefit from treatment programmes that include medical, prosthetic and vocational services.

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