AN EXPLORATORY EVALUATION OF PSYCHOLOGICAL FACTORS IN THE REJECTION OF UPPER LIMB PROSTHESES

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ABSTRACT

This study investigated the reactions of arm amputees to their prostheses and explored possible reasons for these reactions.

A questionnaire was constructed to determine the use to which the recipients put their prostheses. A preliminary validation study was conducted to determine the final form of the questionnaire. Rather than selecting a sample of prosthesis recipients, a census of the recipient population was attempted with 48.57 per cent responding.

Respondents were asked questions measuring their use of the prosthesis, the nature of their prosthesis, the rehabilitation services they had used, and various demographic variables including age, sex, occupation and so on.

It was found that up to 55.9% of the respondents could be classified as low-users of their prosthesis. A regression analysis showed that 44 per cent of the variance in the use of the prosthesis was due to the two variables of prosthesis type and prosthesis length. No other variables explained significant amounts of the variance.

A lower-user and a high-user were selected to pilot a further study examining psychological factors that may affect prosthesis use. The areas examined were those of training, perceptions of independence and stigma, and perceptions of the prosthesis. A number of modifications were made to the original questions as a result of the pilot study.

The results of the pilot study indicated that the areas of training and expectations of the prosthesis' capabilities prior to receiving it would be most likely

to prove useful in explaining different levels of prosthesis use.

Some issues relating to possible future research, interventions, and the rehabilitation process were also discussed.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

CHAPTER 1. INTRODUCTION

In order to introduce the concepts and ideas that this Study will be examining, it would be useful to focus attention for a moment on the situation of a young Siamang ape named Sai Buri.

Sai unfortunately had had her arm chewed off by her father. This left her in the predicament of having to live with a severe disability. This was particularly serious in her case because her species' usual mode of transport is by swinging from tree to tree. A unique solution to this problem was attempted when Sai was fitted with a prosthesis, having a hook attachment, to enable her to swing again. Sadly Sai's reaction was somewhat less than total acceptance, ranging from vigorous attempts at removing it to at best, ignoring its presence altogether.

As with Sai there are many individuals who are faced with a disability through a limb deficiency (due to some congenital problem) or having lost a limb (through trauma or surgery). The common practice in rehabilitation is to fit these people with prostheses called artificial limbs. These prostheses range from simple cosmetic attachments through mechanically powered units to complex myoelectric units, the purpose of which is to in some way compensate for the limb deficiency.

Many questions can be asked as to what style or type of prosthesis is most suitable in a given situation. However with the wide range of options and technical expertise available it is more important to start asking the question of how recipients react to their prostheses; questions such as the actual levels of use of the prosthesis, the perceptions of the individual towards their prosthesis, the reactions of other people, and skill levels achieved in the use of the prosthesis. These could be key factors affecting the use of prostheses.

The Thesis will be addressing itself to these questions, with specific reference to the New Zealand

situation. The emphasis of the study will not be a simple examination of how recipients feel towards the prosthesis. It will take the approach of asking, "Are there recipients who, like Sai the ape, have upon receiving a prosthesis tended to reject or ignore it?" Attempts will then be made to ascertain what psychological factors have influenced or caused this reaction. This approach could facilitate the development of rehabilitation approaches to remedy the problem.

Within the realms of limb deficiences and prostheses this Study will limit itself to the area of upper limb deficiencies. Throughout the study, unless specificially stated otherwise, all references to prostheses or limb deficiences will be within the framework of arm prostheses and deficiencies.

Restricting the study in this way is a logical approach as the nature of upper and lower limb prostheses are essentially different. Firstly, the lower limb prosthesis can more completely duplicate the basic function of a leg than an upper limb prosthesis can of an arm. This is due to the complex manipulative and grasping functions of a hand. Secondly, the wearing of a lower limb prosthesis can be more completely disguised. Trousers and shoes can completely hide a lower limb prosthesis. The hand of an upper limb prosthesis, while often looking realistic, does not have the continual movement of a natural hand, making it more obvious. These things mean that it is reasonable to assume that the reactions of the recipients of upper limb prostheses will differ substantially from those of lower limb prostheses.

The concern over possible reactions by recipients was first raised during discussions with specific staff members at the Rehabilitation Unit of the Palmerston North Public Hospital. They perceived that patients fitted with prostheses would wear and utilise them while in the supervised environment of the Centre. However,

in the words of one staff member, "They took them off as they went out the door." These perceptions point to the specificity of the problem to upper limb prostheses and indicate that there is a very real problem worthy of investigation.

Prior to discussing the details of the issue it would be useful to examine the services available to the limb deficient person. The main organisation in the southern North Island of New Zealand would be the Artificial Limb Centre attached to the Wellington Hospital. This unit is the main assembly and construction centre for prostheses in New Zealand with fitting centres in Auckland and Christchurch being served by the Wellington workshop.

The usual procedure is for a person requiring a prosthesis to be referred to the Limb Centre by their orthopedic surgeon. Following this a series of visits to the Centre would accommodate the measurement for and fitting of the prosthesis. This procedure would include the training of the recipient in the use of the prosthesis. In some cases, where the necessary services are available, follow up rehabilitation is exercised through a rehabilitation unit attached to a hospital in the person's home district.

In determining the possible psychological factors involved in the reaction of recipients to their prostheses it must, of course, be first shown that a problem exists. It is important to clearly determine known levels of use. Unfortunately there is an extremely limited amount of information available regarding this question. One study, while not centrally concerned with this question, took a measure of the number of recipients who were still using the prosthesis after a given period of time. That study found that with certain types of prostheses there was a marked decrease in use over time (this and other studies are covered more fully in the Literature Review.) This dearth of information has meant that the present study faces a dual difficulty.

The first is the need to establish the nature and extent of the problem; that is, to measure the reactions of recipients to their prostheses, in particular to examine whether 'rejection' of the prosthesis occurs (operationalisation of 'rejection' will be discussed later in the study). This leads into the second concern that because the question of 'rejection' has not been examined appropriate means of measuring it have not been developed. This means that an initial requirement of the study is to develop a criterion for 'rejection' and to operationalise that criterion in the form of usable quantitative measures. This prerequisite must be fulfilled if the question of the factors contributing to the different reactions to prostheses can be examined.

In examining the psychological factors relating to the rejection of prostheses there are a large number of avenues which could be explored. This study will therefore first of all need to establish the areas of interest. An initial consideration suggests that there are three divergent areas that could usefully be examined for their relevance.

The first of these areas is training, the effect of training, or perceptions of adequacy of training, on use. Secondly there is the area loosely called 'body image'. This relates to the recipients' perceptions of themselves, the effect that the prosthesis has on that self image, and the recipients' perceptions of how others see them. The final area is how the recipient views the prosthesis and its function. The nature of this latter perception, especially among recipients whose limb deficiency is due to trauma, and its relation to the role of a natural arm could have major effects on levels of use. (The details of these different possible contributing factors will be expounded both in the Literature Review and at further appropriate points in the Study).

Knowing the general aims that need to be achieved

by the study, the next step is to decide upon a specific design that consistantly follows them through. Before fully developing this design there are a number of different factors, beyond those already discussed, that limit the design choice.

The first concern is related to the population of prosthesis recipients. The available population are those recipients who have been serviced directly by the Artificial Limb Centre. Two characteristics of this population are likely to affect the chosen design. The first of these is its size. There are approximately ten recipients of prostheses a year. These small numbers, mostly of amputees, and the low need for followup by the Limb Centre will make the contacting of recipients from earlier years difficult. It also places limitations on the sampling schemes that can be adopted. The other characteristic is the geographical distribution of the population. Because the recipients are scattered over six regions there would be a great time and expenditure cost in physically interviewing them all.

The design used is a form that will circumvent these limiting factors while still maintaining the ability to provide adequate answers to the questions raised for study.

The study is separated into two stages that will deal successively with the dimensions of the problem that have been discussed. The first stage will examine the question of the reactions of recipients to prostheses for the purpose of exploring the possibility of there being a sector of the population who actively 'reject' the prosthesis to some degree. The first step in this will be the development of the concept of rejection. This will particularly involve the exploration of measures of rejection that can be used in a quantitative way. Because of the limiting factors mentioned earlier, direct behavioural measures and interviewing could not be used as data collection methods. The method that seemed the most

practical under the circumstances was a postal questionnaire. This format will therefore be adopted for the first stage.

The content of the questionnaire will, in general terms, be comprised of the following kinds of items; items designed to act as measures of the concept of rejection; items covering the kind of prosthesis that the recipient has been fitted with, and the health services involved in the fitting and rehabilitation processes; items relating to relevant biographical variables.

This questionnaire content will enable a number of things to be achieved. The rejection measures will allow all respondents to be rated on that dimension, thus giving an immediate answer to the questions regarding how recipients are reacting to their prostheses. The measures of types of prostheses, services used, and biographical variables can be compared to the measures of rejection. This will help to determine how much of the variance in reactions can be explained directly by these variables.

Apart from these primary objectives the questionnaire will enable the collection of data on the make up of the recipient population, especially in terms of different groups of people and the kinds of prostheses they use. This kind of data may be of value to services such as the Artificial Limb Centre in the continuing development of their role in assisting Limb deficient people.

The final requirement that the questionnaire will achieve is that it will enable the selection of subjects for the second stage of the Study. The rating of each respondent on the 'rejection' dimension will mean that high scorers on that dimension (high-users) and low scorers on that dimension (low-users) can be selected so that their responses in stage two can be compared with each other.

The second stage in this Study will deal with the

possible psychological factors that may be contributing to the types of reactions that will have been identified in the first stage.

Due to the type of material being explored in this stage the use of a postal questionnaire was rejected. The personal type of responses required may have biased subjects against completing such a questionnaire. Moreover the areas of interest would not lend themselves easily to presentation in such a format. This means that the most appropriate methodology is the interview. Research interviewing allows the respondent the freedom to give full and complex responses that are very useful in the evaluation of psychological factors. Also the fact that only a small proportion of recipients would be involved means that the time and finance involved would not prove prohibitive as was the case with the first stage of the study.

The content of the interviews will of course be related to such things as training in the use of the prosthesis, the perceptions of the recipients of the purpose and nature of the prosthesis, the recipients perceptions of how the prosthesis affects their self-image and how it affects the way that other people act towards them. The questions relating to each of these areas will be structured to allow the individual the maximum possible freedom of response while still ensuring that useable data is obtained.

By interviewing both rejectors and non-rejectors, of prostheses, the differences in response patterns between the two groups can be used to indicate which of the psychological factors are relevant, in explaining reactions of recipients to their prostheses.

Due to the time commitment required in both stages of the proposed research, this report will present only a pilot study used to refine the measures for use in the second stage.

The major academic relevance of these results will be in the provision of indications of the most fruitful direction for future comprehensive research into recipients' reactions to prostheses. There may also be some basis to suggest a generalisation to other specific rehabilitation aids. An immediate practical result will be that the findings may be of use to workers in the helping professions when they are dealing with individuals who seem to be rejecting their prostheses.

In summary it is hoped that this study will be able to demonstrate clearly the nature of the situation that is present among the recipient population; to supply future research with the tools to evaluate other populations of recipients, and to provide some clues as to psychological factors that could be usefully explored in attempts to fully understand the causes of reactions to prostheses. It is also aimed at giving helping professionals some tentative basis for the development of services to assist the rehabilitation of prosthesis recipients.

Furthermore this study should demonstrate that the examination of reactions to rehabilitation aids is a fruitful avenue for applied research, not only to answer academic questions but also to contribute towards the continuing development and growth of rehabilitation medicine and services.

CHAPTER 2. LITERATURE REVIEW

- Prior Research
- Training
- Perceptions of Independence and Stigma
- Perception of the Prosthesis
- Hypotheses

This review will be developing a number of different themes. The first section entitled 'Prior Research' will endeavour to show the nature of the various approaches into research involving prostheses and their rejection.

The other theses are, Training, Perceptions of Independence and Stigma, and Perceptions of the Prosthesis. The aim will be to explain the background to these areas and to show how they could be factors affecting the reactions of recipients to prostheses.

PRIOR RESEARCH

The first question to be asked is, whether there has been any awareness shown in the literature of the existence of a problem of rejection of prostheses. Reference has been made to the existence of such a problem by Wilson (1970) who stated that there is,

> "No doubt that today the acceptance rate of prostheses ..... is woefully low."
>
> (P.331)

He then goes on to expound briefly the value of examining this deficiency. The factors that Wilson (ibid) sees as causing this low acceptance are the functional capabilities of the prosthesis and technical difficulties such as malfunctioning joints and poor fitting to the stump.

McKenzie (1970) is another who has alluded to the existence of rejection, stating that,

> "The rejection rate by unilateral-arm amputees is much too high for any complacency."
>
> (P.363)

He also states that this phenomenon is much worse than it is for the bilateral amputee. His views on the cause of the high rejection rate are that it is due to, the development of one handedness in task performance removing a functional need for the prosthesis, a lack of sufficient training or skill in using the prosthesis

the poor comfort of a prosthesis, the unnatural look or profile of the prosthesis, the reactions the wearer gets from other people when wearing the prosthesis.

Both these individuals have stated that a problem exists. Neither, however, were able to present any figures that demonstrated the actual extent of the rejection. It is all very well to allude to a rejection and to suggest possible causes but it is important to determine the parameters of the problem before making such definite statements. This then enables the development of a schema to test the effectiveness of any interventions.

One has to wait much later before an actual measure of rejection rates surfaces in the literature. Herberts, Korner, Caine and Wensby (1980) provide such a measure. Ironically they were not directly concerned with the problem of rejection itself but were evaluating a clinical rehabilitation programme for amputees. Their measure relating to rejection was a simple survey of the numbers of individuals using different kinds of prostheses. One of the categories was 'none'. Of the sample of 38 individuals surveyed, between 1 and 12 years after receiving a prosthesis, 26.3 per cent indicated that they did not use it. This measure has demonstrated clearly the existence of a problem with recipients rejecting their prostheses. The measure was very simplistic as it only allowed for use or non-use responses and did not explore levels of utilization which may mean that there could be a further hidden rejection problem. The simplistic nature of the measure is unfortunate but should not be seen as a fault in the Study as it must be remembered that 'rejection' was not really a concern for the researchers. (Other aspects of this study are more fully dealt with in the section on training).

There are two possible reasons why this rejection has not been researched to any great extent. The first

would be that amongst those aware of the existence of rejection there was not the expertise and knowledge to carry out relevant research. Freeney (1970) puts a damper on this possibility when he talks of evaluation of the prosthesis. His article shows an awareness of the need for representative sampling and the possibility of the effect of demographic variables. This would give a basis for exploring methodologies to discover a robust research design. However Freeney, like the others, continues on with a discussion of training impact, the functional attributes of the prosthesis, and the performance of its recipient.

This interest in the technical aspect is possibly a key to why there has been a dearth of research into 'rejection'. The background of prosthetic research has been an engineering and design approach with the technical nature of the instrument continually being improved and developed (Swain, 1980; Shaperman and Sumida, 1980).

The way to overcome problems of rejection (non-use) when approached from such a background is seen to be by improving the function and design of the tool which may in turn, improve its use. Concentrating on earlier fitting (Lamb, 1970), better cosmetics (McKenzie, 1970) or greater training (McKenzie, 1970; Lamb, 1970; Freeney, 1970) are also seen as possible answers. These cures for an unmeasured problem have been orientated around an informed, but presumptuous premise of causation and have meant that the direction of concern has been almost exclusively technical. This is an unsuitable imbalance when dealing with a man machine interaction and is of questionable value until the actual reasons for rejection can be demonstrated.

TRAINING

> "Learning to use an arm prosthesis never comes instinctively and its effective use is an acquired skill, so much so that no worthwhile return in the way of function is

> apparent to the user and rejection may result."
>
> (McKenzie, 1970, P.365)

Viewing the use of a prosthesis as a skill that needs to be learnt is a useful approach. It opens up a clearly definable area of interest. Training has been researched in Industrial Psychology and this expertise would provide a basis for evaluation of existing training programmes. It is not, however, the aim of this review to go into details of training. These things have been covered in depth elsewhere and useful starting points would be texts by Landy and Trumbo (1980) and Dunnette (1976).

There can be no question that efficient training can be related to levels of performance. The question can however be asked about how the perception of the efficiency or adequacy of training can affect performance. Surely, if a group of individuals undergo a substantially similar rehabilitation programme but have different reactions, then it cannot be said that the programme itself is a cause of the variance. However if perceptions of the adequacy of that programme vary then that could account for some of the variance. It can be seen that this kind of situation is encountered, when examining the reactions of the recipients to their prostheses.

Perceptions of the adequacy of training would be mainly governed by the comparison between the outcome of the training and the expected outcome by the trainee. Landy and Trumbo (1980) recognised the importance of attitude training in the industrial setting. If a difference in perceptions about the adequacy of training is found between low-users and high-users their training for attitude changes may be important. This can be achieved by changing the attitudes directly or by changing the training programme.

Changing the training can involve both a re-evaluation of the procedures, goals and effects of the training. Fishman (1973) provides a discussion on evaluating the goals of training. Hinrichs (1976);Annett (1978) and Landy and Trumbo (1980) provide starting points for the evaluation of procedures, if needed.

Changing perceptions is as much related to the recipients' view of the capabilities of the prosthesis as it is to their views of the training. At this stage it is sufficient to state that realistic expectancies would need to be established within the recipient.

If training is a variable affecting rejection then there needs to be room for decision as to which of the many facets of the training has the most impact on perception. It is also important to evaluate which area can be improved and changed to facilitate the greatest benefit to the prosthesis recipients with the least cost.

Having shown how the concept of training could be useful in explaining rejection among the recipients of prostheses it would be useful to see if this has been examined. The possible role of adequacy of training in affecting use levels has been recognised by a number of earlier writers (Freeney, 1970; McKenzie, 1970). However the more recent work of Herberts et al (1980) addressed itself in a more direct way to the issue.

Herberts et al (1980) concentrated on training in the use of a below-elbow myoelectric prosthesis. Their training programme involved an intensive training programme in generating myoelectric impulses in the stump. This was followed by a one week training course following the fitting of the prosthesis, the purpose of the course being to enable the recipient to master the use of the grip function over the full range of orientations of the prosthesis. The cited study was designed to evaluate the usefulness of the programme.

A total of 38 subjects were surveyed between 1 and 12 years after the fitting of a primary prosthesis. This included 16 who had experienced the training programme and 22 other prosthesis recipients. All subjects had initially received myoprostheses. The subjects were asked what kind of prostheses they now wore. Among the trained group 9 still used myoelectric, 3 used cosmetic, 2 used hook, and 2 used no prostheses. Among the untrained group 5 used myoelectric, 6 used cosmetic, 3 used hook and 8 used no prostheses.

At this point there is a query about the design. Specifically about the time between fitting of the prostheses and the survey for the two groups. The time elapsed ranged from 1 to 12 years. It must be asked how the trained and untrained groups were distributed across this range. Further reading of the study revealed that the time after fitting, for the trained group, was from 1 to 4 years. It would seem therefore that the untrained group were most likely to be individuals fitted at the Centre before the training scheme was introduced, that would have been 4 to 12 years before the survey. The differences in profiles, between the two groups, for the type of prosthesis used may have been due to the time since fitting and not the training programme as claimed. This confounding variable brings the conclusions of the study into question.

Further through the study, those subjects who had received the training were put through a series of tests. These involved two objective behavioural ratings, ADL ratings (Aids for Daily Living) and a timed functional test which were combined with a clinical functioning rating done by one of the authors. These tests showed a range of performance levels among the subjects. The researchers also had information on; age, side of amputation, dominant side, delay between amputation and training, cause of amputation, stump length and the use of other types of prostheses. They failed however, to

use any of this information in any way, as far as can be gathered from the report. Yet here they had the opportunity to check out the effect of a number of secondary variables on the level of prosthesis use.

These researchers have, through poor design and incomplete use of their results, lost a golden opportunity to demonstrate factors affecting the levels of use of prostheses and the effect of training on prosthesis utilization.

PERCEPTIONS OF INDEPENDENCE AND STIGMA

This section of the review will examine the perceptions and needs of the recipient, especially in relation to themselves and the reactions of other people. An early work on rehabilitation (Wright, 1960) briefly discussed the concept of independence and the rejection of help. This need for independence can be profitably discussed in terms of personal control.

At a fairly general level the idea of personal control is that people have a need to manipulate the environment. White (1959),in Rodin, Rennert and Solomon, 1980) has supplied a comprehensive theory involving the role of control in the motivation of human behaviours.

Briefly examining studies showing the effects of perceived control can demonstrate how the perception may affect decision making. When individuals are institutionalised there is often an adverse reaction. This has been thought to be due to the fact that they perceive an inability to control or manipulate their environment. If this is so then the provision of a way in which they can manipulate their environment should lead to a change in reactions. Langer and Rodin (1976, in Gatchel, 1980) allowed a number of nursing home residents a sense of control by giving them more personal responsibility and choices. These residents, in contrast to a comparison group, showed a higher sense of wellbeing and improvement in areas such as their general alertness

and active participation in life. Further work has shown that the belief of the subjects in their control is as important as actual control. This was demonstrated by Glass and Singer (1972, in Gatchel, 1980).

In their experiment two groups were presented with a loud (108db), unpredictable, tapping noise. One group was told that they had potential control over this adverse noise (perceived control group). This was through a button on their chair which could be pressed to terminate the noise for the rest of the session. They were asked not to press it and to finish the experiment. The other group (no control group) were not given any instructions pertaining to control of the noise. It was found that, unlike the no control group, the perceived control group had no disruption in later tasks such as a tolerance for postnoise frustration and proofreading effectiveness. There was also a tendency towards reduced physiological reactions from the perceived control group. This experiment demonstrated that perceived control can reduce the impact of aversive stimuli.

Control also seems to limit the effect of stress upon the individual (Glass and Carver, 1980). This is finding an application in the treatment of depression and the effects of heart disease.

If it is accepted that control is a desirable relationship that a person achieves with his or her environment then it is only a short step to applying this in the area of reactions to prostheses.

Personal control is thought to take three major forms (Averill, 1973, in Gatchel, ibid); Behavioural which involves action on the environment, Cognitive interpreting events (Perceived control), Decisional having a possible range of choices for courses of action.

It can be assumed that any dependence on an external

factor could be seen to be a relinquishing of control over the environment. This could be especially so if that dependence were concerned with activities in which 'normal' people did not require external help. In this situation it would be expected that the individual would attempt to minimise the use of the external factor.

However if something is seen as allowing the person greater control over the environment then it would be reasonable to expect the person to maximise the use of that thing.

Relating these ideas back to prosthesis use it can be seen that the prosthesis may be seen to fall into either category. If the recipient sees that the prosthesis makes them more dependent or that the need to use it indicates an inability to control their environment then they would be unlikely to use it or to minimise its use. However if they perceive the prosthesis as a tool through which they can control and manipulate their environment then they would be likely to maximise its use.

Apart from perceived control there is another concern within the area of self-perception that may have an important effect on reaction to prostheses. This area is that of body image and especially the phenomenon known as stigma.

A stigma can quite simply be defined as a physically obvious abnormality such as obesity, facial disformity, limb deficiency or any one of numerous other things. Some of these factors have been shown to have effects on non-trivial social interactions and impression formation. Wright (1960) has stated that physically abnormal individuals may simply assume that the nature of interaction with others is linked in causal manner to their own abnormality.

The perception may be best explained within the framework of attribution theory (Kelley 1973). Here the

individual works from a single or few, observations combined with a configuration concept, which is an assumed pattern, or configuration, of the different possible causes to decide what caused a particular behaviour. The possible causes are either internal or external in nature. The decision as to which cause is operating is governed by what Kelley calls the discounting principle which he states as being;

> "the role of a given cause in producing a given effect is discounted if other plausible causes are also present."
>
> (P.113)

This means that a certain action will only be attributed to a specific cause if no other more plausible causes are present.

An external cause is usually perceived to be more plausible than an internal cause. Though if an external cause is perceived to be inhibitory, of the action, then the presence of the action is interpreted as indicating the presence of a strong internal cause. The individual develops what is termed a 'causal schema' which is really a framework of possible causes and the 'plausibility' that the individual has for each cause.

Returning to physical abnormalities. It has been shown by Kleck and Strenta (1980) that people with physical abnormalities perceive them as causally related to the behaviours of others. Subjects in this study were put in groups where they were told to act as if they had an allergy, were epileptic, or had a facial scar. This created three levels of stigmatising abnormality. The scar was constructed with theatrical makeup. It was removed under pretext of moisturising it to ensure that it stayed in place. This meant that none of the groups had any actually observable abnormalities. Each subject had an interview with a confederate whom they believed had seen a sheet describing them and their 'role' abnormality, when in fact the confederate had not.

The results showed that a highly stigmatising abnormality (scar) was perceived to have a greater causal effect on the confederate's behaviour than a less stigmatising abnormality (epilepsy or allergy). The nature of the perceived abnormality affected the kind of behaviour that was observed in making the decision about the confererate's behaviour. Those in the scar group used the gaze patterns of the confederate, that is, where the confederate looked and for how much of the time. Those in the epilepsy group used the verbal and non-verbal communication of the confederate while those in the allergy condition showed no effect. By the use of independent judges and recording subject expectations the authors were able to demonstrate that self fulfilling prophesy, causing actual changes in the confederate's behaviour, did not occur. This indicated that the attributions were in the perceptions of the subject.

The results clearly fit the attribution theory with the stigma strength of the disability being a major factor in the construction of the subject's causal schema.

The reason why stigma is such a strong causal attribute can be seen in a number of studies. Uelmen (1978) showed that disabled people when rating profiles of people who were normal, in a wheel chair, or without arms, rated the normal individual more positively with regards to body image. The conclusion was that there may be basic differences in body image between normal and physically disabled individuals. Johnson (1978) working with burn victims looked at high level burns (50%+) versus lesser burns (50%-) and head or hands burns versus trunk burns. These victims were tested on measures of body image, self-concept and social perception. The results were such that the high burn individuals had less positive body image than low burn patients. Moreover the head and hand burn victims

showed both a less positive body image and self-concept than trunk burn victims. Women were worse than men, which suggests a greater concern with body cosmosis.

The important fact to be gleaned from these studies is that a stigmatising disability has a strong influence on the individual's self perception. This would reinforce the idea that those with a physical abnormality perceive it as having a strong influence on their social interactions therefore giving it a high 'plausible cause' value in this area. This would mean that it would tend to over-ride other 'plausible causes' in explaining situations encountered by the individual.

Before describing how this applies to prosthesis recipients one more study gives some valuable information. Lenhart (1977) sampled three groups of people, normal, disabled, and helping professionals. Each participant was asked to place themselves in three roles, as a disabled person, a normal person, and a helping professional. While in each role the participants were asked to complete a "Attitude towards Disabled survey'. The results showed that stigma existed in relation to disabled, also that most people denied contributing to it. The 'normal' group idealised the role of the helping professional. But most importantly, for the purposes of this study, it was shown that the disabled group expected negative reactions from both other groups.

So it can be expected that the limb deficient individual would expect interactions to be negative and that they would perceive them as negative, regardless of their actual nature. They would also tend to attribute these perceived reactions to the disability.

The question is whether the recipient would perceive the prosthesis as making the disability more or less stigmatising. If more stigmatising then the prosthesis would be less likely to be worn. If less stigmatising

then it would be more likely to be worn. There would also in that case, be a corresponding change in their perception of others with a lowered expectancy of negative results and the disability becoming less powerful 'plausible cause' in attribution.

PERCEPTIONS OF THE PROSTHESIS

As well as being a review of the literature this section proposes to present a conceptual dilemma which may have a great bearing on how a recipient reacts to the prosthesis.

The dilemma is in the form of the question, "What is a prosthesis?" This may seem to be a stupid question. A prosthesis is a plastic/metal/wood contraption which people can use in place of a limb deficiency.

The question is however quite valid and can have two diametrically opposed answers. Firstly a prosthesis is a rehabilitation aid, a tool enabling a limb deficient individual to function more adequately, a pair of glasses for the arm so to speak. Alternatively, it is a replacement for the missing arm with the purpose of fulfilling the functional and cosmetic role of the arm.

Let us first examine the idea of the prosthesis as an aid. It should be viewed in the words of Wolff(1980) as a 'Tool for living',

> "designed like any other tools to extend the physical capabilities of the user."
>
> (P.3)

The nature of this tool or aid would be determined by the individual's personal history and needs. Accepting this, the prosthesis as an aid would be designed to give the best functional use for the individual. There would be no excessive attempt to make an arm look real but the most efficient form would be adopted. It would also not be designed to attempt to function in the manner of an arm but to be of most use to the individual in

concert with already present physical capabilities. This idea has been stressed (Kronlund 1970) but may not be fully realised.

The second option is the prosthesis as a replacement for the missing arm, designed to duplicate its function and cosmosis.

Taking the functional concern it may be useful to examine what the prosthesis is trying to replace. Functionally the hand is most important. It has a number of functions such as grasping and gripping. It can hold or pick up any object changing dimensions to accommodate to the object. It can also exert finely controlled pressure. It can move objects, mould pliable objects, press buttons and perform other manipulative functions. For communication purposes the hand is used in general non-verbal communication and in deliberate gestures. However the most important role of the hand is, possibly, its sensory role; touch, pressure, texture, temperature, are all contributing sensations. Its main role here could best be summed up in the words of Simpson (1970) who said that the hand

> "is not allowed to adapt out, but is kept in constant motion exploring such well known ground as the owner's face, his desk, ... or the catch of a ball point pen. It could be argued that the depreciation of this reassuring background information would be unfortunate."
>
> (P.431)

After the hand there is the arm with its load bearing capacity, its leverage potential, its use in positioning and orientating the hand through the use of shoulder, elbow and wrist joints. Finally, there is the orientation feedback through kinesthetic receptors, in the joint interfaces, that enables the positioning and orientation of the hand and arm to occur without the need for visual confirmation.

On the cosmetic side there is the appearance of

the hand and arm with their minor irregularities and unique features. There is also the functional cosmetics, the natural fluent way in which the system moves and functions. If the prosthesis is to be a replacement arm then it should be attempting to duplicate all these features of a normal arm.

There have been recent developments along these lines with Shaperman and Sumida (1980) working towards functional improvement while Swain (1980) has worked with electromyographic signals to control a hand prosthesis containing 14 touch sensors in the extremities.

The two conceptual approaches can have an effect on the recipient's reaction. First take the example of the individual who perceives that the prosthesis is designed as a replacement arm. This individual would build up expectations about the performance capabilities and cosmetics of the prosthesis based on their knowledge of a natural arm. They would, of course, evaluate the prosthesis against these established criteria. The prosthesis would obviously not live up to these expectations. A strong 'external probable cause' would be that the prosthesis was in some way inadequate or poorly designed. This attribution of performance discrepancy on to the prosthesis would be a likely cause of rejection of the prosthesis.

Alternatively, if the recipient is taught to treat the prosthesis as an aid the expectations would be along the lines of evaluating its usefulness to the recipient. As a reasonable performance level would be accepted with no need for negative attributions then the prosthesis would be more likely to be used. If, on the other hand, the prosthesis was not found to be useful then this would be attributed to a lack of skill in the use of it, in the same way as poor pictures are attributed to a lack of skill in using a camera. This internalising of the 'most plausible' cause should lead to heightened attempts to develop appropriate skills for using a

prosthesis.

As a result of examining these areas of research which have applications in the area of prosthesis rejection of use, the following research questions were formulated for the present study.

HYPOTHESES

This study in measuring the amount of use that recipients make of their prostheses expected to find a proportion of respondents who indicated that they did not use, or only made minimal use of, their prostheses. These respondents would be said to be recipients who had rejected their prosthesis in some way.

Further examination would be expected to show that these low-users exhibited all or some of the following characteristics.

(1) Feeling that the training they received in the use of the prosthesis was inefficient and inadequate.

(2) Seeing that wearing the prosthesis in some way made them less independent of their environment, or at best did not improve their independence.

(3) That wearing the prosthesis made their disability more obvious to other people.

(4) That the prosthesis was meant to be a replacement for their missing limb and should therefore function to that level.

Those respondents who indicated they were high-users of the prosthesis should however exhibit the following characteristics.

(1) See the training they received to be at least adequate.

(2) Seeing the prosthesis as a means of increasing their independence or at worst not affecting it adversely.

(3) That by wearing the prosthesis they made their disability less obvious.

(4) That the prosthesis was meant to help them to function, or live, more successfully and was utilized as such.

CHAPTER 3. THE QUESTIONNAIRE

- Introduction
- Development

INTRODUCTION

The purpose of the questionnaire is simply the evaluation of the reactions of recipients to their prostheses. This is done with the specific aim of identifying if rejection occurs and to what extent it occurs.

Obviously the first step is to develop a clear understanding of what this concept of rejection is. To reject something is to "put it aside" (Fowler and Fowler, 1974). It could therefore be said that at its simplest level the rejection of a prosthesis is its non-use. However rejection could be conceptualised, in many cases, as being less than total. It could therefore be equally as valid to talk of rejection as being an under-utilization of the prosthesis. In other words rejection can be expressed as the level of use to which the recipient puts the prosthesis.

To operationalise this concept it is easiest to start from the idea of levels of use and ask what kind of measures can be developed to show how much the prostheses are used.

The first, and most obvious, type of measure is that of the quantity of use. How often? For how long? In how many places?

How often is easily related to the idea of how many days of the week the prosthesis is worn. How long can be related to hours of the day, while How many places can be tied into examining the different situations in which the recipient wears the prosthesis. These must all, of course, be related to a base line or expected level of use if a comment on rejection is to be made.

The quality of use of the prosthesis is another aspect that needs to be considered in operationalising the idea of rejection. The quality of use relates to the number of different functions that a person

performs with the prosthesis. This can most easily be developed by examining which of a series of tasks are performed by the individual.

There is one final dimension in the concept of rejection. If a recipient rejects the prosthesis then this action would be reflected in their attitude towards it and towards its performance. A measure of the satisfaction of the recipient with the prosthesis would be expected to reflect whether or not that person had or had not rejected the prosthesis.

Ideally a direct observation of the behavioural quantitative measures of rejection would be preferred. However because of the factors discussed earlier a questionnaire has to be used. These dimensions of rejection will therefore be refined into questions of a suitable form for a postal questionnaire.

Furthermore it is important to state that this study in no way attempts to deal with medical or technical rejection. That is, rejection due to medical problems such as a change in stump size or the development of scar tissue on the stump. Nor is it concerned with rejection due to faults in the prosthesis, for example an irritating or illshaped socket.

With the practical constraints mentioned earlier dictating that the method of measurement be a postal questionnaire it would be useful to mention some of the principles that need to be followed in design. The first part of these is non-ambiguity. This is important both in the wording of questions so that they can be easily understood and in the response format, making it as systematic and easy to perform as possible. This would have the dual benefit of providing for intelligible answers and promoting a higher response rate among recipients.

Bias in the wording of questions, suggesting a

particular nature of response, must be avoided. This can be done by ensuring that a full range of possible answers is allowed for by each question. These concerns will be followed through as explained in the section on questionnaire development.

Alongside the discovery of the actual dimensions of any problem of rejection among prosthesis recipients, other facets of the questionnaire may bring in useful information. The collection of data on types of prostheses (See Appendix A for detailed information), the helping services that the recipient made use of, and demographic variables would be a worthwhile exercise. The initial use would be in seeing what effects the nature of these variables had on the reactions of recipients.

It may be reasonable to suppose that the less functional prostheses, such as those fitted to forequarter amputees may be less utilized because of their functional limitations. Particular groups within the population, as identified by such demographic variables as gender, age, ethnic origin, occupation and education, may have different patterns of response to prostheses. The inclusion of questions relating to these kinds of variables would mean that such comparisons can be carried out. The amount of variance within the reactions to prostheses among the recipients that can be explained by these kinds of variables will be calculated.

In summary, this questionnaire with its items pertaining to the level of rejection among recipients of prostheses will provide a quantitative measure of their reactions. It will also provide the means to identify any patterns of reactions among specific groups of recipients. The way in which the variance in reactions is related to the variables of prosthesis type, services used and demographic variables will also be compared.

QUESTIONNAIRE DEVELOPMENT

INTRODUCTION

The development of the questionnaire initially required that a pool of questions be developed that directly related to the operationalised definition of the concept of rejection. These were combined with the questions on prosthesis types, services used, and demographic variables to form the questionnaire. Two considerations were that items should be easy to answer and provide clear responses for analysis. For this reason the range of possible responses, for each item, was predetermined and the respondents were only required to tick the appropriate option. The wording of the questions needed to be unambiguous and easily understood. This could be informally checked by administering the developed items to some non-academic associates of the researcher, and modifying the items in line with their feedback.

While questions referring to prosthesis types, services used and demographic variables were straight forward, it was important that questions designed to measure 'rejection' should be validated against that concept.

There are a number of specific techniques available for the validation of questionnaires. The basic process in all techniques is to administer the questions to a group of people, then to use their reactions in determining the validity of the items. The different techniques use different groups in the procedure.

The most obvious group to use would have been prosthesis recipients. This approach would have been desirable because the responses of the group would be very close to the responses that could be expected from the final sample. This approach, in the present

case, had a number of unfortunate effects. The first was the difficulty in contacting subjects. This would have required more time and finances than were available to the researcher. Secondly the quality of feedback about the items may have suffered if a postal method was used. The third problem was that the population of prosthesis recipients was small (n = 70). This meant that the use of a validation sample would seriously deplete the available pool of subjects for the main study.

A second possible validation group were lower limb prosthesis users. Their use would have in no way affected the size of the subject pool for the main study. There would however have been a similar difficulty in contacting them. The main question with using this group was how closely related their experiences were to those of upper limb prosthesis recipients. If the differences were major then the procedure would not have produced valid items in relation to upper limb prosthesis recipients.

There was a possible third group available for use, namely, expert judges. Expert judges are people, who, while not personally experiencing the problem, are closely associated with and aware of it. Such a group were the staff of the Rehabilitation Unit at the Palmerston North Public Hospital. This group had the desirable feature that they were easy to contact and readily available. Through their work with recipients of prostheses they had knowledge that was relevant to the issues being covered. The quality of feedback from expert judges would not have been as good as from upper limb prosthesis recipients but it would have more relevance than feedback from lower limb prosthesis recipients. Their availability and the fact that using them would not deplete the subject pool for the main study were also factors that made the helping professionals the most viable choice as a validation group for this study.

METHOD

SUBJECTS

The validation consisted of ten expert judges. All judges were helping professionals (see Table 1 for a breakdown by profession) who were, or at one time had been, on the staff at the Rehabilitation Unit of Palmerston North Public Hospital. All judges had had experience working with prosthesis recipients. All the judges, apart from the Clinical Psychologist were female.

TABLE 1. Professions of expert judges in validation sample.

Profession	Frequency
Charge Nurse	1
Clinical Psychologist	1
Medical Officer	2
Occupational Therapist	3
Physiotherapist	3
Total	10

APPARATUS

The apparatus consisted of two sheets (See Appendix B). One sheet contained a list of nine questions to be judged. Six of these questions related to quantitative values of use and three questions related to qualitative values, including two satisfaction measures.

The other sheet consisted of five different judgement tasks related to various items from the first sheet. The first task required that the judges evaluate the quantitative items on how important they were. This was designed to measure how much a recipient would wear a

prosthesis. Their judgements were to be made on a three point scale ranging from 'Important'; through 'Useful but not Important', to 'Irrelevant'. The second judgement task was a preference choice between two items measuring the times of the day when the prosthesis was worn and how many hours a day the prosthesis was worn. The third task was another judgement of the value of items in measuring the use of the prosthesis. This task used the same three point scale as the first task but was applied to the qualitative items. The final judgements related to the activities performed using the prosthesis and the places where the prosthesis was worn. The judges were asked to rate each activity on a three point scale of how necessary the prosthesis would be in performing that activity. The places were judged according to how often it would be expected that a recipient would wear his or her prosthesis in that place.

Space was provided for extra comments by the judges and full instructions were given on the task sheet.

PROCEDURE

Each of the expert judges was given a copy of the sheet of questions and the sheet of judgement tasks. Each of the judges was required to complete the judgement tasks independently. This was done in their own time and at their own pace. Apart from the request to do so no check was made to ensure that the tasks were completed independently. Doing the tasks in their own time would have, hopefully, limited any conferring among judges. The procedure from the issuing of forms till their return to the experimenter took two weeks.

ANALYSIS PROCEDURE

The validation tasks performed fell into three categories. These required different forms of analysis in order to extract the desired information.

Judgement tasks (A) and (C) (Refer to Appendix B) were of the first type. These tasks examined the question of whether or not particular items should be included in the questionnaire. With this question of the content validity of the items it is important to understand the premise behind the use of expert judges. The concept is that a high level of consensus among the judges, about the importance of an item, would allow a confident statement to be made concerning the validity of that item.

The question of how high a level of consensus is required before such a statement could be made had to be decided. It was important to determine what level of consensus would be needed before it could be said to be greater than may be expected by chance. This issue was dealt with by Lawshe (1975) with the development of the Content Validity Ratio (C.V.R.) (See formula 1).

$$C.V.R. = \frac{n - N/2}{N/2} \qquad (1)$$

Where n is the number of judges who agree and N is the total number of judges. As can be seen from formula (1) the C.V.R. will give a validity co-efficient between 1 and -1. The measure was designed for use with a three point judgement scale. Lawshe (ibid) also supplied the minimum C.V.R. values required for a significant level of consensus ($P < 0.05$; One tailed test) while using different numbers of judges.

Using the C.V.R. values had many advantages. It allowed for a quantitative measure of the content validity of each item to be obtained. The decision of whether or not to include a particular item was not influenced by the nature of other items available. Neither was it decided by arbitrary cutoff points. It was however determined by preset levels of significance.

Judgement tasks (D) and (E) (Appendix B) were designed to enable the classification of activities

performed using the prosthesis and places where the prosthesis would be likely to be worn. A range of options was desirable for these items so that the questions, in their final form, could have a range of activities, and places, from low to high likelihood of prosthesis use. This meant that some form of ranking of the activities and places was important.

As a three point scale was used in the validation judgement a weighting of each activity was one way of ensuring a range of values. Weights of 4, 2 and 1, were assigned to the three judgement categories. A composite score was then obtained for each activity by summing the weighted score for all judges on that activity. This method meant that the relative position of each activity could be easily determined and a choice made. This procedure was repeated for the places where the prosthesis was likely to be worn.

The final analysis was of judgement task (B) (Appendix B). This task was to evaluate the relative value of items (1) and (2) (Appendix B). The analysis required was a simple analysis of the numbers of judges that preferred each item. A chi squared test for a significant difference in the number of judges preferring each item was appropriate here.

RESULTS

ANALYSIS ONE

Judgement tasks (A) and (C) required the judges to respectively rate the quantitative and qualitative items for their importance in measuring prosthesis use. Table 2 shows the numbers of judges who assigned each importance level to items. It can be seen that except for items 3 to 5, there was a high level of agreement among the judges with from 8 to 10 of the judges rating each item as 'Important'.

TABLE 2 Judges ratings for all questions on three point scale of Important, Useful and Irrelevant.

	Rating		
Question	Important	Useful	Irrelevant
1	9	1	0
2	8	2	0
3	7	2	1
4	5	5	0
5	4	5	1
6	9	1	0
7	10	0	0
8	10	0	0
9	10	0	0

Using formula (1) C.V.R. values were calculated for the 'Important' ratings of each item. Using the table provided by Lawshe (ibid) it can be shown that the C.V.R. value which indicates significance, at the P = 0.05 level, for ten judges is (C.V.R. = 0.63). From Table 3 it can be seen that items, 1, 6, 7, 8, 9, with C.V.R. values of 0.8, 0.8, 0.99, 0.99 and 0.99 respectively, all indicate a significant level of consensus across the judges. Items 3, 4, 5, with C.V.R. values of 0.4, 0, -0.2 respectively, obviously demonstrate no significant consensus. Item 2 with a C.V.R. value of 0.6 is a special case. Its C.V.R. value is only minimally below the significance cutoff point so its value as an item in the questionnaire could be argued.

TABLE 3. C.V.R. Score for all questions, using 'Important' rating.

Question	1	2	3	4	5	6	7	8	9
C.V.R.	0.8	0.6	0.4	0.0	-0.2	0.8	0.99	0.99	0.99

ANALYSIS TWO

This analysis was conducted in relation to judgement tasks (D) and (E). In examining the results it would be less complicated if each of the tasks were examined separately.

Judgement task (D) looked at how essential a prosthesis was in the performance of different activities. The ratings given to each activity have been summarised in Table 4. It can be seen that there was a wide range of ratings given for the activities. Table 4 also shows a Weighted Rank Score (W.R.S.) for each activity, which was obtained by applying formula (2) to the frequency of ratings for each activity.

$$\text{Weighted Rank Score} = 4\,(Ne) + 2(Nus) + Nun \qquad (2)$$

Where Ne, Nus, and Nun were the number of judges who rated the prosthesis as essential, useful, or unnecessary, for the activity.

TABLE 4. Ratings by judges of Activities and ranking of each Activity.

Task	Essential	Useful	Unnecessary	Rank Score
Answer Phone	0	7	3	17
Dressing	5	4	1	29
Driving Car	3	7	0	26
Eat with Knife & Fork	6	3	1	31
Hang out clothes	5	5	0	30
Hold cup and saucer	1	4	5	17
Make a bed	0	8	2	18
Peel and orange	4	6	0	28
Pick up coins	1	4	5	17
Slice food	4	5	1	27
Take note out of wallet	2	8	0	24
Take lid off a jar	6	2	2	30
Light a match	3	5	2	24
Tie shoelace	1	7	2	20
Use tools	7	3	0	34
Wash dishes	1	8	1	21
Writing	0	7	3	17

The task at hand, then, was to use these W.R.S. in the determination of different response options to be included in the final form of the question. A useful choice would be a range of nine activities. Three each from high, middle and low, rankings on the W.R.S.

From the W.R.S. those activities with the highest values could be easily identified. These were 'Using Tools' (W.R.S. = 34), 'Eat with Knife and Fork' (W.R.S. = 31), 'Hang out Clothes' (W.R.S. = 30), and 'Take Lid off Jars' (W.R.S. = 30). The task was to select three of these four activities for inclusion in the final form of the question. The rejected item was 'Hang out Clothes' as it was felt that this was a less widely practised activity than the others.

The four activities with the lowest W.R.S. were also easily identifiable. They were, 'Pick up Coins' (W.R.S. = 17), 'Answer Phone' (W.R.S. = 17), 'Hold Cup and Saucer' (W.R.S. = 17), and 'Writing' (W.R.S. = 17). One of the four activities had to be dropped to retain the three activities needed for the question. An arbitary decision was made to drop 'Answer Phone'. This was justifiable in that the removal of any of the activities was not expected to alter the pattern of responses to the question in its final form.

The determination of the three activities to represent the middle of the range was more difficult. This decision was however assisted by the fact that three of the remaining activities had been rated in the middle category by eight of the judges. These activities were, as shown on Table 4., Make a Bed (W.R.S. = 18), Wash Dishes (W.R.S. = 21) and Take a note out of a Wallet (W.R.S. = 24). It can be suggested that these activities represent the strength of rankings in the middle of the range. It can also be noted that the level of consensus for these activities being 'useful but not essential' gives a C.V.R. value of 0.6 which is on the borderline of significance at (P = 0.05). This fact reinforces their choice as the desired activities.

The second judgement task (E) to undergo weighted rank score analysis was designed to examine the places for inclusion in the final question on places where the prosthesis was worn. Table 5 shows the frequency of the judges ratings. It also gives the W.R.S. for each place calculated by formula (2). It can be seen that two places obtained weighted rank scores of 40, these were, Work and Meals. Three other items received rank scores of 38, 38 and 36. These options were, In Public, Social Occasions,and At Home respectively. Two places had rank scores in the mid range. Movies (W.R.S. = 32) and Travelling (W.R.S. = 28). While one place had a low value, Bed (W.R.S. = 10).

From these places the two with the maximum W.R.S. the two with values in the mid range and the option with the lowest weighted rank score were all selected for the final form of the item.

TABLE 5. Ratings by judges of places prosthesis worn and rank scores for each place.

Places	Often	Sometimes	Never	Ranking Score
Bed	-	-	10	10
Home	8	2	-	36
Public	9	1	-	38
Meals	10	-	-	40
Movies	6	4	-	32
Social +	9	1	-	38
Travelling	4	6	-	28
Work	10	-	-	40

+ Abbreviated option.

ANALYSIS THREE

The final analysis to be carried out was on judgement task (B). This task required the judges to say which of item (1) and item (2) (Appendix B) was, in their opinion, the better measure. It can be seen from Table 6 that six judges opted for item (1) and four for item (2).

TABLE 6 Choice of Judges between Questions 1 and 2

Question	1	2
Frequency	6	4

The χ^2 formula with a continuity correction, shown below, as specified by Roscoe (1975) was used in determining if the difference was significant.

$$\chi^2 = \sum_{j=1}^{k} \frac{(|0j-Ej|-\frac{1}{2})^2}{Ej} \qquad (3)$$

Roscoe (1975; P.249)

Applying this formula to the values obtained and using expected values of equal judgements for each item, it was found that;

$\chi^2_{(1)} = 0.1$ $(P > .05)$ (See appendix B for calculations)

It can therefore be stated that there was no significant difference, in the opinions of the judges, between item (1) and item (2).

DISCUSSION

From the results of the validation procedure it can be seen that items 1, 2, 6, 7, 8, 9 were able to be included in the final form of the questionnaire. For item (6) the nine options included were, 'Using Tools', 'Eat with a knife and fork', Take lid off jar', 'Pick up coin', 'Hold cup and saucer', 'Writing', 'Make a bed', 'Wash dishes' and 'Take note out of wallet'. For item (7)

the five options included were 'Work', 'Meals', 'Movies', 'Travelling' and 'Bed".

Included with these measures of use and satisfaction with use were the items relating to prosthesis types, services used and demographic variables.

There were four different characteristics of prostheses that were useful in classifying them. Firstly motive power - Does the prosthesis operate using myoelectric signals or is it mechanically operated? Another option was a purely cosmetic, nonfunctional unit. The length of the prosthesis was important. The length could range from full arm units, down through above elbow, below elbow and wrist units, to a part hand prosthesis.

Another characteristic was the kind of terminal attachment used. These could be utility hooks, artificial hands, or special attachments for specific purposes. (Fuller details on these terms are given in Appendix A). These characteristics combine to give an accurate classification of the type of prosthesis worn by the respondent. The final characteristic was the length of time that the respondent had owned a prosthesis.

This therefore gave five items on the prosthesis. One was on motive power, one on length, two on type of terminal units, and one on the length of time the prosthesis has been owned.

An item inquiring into what helping professionals were seen during the fitting and rehabilitation processes seemed appropriate. The different options were, Limb Centre, Physiotherapist, Occupational Therapist, Rehabilitation Unit or none.

Other relevant information to be included in the questionnaire were the demographic variables. This information can be of use in identifying the major groups of amputees and whether or not low-users had certain profiles. There were six demographic variables chosen as

relevant. These were, the age of the recipient, their occupation which in some cases could be compared to their occupation prior to receipt of the prosthesis, gender, ethnic origin, and education level. A final one was the recipient's dominant hand. This was included to see if having the prosthesis on the dominant side affected its use.

The only question remaining as regards these variables was what options to allow for in the classification of ethnic groups. A recent study examining the dental needs of the disabled (Croxson, Clarke and Burrough, in preparation) showed that the majority of respondents within New Zealand fell into three clear ethnic groups, Maori. Polynesian and Caucasian. Using this as justification the question allowed four options, European, Maori, Polynesian and an 'others' category.

In the construction of the first form of the questionnaire a number of general factors had to be taken into account. These were due to it being presented as a postal questionnaire. Firstly all the relevant information required to successfully complete the questionnaire needed to be included. All instructions would need to be clear and unambiguous so that the respondent could fill in the questionnaire accurately. Finally, to encourage a high response rate, brevity would be desirable.

With these things in mind a number of techniques were used to facilitate the success of the questionnaire. Initially it was separated into four sections. There was a statement at the beginning of each section to orientate the respondent towards the kind of things the items in that section would be covering. It was envisaged that this would make the questionnaire easier to understand. Except for the items dealing with the length of time the recipient had had the prosthesis, the age of the recipient, the recipient's occupation, and the recipient's education, all responses required were similar. By only

requiring the respondent to tick the appropriate answer for each of the items a number of things were accomplished. The size of the questions were minimised, the time commitment in answering the questionnaire was lessened and the instructions could be simple and stated a minimal number of times.

These features were all combined in the final form of the questionnaire as can be seen in Appendix C.

CHAPTER 4. THE INTERVIEW

- Introduction
- Research Interviews
- Interview Content

INTRODUCTION

The interviews were presented in this study as a pilot study for further use in research examining possible psychological factors affecting the reactions of recipients to their prostheses. The factors being examined were introduced in the Literature Review. By the examination of both low-users and high-users comparisons of their relative positions on these factors could be evaluated. The main purpose in the proposed future research would be to identify those factors which related to the rejection of prostheses, in an attempt to provide some avenues that helping professionals may explore in their dealings with prosthesis recipients at risk of becoming rejectors.

The use of the interview in this research would allow the interviewees freedom in their responses while still permitting enough structure to enable the researcher to obtain usable data.

The type and range of issues meant that a questionnaire was too impersonal to expect a high level of response. The range of issues also meant that no pre-designed instruments were available to measure them.

RESEARCH INTERVIEWS

All the points expressed about research interviews were developed from Brenner (1981) who expounds the guidelines more fully and provides justification where applicable.

In the design and implementation of a research interview there are a number of concerns that need to be taken into account. The writer acknowledges these concerns in describing a process in which the primary aim is to collect valid usable data. The interview has three dimensions that can affect the results achieved.

The first of these is related to the interviewee. With the interviewee the quality of response is the

main concern. Three things can affect this quality. Firstly, the accessability of information; "Can the interviewee retrieve the required information?" Any difficulty may be due either to the fact that the interviewee doesn't have the required information or it may be being suppressed because of desirability factors. While a lack of information cannot be counted out the effect of social desirability factors can be minimised by careful attention to the nature and wording of questions along with the presentation techniques used. Secondly, "Does the interviewee understand the question being asked?" This again requires that the questions be examined for intelligibility and ambiguity. The third area is the willingness of the interviewee to answer the questions. Interviewee motivation to answer can be controlled to some extent by the nature of the presentation by the interviewer.

The next area of concern is that of the interviewer. The primary way in which the interviewer can affect the results is by causing bias through reacting to the topic, the answers, or the interviewee. Inappropriate action in these areas can cause a change in the responses of the interviewee. Another problem is that the interviewer may introduce errors in recording responses. The way to overcome this is by training and practising the skills of recording prior to conducting the research.

Accuracy and impartiality can be facilitated if the interviewer follows a number of rules in relation to the presentation of questions, the recording of responses and in dealing with any interviewee difficulties. In asking questions the interviewer should speak slowly with the correct stress ensuring that the questions are presented as written. The questions should be asked in the pre-determined order and all questions relevant to that interviewee should be presented. Prompts should be used where necessary. Answers should be recorded verbatim and then repeated to ensure correct recording. The interviewer

should give no verbal or non-verbal approval or disapproval for particular answers. It is also important that the interviewee be encouraged to respond and that the interviewer should show interest as this could motivate the interviewee to answer further questions. The interviewer must probe for more complete answers in a non-directive way and must not answer for the respondent. The interviewer should not seek unrelated information. If the interviewee is having difficulty with a question then the interviewer should be prepared to either repeat the question or provide clarification as required.

The final area of concern is the design of the questions for the interview. They must be unambiguous and expose relevant information for the study. The interview presentation must be standardised so that its presentation across subjects will be the same to enable a valid comparison of information from different subjects.

Interview Content

Having covered the general principles, in the design of research interviews, the next step was to explain how each of the areas of psychological concern were explored within the context of the interview.

Training

The major interest in this area is the perceptions of the recipients as to the adequacy of the training they received. In doing this it is important to obtain some idea of the amount and kind of training that occurred. If differences appear in the perception of the adequacy of training, between high-users and low-users, the actual training received could be checked for corresponding differences.

The question about the amount of training was: "Could you briefly outline the steps you went through in getting your prosthesis?"

This format allowed for a narrative description of the whole procedure the recipient was involved in, especially any significant events outside the fitting period.

The question about the perceived adequacy of training was:
"How satisfactory was the training you got?"

The interviewee was asked to respond using one of a series of options printed on a card. These options were: very unsatisfactory, unsatisfactory, adequate, satisfactory, and very satisfactory (see Appendix D). This was done to ensure a uniform type of response to facilitate analysis.

It was expected that low-users would see the training as being less adequate than would high-users. Moreover, the substantially uniform fitting procedure used at the Artificial Limb Centre would mean that no corresponding differences in actual training received would be found to match the differences in perceived adequacy of training.

If the recipient perceived the training as inadequate then this may have been due to their having unrealistic expectations of the potential performance capabilities of the prosthesis. The failure of the prosthesis to match such unrealistic expectations could be attributed, by the recipient, to a failure of the training procedure. Such an attribution would show up as the recipient perceiving the training to be inadequate.

The existence of such unrealistic expectations was checked by the question:
"Before getting the prosthesis how well did you expect to be able to use it?"

Answers suggesting expectations that the prosthesis would have capabilities comparable to those of a natural arm were seen as unrealistic. Answers relating expectations to the later experienced actual capabilities of a prosthesis were seen as realistic. The relationship between expectations and perception of training were

checked by comparing the recipient's answers about how adequate they thought the training was with their answers regarding their prior perceptions of the capabilities of the prosthesis.

Perceptions of Independence and Stigma

Independence

The importance of independence and the ability to control or manipulate the environment has already been stressed (Chapter 3). To examine how recipients saw the prosthesis affecting their independence two questions were asked:

"How much help do you need when you are wearing the prosthesis?"

"How much help do you need when you are not wearing the prosthesis?"

Interviewees were asked to respond to one of five options. These were: no things, few things, some things, most things and all things (see Appendix D).

Each subject's responses to the two questions would be combined. Each subject could show one of three patterns of response. They could say that with the prosthesis they needed less help than without it, that they needed the same amount of help with or without the prosthesis, or finally that they needed more help with the prosthesis than without it.

Low-users would be expected to only say that they need the same or more help with the prosthesis than without it. High-users would be expected to only say that they need less or the same amount of help with the prosthesis as without it. Comparing the high-users and low-users would therefore show one of four patterns of response. (Table 7).

TABLE 7. Independence and help needed when wearing the prosthesis as against when not wearing it for low and high users.

		High Users	
		Less Help	Some Help
Low Users	Some help	H.User: More independent L.User: No difference 1.	H. User: No difference L. User: No difference 4.
	More help	H.User: More independent L.User: Less independent 2.	H. User: No difference L. User: Less independent 3.

The effect of the need for independence would be seen in three of the four patterns. The first pattern with high-users needing less help and low-users needing the same amount of help shows the prosthesis aiding the high-users need for independence resulting in their increased use of the prosthesis (1). The second pattern with high-users needing less help and low-users needing more help show the dual effect of high-users seeing the prosthesis aiding their independence resulting in higher use while the low-users seeing the prosthesis adversely affecting their independence resulting in a lower level of use (2). The third pattern with high-users needing the same amount of help and low-users needing more help shows the low-users seeing the use of the prosthesis adversely affecting their independence (3). The final pattern of both high-users and low-users needing the same help shows the situation where independence is not a factor affecting use (4).

Stigma

The occurrence of social stigma for the disabled has already been discussed (Chapter 3). A useful measure of

stigma was how the recipients saw strangers reacting to them. The questions used to explore this were:

"How do strangers react to you when you are wearing the prosthesis?"

"How do strangers react to you when you are not wearing the prosthesis?"

The answers would be in narrative form to allow the subjects to freely draw on specific memories that highlighted attitudes they had been faced with. The answers would be presented blind to a judge to be rated according to how positive they saw the expressed reactions. If low-users indicated that strangers reactions were more positive when they were not wearing the prosthesis it would indicate that the desire to avoid stigma resulted in their lower use of the prosthesis. On the other hand if high-users saw more positive reactions when they were wearing the prosthesis then the desire to avoid stigma would result in their higher use of the prosthesis. The occurrence of either or both of these response patterns would indicate that the presence of stigma affects the use of prostheses by recipients.

Perceptions of the prosthesis

There was a concern expressed that recipients who perceive the prosthesis as a replacement arm may not use it because of its failure to perform up to the expected standard. To see if the recipient perceived the prosthesis as a tool or a replacement arm a series of questions were asked. They were:

"For what reason do you wear the prosthesis?"

The narrative responses to this question were to be judged on whether interviewees referred to uses such as performing specific tasks or to uses related to replacing the lost arm. Low-users were expected to tend towards arm replacement reasons while users were expected to have more task orientated reasons for wearing the prosthesis.

"What kind of thing would you call your prosthesis?"

Here again the low-users were expected to respond with reference to a replacement arm. Users were expected to respond more along the lines of a tool or something to help them do things.

"If you had a choice of terminal units which would you prefer?"

Interviewees were asked to respond with one of a number of supplied options, which were: hook, mechanical hand, cosmetic hand, and special attachment. An interviewee with a 'replacement' view should have responded with mechanical or cosmetic hand while one with an 'aid' view should have responded with hook or special attachment. Low-users therefore would be expected to opt mainly for a 'hand' which gives the appearance of normality while a high user would be expected to opt for the more functional hook or a special attachment.

The recipients view of the prosthesis could also be assessed through the question relating to prior expectations of performance with the prosthesis as mentioned in the section of training (page 49). Expectations that it could do everything a natural arm could do would indicate a replacement view.

There is one final measure which is partly prosthesis perception and partly self-perception. This is to see how much the recipients have integrated the prosthesis into their view of themselves. A high-user would be expected to have a more integrated view.

It was hoped to measure this by getting the interviewees to draw a sketch of themselves. Drawings have been used in the field of neuropsychology as an assessment tool among brain damaged subjects (Walsh, 1978; Silver, 1975; Bisiach and Luzzatti, 1978). These studies have looked mainly at representational space and the interrelatedness of different aspects of drawing. Cohn (1980) has used the drawing of self to examine 'Body Image'

concept among brain damaged patients. This procedure can be adapted for use with amputees to assess the way in which the prosthesis is, or is not, included in their body image.

There would seem to be three possible configurations that could be drawn. The drawing could include stump only, or a stump with a prosthesis attached, or finally a normal body with two arms and no stump/prosthesis delineation.

Low-users were expected to draw themselves with a stump and no prosthesis, indicating the way in which the prosthesis has not been accepted as an integral part of their lives. High-users would be expected to draw themselves with the prosthesis attached, showing its acceptance as part of their lives, or without it, which would be interpreted as showing a definite tool approach. The third configuration that of a normal person, would occur only in limited cases such as new amputees who have not yet fully accepted the loss of their natural limb.

All the questions in the order in which they were presented are given in Appendix D.

CHAPTER 5. METHODS

- Questionnaire
  - Subjects
  - Procedure
  - Analysis
- Interview
  - Subjects
  - Procedure
  - Future research

QUESTIONNAIRE ADMINISTRATION

SUBJECTS

There was a major problem in the selection of a sample of recipients on which to conduct the study as there were limits set on the population. Firstly it included only those individuals who received a primary prosthesis anytime between January 1975 and May 1982. Secondly any individuals who at May 1982 were aged less than 5 years were excluded. Within these limitations there was a population of seventy recipients.

Given this population size the formula given by Christensen (1980) could be used to calculate the required sample size for significant results with a dichotomous variable.

$$n = \frac{\chi^2 \cdot N\text{-}P(1\text{-}P)}{(d)^2 \cdot (N\text{-}1) + \chi^2 \cdot P(1\text{-}P)} \qquad (4)$$

where n equals required sample size, χ^2 the value for 1 df at required significance level, P equals population proportion (with P=0.5 giving the largest value), d equal to the maximum departure allowed from the estimated proportions, and N being the population size.

Setting P to 0.5 and d to 0.05 the required sample is 60.

This value equals 85.71 per cent of the population (Appendix C).

The need for such a high percentage of the population in a random sample and the political consideration of allowing all recipients the chance to comment affected the sampling decision. These considerations and the fact that this study was designed to give guidelines rather than be generalised beyond the present population meant that it was feasible to attempt a census of prosthesis recipients.

Of the population of seventy individuals 34 returned

completed questionnaires. This response rate of 48.57 per cent seems relatively low. However, Croxson, Clarke and Burrough (in preparation) using a postal questionnaire with a follow-up visit to collect it, to study dental needs among the disabled, had only a 15.79 per cent return rate for amputees. The return rate for purely postal questionnaires can range from 10 to 50 per cent (Kidder, 1981). In comparison to these figures the present study seems to have achieved a reasonable response rate. It does mean, however, that the conclusions of this study must be handled conservatively.

A breakdown of the recipient population across the variables, age, sex, referring Hospital Board, cause of limb loss, and site of limb loss is given in extracts from a preliminary report to the Artificial Limb Centre (Appendix E).

APPARATUS

The apparatus used was the questionnaire (Appendix C) as developed in the chapter on 'The Questionnaire'.

PROCEDURE

The procedure simply consisted of posting each individual in the population a copy of the questionnaire which was accompanied by a covering letter explaining the purpose of the study and inviting the individual to participate. Each posting included a stamped addressed envelope for the return of the completed questionnaire.

One unfortunate incident which occurred was that, due to a communication breakdown, copies of a draft questionnaire were initially distributed. This was overcome by sending each individual a copy of the final questionnaire with a covering note explaining the situation and asking the individuals to complete the second questionnaire. Seventeen of the respondents completed both questionnaires.

ANALYSIS

The analyses were designed to fulfil the aims of the study; the examination of the prostheses-related variables and the demographic variables together with the measures of use variables to look for patterns of response for different groups. This was completed by a cross tabulation of the relevant variables with the appropriate use measures.

The second main aim of the questionnaire was to provide a means of ranking the respondents according to their use levels. The best way to achieve this was through the combination of the information on the different use measures into one composite 'level of use' variable. As this 'level of use' variable could be seen as a common underlying factor across all measures, a factor analysis procedure would have been the first choice in isolating this underlying variable. However it has been recommended (Gorsuch 1974) that factor analysis not be attempted with a pool of less than 100 subjects. With only 34 respondents this questionnaire fell well short of that required number. Factor analysis was therefore dropped as a possible procedure.

Another approach would be to make the assumption that the 'level of use' could be seen as a dimension in space onto which the respondents patterns of responses on the other use variables could be mapped. This mapping could then be used to determine each respondent's position on the 'level of use' dimension.

This assumption would suggest the use of a multi-dimensional scaling technique (van der Ven 1980). Multidimensional Scaling (M.D.S.) has the advantage that it can be used with a small number of subjects. To use the available M.D.S. required that data be in the form of difference or similarity measures. This is where the subjects are asked to make judgments regarding the differences or similarities between pairs of stimuli

(Torgerson 1958). The data obtained from the questionnaire was not in this form and could not be converted without causing basic changes in the patterns of responses. Unless it could be shown that such changes did not occur the M.D.S. analysis would be invalidated. This meant that M.D.S. was also an unusable procedure.

A less formal approach would be to create a composite variable by summing the scores on each variable for each respondent. This would be best achieved by transforming all the variables into a similar scale of measurement, applying weights to each variable according to its importance in measuring use, then summing the scores across variables. Each variable's scores were converted into Z scores which meant that all of the variables were expressed in standard deviation units. The most feasible weighting was, of course, the C.V.R. as given in Table (2) (page 38). These C.V.R. scores showed the importance of each variable in measuring use. The Z scores were then multiplied by the appropriate C.V.R. value and added together giving the 'level of use' variable scores.

The final stage of analysis was to determine if any of the types of prosthesis or demographic variables could explain significant amounts of the variance in the 'level of use' variable. To do this a multiple regression procedure was used, comparing 'level of use' against the questionnaire results (Hull and Nie, 1981).

Interview Administration

The research for which this was a pilot study is designed to test the significance of certain psychological factors in explaining the pattern of prosthesis use among recipients. This will be done by selecting two groups of subjects, one being low-users and the other being high-users, of their prostheses, as indicated by their results on the questionnaire presented in this report. The two groups will be interviewed and their responses statistically analysed to determine any significant differences. The aim of the pilot study was to check on the efficiency of the interviews (Appendix D) to elicit the desired information and to identify any further areas of interest that could be explored in the main study.

Subjects

Two subjects were tested. One subject was shown to be a high user of the prosthesis scoring 46.98 on the 'level of use' variable. The other was shown to be a low user with a 'level of use' score of -53.42 (Chapter 7).

Procedure

The interview (Appendix D) was administered to both subjects with their responses being recorded on tape and transcribed later. Both subjects' involvement was voluntary and they understood their right to refuse to answer any of the questions. Both subjects exercised this right with regard to question K which requested that they draw a sketch of themselves in an attempt to measure the way in which they had integrated the prosthesis into their own body image. The refusals were directed at the artistic requirement implied within the question.

The results of the two interviews are presented separately as case studies with each subject's responses to the earlier questionnaire being included to supply relevant background material.

The case study format has been used because it allows

for a detailed examination of the kind of information in the subjects' responses. This approach permits an informal comparison between the two subjects and the presentation of new areas of interest that arose in the interview. This flexible approach could not have been achieved with any more formal presentation of the responses.

CHAPTER 6. QUESTIONNAIRE: RESULTS AND DISCUSSION.

- Results

- Discussion

RESULTS

A preliminary report was compiled and sent to the Artificial Limb Centre. This report contained a breakdown of response frequencies for the use measures and comparisons between these measures and each of, prosthesis type and demographic variables. A summary of that report and relevant extracts from it can be found in Appendix E.

There were six measures of prosthesis use; hours worn a day, time of day prosthesis worn, activities done with prosthesis, places prosthesis worn, satisfaction with number of things able to be done, and satisfaction with how well things could be done.

In responding to hours worn a day question 61.8 per cent of respondents said that they wore the prosthesis less than 6 hours a day with 38.2 per cent indicating that they usually did not wear it at all (Table 15. Appendix E). The time of day when the prosthesis was most likely to be worn was from 9 a.m. to noon with 41.2 per cent of respondents wearing it at that time. The time when least use occurred was after 9 p.m. with only 17.6 per cent (Table 16. Appendix E).

There was a wide range of responses to the question pertaining to activities performed using the prosthesis. The activity 'Using Tools' was the most frequently chosen option (32.8 per cent) and 'Picking up a Coin' was chosen by only 2.9 per cent of respondents (Table 17. Appendix E).

To get a more usable measure of activities performed using the prosthesis a composite variable was developed from the answers to this question.

The question contained nine activities as options. Each activity had previously been classified according to how necessary the prosthesis was seen to be in performing it (Chapter 3). The three activities for which the prosthesis was most likely to be used were assigned a weight of 1. A weight of 2 was given to the three activities

in the mid range of necessity of prosthesis use. The three activities where the prosthesis was least likely to be used were assigned a weight of 3.

The composite variable was arrived at by summing the weights of all the activities which the respondents indicated as being ones for which they used the prosthesis. The use of weights meant that a respondent's score did not just indicate the number of activities they used the prosthesis for but also indicated the kinds of activities done in terms of how necessary a prosthesis was seen to be in performing those activities.

The composite 'Things done' variable had a minimum possible score of Ø and a maximum of 18. Of the respondents answering this question 55.9 per cent scored Ø and the highest score for any respondent was 11. (Table 18. Appendix E).

The responses of where the prosthesis was worn ranged from 41.2 per cent wearing it to work, down to 29.4 per cent wearing it at meals. These figures exclude the option of 'bed' which was dropped from all analyses because no respondents indicated that they wore the prosthesis there.

As with the question pertaining to things done, a composite variable was developed for the places question. Of the four remaining options, after removing 'bed', two had been rated as places the prosthesis would be likely to be worn and two had been rated as places where the prosthesis was less likely to be worn (Chapter 3). The places where the prosthesis was likely to be worn were assigned weights of 1 while the places where the prosthesis was less likely to be worn were assigned weights of 2. The composite score for each respondent was arrived at through the summing procedure previously described.

The range of possible scores on the 'places' variable was from 0 to 6. Table 20 (Appendix E) shows that 38.2

per cent of respondents indicated that they did not wear the prosthesis to any of the places given.

Looking at the two measures of satisfaction 38.2 per cent of respondents indicated they were either unhappy or very unhappy with the number of things they could do with the prosthesis (Table 21. Appendix E) while 29.4 per cent indicated some level of unhappiness with how well they could do things (Table 22. Appendix E).

The key variables that came out as most important were those relating to the type of prosthesis that the respondents owned. The types of prostheses were categorised into three groups for analysis. There were 4 respondents with myoelectric prostheses and 7 with cosmetic prostheses. Five respondents did not complete that part of the questionnaire (Table 8).

TABLE 8. Types of prostheses worn by respondents.

Type	Myoelectric	Mechanical	Cosmetic	Unknown
Frequency	4	15	7	5

In relation to length of prosthesis, 6 respondents had full arm prostheses, 4 above elbow, 15 below elbow, and 4 to wrist. Again 5 respondents did not complete this question (Table 9).

TABLE 9. Length of prostheses worn by respondents.

Length	Full arm	Above elbow	Below elbow	Wrist	Unknown
Frequency	6	4	15	4	5

The terminal units used were all either hooks or hands. Nine respondents used a hook, 7 a hand, and 13 used both, at different times. There were 5 respondents who did not complete this question (Table 10). While information was collected on the side of the body on which the prosthesis

was worn the inclusion of this data made the classification of the prostheses meaningless, creating a large number of categories with few or no responses in them.

TABLE 10. Type of terminal units used by respondents

Unit	Hook	Hand	Both	Unknown
Frequency	9	7	15	5

COMPOSITE USE VARIABLE

The development of a composite 'level of use' variable was achieved using a weighted sums technique (Chapter 5).

In the creation of the composite variable only five of the six use measures were utilized. The measure of times a day that the prosthesis was usually worn was dropped as it could not be converted into a single score which would accurately indicate the respondents' use pattern.

The five measures used were; hours a day, composite 'things done' measure, composite 'places' measure, satisfaction with number of things done and satisfaction with how well things could be done.

The calculation of the composite 'level of use' variable was achieved by first converting the five use scores to standard score form. This was done to ensure that all the measures used similar units so that they could be directly compared.

The second stage of calculation was the assigning of a weight to each of the measures. The weights used were the C.V.R. values that each of the measures achieved in the validation process (Chapter 3). The use of these values was justified because they represent the degree to which the judges saw each measure relating to the concept of 'level of use of prostheses'. Their high values are

due to the fact that the measures had to receive high C.V.R. values before being included in the questionnaire.

The formula for calculating the composite variable was:

$$\text{'level of use'} = Hd(0.8) + Th(0.8) + PL(0.99) + Sn(0.99) + Sw(0.99) \quad (7)$$

with Hd being hours a day, Th things done, Pl places worn, Sn satisfaction with number of things able to be done, and Sw satisfaction with how well things could be done. The fact that standard scores were used meant that those individuals who had scores below the mean on the individual use measures would receive a negative score on the composite variable.

It can be seen from Table 11 that there were three distinct groups of respondents, with 13 scoring below -30, 16 scoring between -19 and 49, and five respondents scoring 70 or over.

TABLE 11. Scores achieved on 'Level of Use' variable for all respondents. (High score equates with high use.)

Score	Frequency
below -50	6
-40 to -49	4
-30 to -39	3
-20 to -29	-
-10 to -19	3
0 to - 9	3
1 to 9	1
10 to 19	2
20 to 29	1
30 to 39	2
40 to 49	4
50 to 59	-
60 to 69	-
70 to 79	3
80+	2
Total	34

REGRESSION ANALYSIS

The regression analysis used was the S.P.S.S. new regression procedure (Hull and Nie 1981) using 'Level of use' as the Dependent Variable against the following Independent Variables; type of prosthesis, length of prosthesis, type of terminal unit, time having owned prosthesis, dominant hand, referring Hospital Board, sex, age, occupation, and education level. Helping services used and ethnic origin were not included in the analysis because a lack of variance within the variables made their predictive ability minimal. Only one respondent acknowledged using any other service than the Artificial Limb Centre and all but two respondents were caucasian.

TABLE 12. Selected statistics from regression procedure.

Multiple R	0.70432	Adjusted R^2	0.44567
R^2	0.49606	Standard error	34.33561

Analysis of Variance

	df	ms	ms/df	F
Regression	2	23210.23767	11605.11883	9.84374
Residual	20	23578.68013	1178.93401	

Significance F = 0.0113

Only two variables were stepped into the regression equation before the probability of the inclusion of any further variables causing significant changes in the regression equation reached the termination value (0.05) for the procedure. The two variables were type of prosthesis and then length of prosthesis. (Complete regression printout in Appendix C). These two variables combined had an adjusted R^2 value of 0.44567 (Table 12) showing that they accounted for 44.5 per cent of the variance in the 'level of use' variable.

DISCUSSION

Prior to discussing the results it is important to reiterate the effect of the relatively low response rate. It will be remembered that a census was attempted but only 48.6 per cent of the population responded. This percentage while low, was reasonable in comparison to other surveys of disabled individuals and expected returns from a postal survey. The distribution of respondents was also similar to that of the population over a number of variables (Appendix E). The low response rate does mean however that the results obtained are not as robust as would have been the case with a random sample. Nevertheless the respondents seemed to be representative of the population which means that trends occurring in the results can be accepted as true for the population. On the other hand the strength of these trends cannot be fully determined from this study.

The major issue that the questionnaire was examining was whether or not rejection occurred. Rejection was defined as the non-use or minimal use of the prosthesis. As was expected, there was strong evidence in the results of rejection of the prosthesis. This can be seen by the level of non-use indicated with 38.2 per cent never wearing the prosthesis, 55.9 per cent not utilizing the prosthesis for performing activities, and the 38.2 per cent indicating that there were no places to which they wore the prosthesis. This data is further highlighted by the substantial percentages who made only minimal use on these measures. (Appendix E). These measures can be seen alongside the qualitative measures of satisfaction with 38.2 per cent and 29.3 per cent of respondents showing some lack of satisfaction with the number of things they could do and how well they could do them, respectively (Appendix E).

These results suggest that the rejection of prosthesis may extend to as much as 40 per cent of the population and must be at a minimum 18 per cent.

These findings of rejection have given qualitative support to the earlier speculations of Wilson (1970) and

McKenzie (1970) both of whom recognised a problem in this area. The results are also of a similar magnitude to those obtained by Herberts et al (1980). Their findings estimated that 26.3 per cent of their sample not using a prosthesis, compared with this study's 38.2 per cent non-wearers.

The second issue that was to be addressed through the questionnaire was whether any of the prosthesis type or demographic variables could be used to explain any of the variance in use levels.

Using the stepwise regression procedure it was found that two of these variables contributed a significant amount to the variance of the 'level of use' measure. These two were the type of prosthesis and its length which together accounted for 44.5 per cent of the variance.

This relationship may be very closely related to the functional value of the prosthesis with myoelectric and mechanical units being of more use than purely cosmetic units. Moreover, it is easier to provide a functional prosthesis when a longer stump exists. This explanation can be further supported from the cross tabulations in the preliminary report, submitted to the Artificial Limb Centre. In the summary of that report (Appendix E) it can be seen that users tended to be employed, and in the middle age range. This further suggests that the functional capabilities of the prosthesis are an important factor in its use.

Wilson (1970) and McKenzie (1970) both identified limited functional capabilities, a lack of skill in using the prosthesis, and one handedness leading to no functional need for the prosthesis, as reasons for rejection.

The strong connection between prosthesis type and its functional use means that the results of this study finally bring some quantitative evidence to support these claims.

The conclusions that can be brought from these studies relate to a need to ensure that recipients have learnt to maximise the functional use of the prosthesis before rehabilitation is terminated. The higher the level of skill attained by the recipient then the less likely is that recipient to reject the prosthesis. This should also mean, as is the practice at the Artificial Limb Centre, that attempts should be made to give each recipient the most functional prosthesis possible according to their stump level.

CHAPTER 7. INTERVIEW: PILOT STUDY

- Results
  - Case I
  - Case II
- Discussion

CASE STUDY I

Mr. X. is a caucasian male between 40 and 49 years of age. He has received secondary school education and had worked as a panel beater in a small engineering business.

A few years ago Mr. X. lost part of his left arm in an industrial accident. The arm was lost at a point approximately 4 to 5 inches below the elbow. This had a major affect on Mr. X. as he was left handed. The loss resulted in an extended period of absence from work. When he returned to work Mr. X. was placed in a supervisory job. This job was less physically demanding that his earlier work and also less senior.

Two years ago Mr. X. was fitted with a below elbow prosthesis which was mechanically powered. He was given a utility hook terminal unit and also a mechanical hand. Attempts were made to adapt his work tools (hammers) to fit into the prosthesis but these attempts were unsuccessful.

In completing the questionnaire Mr. X. indicated that he did not usually wear the prosthesis. He did not use it to perform any of the listed activities and he never wore it to any of the places mentioned. Mr. X. was very unhappy with the number of things that he was able to do with the prosthesis. He was also very unhappy with how well he could do things with it. The combination of these responses into the 'level of use' variable (calculated according to the formula on page) gave Mr. X. a score of -53.42, which was the minimum possible.

Mr. X. could therefore be quite validly described as a recipient who indicated a strong rejection of this prosthesis. He was selected for this pilot study as a non-user.

TRAINING

In receiving the prosthesis Mr. X. visited the Artificial Limb Centre, doing so on two occasions. On the first occasion he was measured for a prosthesis and a mould was taken of his stump. On the second trip Mr. X. was

introduced to his prosthesis and shown what he could do with it.

Mr. X's view on training was that it was non-existent and was therefore unsatisfactory. He stated during the interview that there was "no real training involved; they presented you with the prosthesis and that was that."

This feeling of dissatisfaction with the training received may be a factor contributing to the non-use of the prosthesis but needs to be examined along with Mr. X's view of the prosthesis and his expectations of its capabilities.

PERCEPTION OF THE PROSTHESIS

Mr. X's sole uses for the prosthesis were to hold welding wire and for hammering nails. It was clear from his statement that these limited tasks constituted his total use of the prosthesis. He felt that his prosthesis was "prehistoric, that's exactly the word, ... It's so old fashioned it's not funny." While preferring the hook Mr. X. indicated that he felt that the mechanical hand was functionally inferior, was a different size to his natural right hand, and looked unnatural both in its colour, which contrasted with his natural colour, and in its texture. These things were given as reasons for not wearing it.

The questions were not able to fulfil the purpose for which they were designed, which was to determine whether Mr. X. saw the prosthesis as a tool or as a replacement arm. The purely task orientated use may point to a tool view of the prosthesis. The questions did however allow Mr. X. to indicate that whatever his view of the prosthesis he saw it as being totally inadequate to fulfil that purpose and also as a generally inferior object.

Mr. X. had expected that he would have been able to use the prosthesis for every task he had been able to do before (that was with his natural hand) and that he had thought that "these..... prostheses would work, until I

(Mr. X.) went down and had one fitted." These expectations were unrealistically high and may indicate a view that the prosthesis was meant to be a replacement. They may also explain Mr. X's view of the adequacy of the prosthesis and the training he received.

STIGMA

When Mr. X. first lost his arm he felt that people looked at him though he now feels that those feelings may have been as much due to his own sensitivity as it was to other people's actions. He felt that at present his lack of an arm, "doesn't worry anyone." That is he did not receive any negative reactions when not wearing the prosthesis. This was, he felt, due to the fact that in the medium sized urban centre in which he lived everyone knew him and did not worry about it.

Mr. X. could not really say how people would react to him wearing the prosthesis as he had never worn it in public. In saying this Mr. X. was indicating that the only place he wore it was at home.

INDEPENDENCE

When not wearing the prosthesis Mr. X. felt that he needed help from other people in some things. However, when wearing the prosthesis he did not need any help. While these responses sound, on the surface, as if the prosthesis made Mr. X. more independent it must be said that Mr. X. qualified his response by the statement that he wore the prosthesis for only specific limited tasks. This meant that he was never in a situation where he might need help while wearing the prosthesis and that he only wore it to perform tasks which he knew he could successfully carry out using the prosthesis.

Mr. X. declined to draw a sketch of himself.

Mr. X. therefore seems to present the image of someone who is extremely dissatisfied with the prosthesis and the help he got in adapting to it, this having led to a one-handed life style.

CASE STUDY II

Mr. Z. is a caucasian male who is between 30 and 34 years of age. He had received a secondary education and worked as a fork lift operator.

Mr. Z. damaged his arm in an accident and had to have the majority of it surgically removed leaving him with a 2 inch stump below the shoulder. He also only retained partial flexibility in the shoulder joint. Mr. Z. experienced no major change in his type of occupation following his loss and the fitting of a prosthesis, even though he lost his left arm which was his dominant one.

Eighteen months ago, and some time after losing his arm, Mr. Z. was fitted with a full arm prosthesis which was mechanically powered. Mr. Z. used a hook but had a cosmetic hand for dress occasions. Just prior to the interview he had received a special attachment to assit with changing gears while driving a car.

In filling in the questionnaire Mr. Z. indicated that he usually wore the prosthesis for up to 12 hours a day, mainly between the hours of 9 a.m. and 9 p.m. While doing only a limited number of things with the prosthesis Mr. Z. indicated that he wore it to a large number of places. Mr. Z. was neither happy nor unhappy with the number of things he could do with the prosthesis, he did however indicate that he was happy with how well he could do these things. The combination of these use patterns gave Mr. Z. a score of 46.98 on the 'Level of use' variable.

This score placed Mr. Z. in the group of recipients who made good functional use of their prostheses.

TRAINING

After having his arm amputated Mr. Z. requested a prosthesis from his doctor who initially denied the request. Mr. Z. made further requests and persuaded his doctor to recommend him for a prosthesis. An appointment

was made with the Artificial Limb Centre and Mr. Z. received a prosthesis almost immediately.

Mr. Z. felt that he did not receive any real training, stating that the Artificial Limb Centre staff "showed me how basically it works and that was it." He did however feel that this instruction was adequate and acknowledged that it was possibly the best that could be done under the circumstances of time restraints.

Mr. Z's feelings about the training, as being adequate though limited, may have been related to his view of the prosthesis. If he could use it well then the training must have been all that was needed.

PERCEPTIONS OF THE PROSTHESIS

Mr. Z. felt that he wore the prosthesis for a number of reasons. The protection of the stump was a primary reason with Mr. Z. who stated that, "If I don't wear it, the arm (stump).....gets sore." This purpose while not directly of major interest may be an indication of the integration of the prosthesis into Mr. Z's life style. He also wore it to help him at work, for manipulating forklift controls, balancing on his motorcycle, and for holding objects.

Mr. Z. said that the prosthesis was designed to help him. The hook was the most used terminal unit, though he did find the new special attachment for changing gears in the car to be extremely helpful.

The expectations that Mr. Z. had held of how well he could use the prosthesis, prior to receiving it, were very restrained because "I didn't have the use of me shoulder and.....I wasn't exactly sure so I didn't put me hopes up." This conservative stance meant that Mr. Z's expectations of the capabilities of the prosthesis were actually lower than its capabilities turned out to be.

The overall picture was that Mr. Z. viewed his

prosthesis as an aid that was designed to help him live more easily and that the extent to which he was able to do this was greater than he expected. This may very well explain how the limited instruction he recieved was seen as adequate as it had enabled him to more than fulfil his expectations in the use of the prosthesis.

STIGMA

Mr. Z. felt that many people did not notice the prosthesis when he wore it until he actually performed some task with it or until some time later when they might happen to notice it. Mr. Z. felt that when they did notice it most people's reactions were, "Pretty good." He did however mention that there was the odd sarcastic person, although these were few. When he was not wearing the prosthesis Mr. Z. felt that he got more or less the same reaction as when he was wearing it. He qualified this with the concession that some people did stare at first but that this reaction soon passed.

These feelings may be indications that the possibility of stigma was not a major factor affecting the amount of use that Mr. Z. made of his prosthesis.

INDEPENDENCE

Mr. Z. required about the same amount of assistance when he was wearing the prosthesis and when he was not wearing the prosthesis. This may be an indication that independence did not play a major role in Mr. Z's decision to wear the prosthesis.

Mr. Z. declined to draw a sketch of himself.

The overall picture of Mr. Z. is one of a person who has found an aid to living and has been able to integrate that aid to facilitate his life style.

DISCUSSION

The evaluation of the responses of the two interviewees was best approached from two directions. Firstly, we examined the response received to determine which of the areas explored could be used profitably in further research to measure factors affecting the use of prostheses. Secondly, there was the evaluation of the responses to determine if they contained the kind of information that the questions were designed to elicit.

The use of only two subjects in the pilot study was due to the need to minimise the depletion of the subject pool for further research. The two subjects were however from the extremity of the range of possible scores on the "Level of Use' variable (Chapter 6) with Mr. X. being among the bottom 6 respondents and Mr. Z. being among the top 9 respondents. One limitation with the procedure is that none of the areas under examination could be justifiably excluded from further research as a result of this pilot study. However, the results could justifiably lead to the inclusion of new areas of interest and the modification of existing questions to improve their efficiency in eliciting usable information.

The main demographic differences between Mr. X. and Mr. Z. were their ages, with Mr. X. being between 40 and 49 years of age and Mr. Z. being between 30 and 34, and the lengths of their prostheses.

From the regression analysis (Chapter 6) it was expected that high-users would own below-elbow prostheses and low-users would own above-elbow or full-arm prostheses. Within this pilot study the reverse was actually the case with Mr. X., the low-user, owning a below-elbow prosthesis and Mr. Z., the high-user, owning a full-arm prosthesis.

TRAINING

The fitting procedure for receiving a prosthesis seemed to be similar for both Mr. Z. and Mr. X. In both cases it consisted of brief visits to the Artificial Limb

Centre for measuring, fitting, and instruction in the use of the prosthesis. Mr. X. indicated that this was accomplished with two trips, while Mr. Z. did not indicate the number of trips he had but his description may be used to infer a single trip, taking into consideration his statement that he received a prosthesis almost straight away. Mr. Z. mentioned that he had difficulty in obtaining a referral to the Artificial Limb Centre. Both subjects acknowledge receiving instruction in the basic use of the prosthesis, but did not receive any further training.

There were, however, major differences in their perceptions of the value of the instruction. Mr. X. said that it was unsatisfactory while Mr. Z. said that it was adequate. This difference in their perceptions of the training corresponded with their levels of use of the prosthesis.

One possible comparison which was suggested earlier (Chapter 4) was that a feeling of dissatisfaction with the training may be due to the performance of the prosthesis, after training, not matching up to prior expectations. This expectation/performance discrepancy may be attributed, by the recipient, to a lack in the training procedure available.

Mr. X. had expected that a prosthesis would enable him to perform all of the tasks of which his natural arm had been capable. Knowing the capabilities of prostheses, this expectation could be said to be unrealistically high and would result in an expectation/performance discrepancy. In comparison Mr. Z., the high-user, had a realistic expectation which even tended to be somewhat conservative with the prosthesis's eventual performance capabilities being greater than he expected.

FACTOR USEFULNESS

The similarity in actual experiences of training and the differences between the two subjects in their perceptions

of the experiences indicate that perceptions of training is a factor in the non-use of prostheses. This could be usefully followed up. The answers to the question on expectancies of usefulness of the prosthesis give indications that this may also be a contributing factor. The continued exploration of the effects of these factors is important as the substantiation of their role in the non-use of prostheses would open the way to a wide range of interventions. These would be mainly in the area of education and facilitating the development of realistic expectations among recipients.

QUESTION EFFECTIVENESS

Question A (Appendix D), asking for a description of the fitting procedure, obtained usable information. Mr. Z's comment on his difficulty in getting a referral may be significant in that it could lead to his justifying the value of the prosthesis because of the effort in obtaining it. If certain significant events, like this, are occurring during fitting then it may be important to get a fuller account of the fitting procedure in order to discover exactly what they involve. To do this Question A could be modified by removing the word 'briefly'. The interviewer could also be instructed to obtain as much detail as possible. A further option may be to reword the question so that it asks about all the things that happened to the subject between the loss of the limb and finally receiving the prosthesis.

Questions B and J seemed to be successful in eliciting useful information regarding the subject's perceptions of the training and expectations about the prosthesis' capabilities.

PERCEPTIONS OF THE PROSTHESIS

When asked what he would call his prosthesis Mr. X. talked in terms of it being old fashioned and prehistoric. His feelings about terminal units were that the hook was

the best of a poor lot and that the cosmetic hand had an unacceptably high number of design faults or shortcomings. The uses he made of the prosthesis were definitely task orientated but were at the same time extremely limited.

Mr. Z's comments were more general talking about the prosthesis in terms of something designed to help him and indicating a preference for the more functional terminal units. His uses of the prosthesis were, like Mr. X's, task orientated but of a far wider range than Mr. X. had indicated.

FACTOR USEFULNESS

The aim of questions D, F, and H was to look for a tool or a replacement view of the prosthesis. Mr. Z's comments could be used to show that he viewed his prosthesis as a tool to help him. Mr. X. from his responses, while sharing something of a tool view, used the questions mainly to express his feelings about the adequacy of the prosthesis. These results tend to indicate that the potential usefulness of the tool/replacement dicotomy in explaining different reactions to prostheses is limited. This does not mean, however, that this area can be dropped from the final form of the interview, as the use of only two subjects means that the obtained results are not robust enough to justify such an action.

One hopeful point in relation to the tool/replacement dicotomy is the responses to question J about the subjects prior expectations of the capabilities of the prosthesis. Mr. X's expectations were definitely orientated towards a replacement while Mr. Z's were orientated to something which may be a useful aid in his life. This may indicate a difference in views which was not exposed by the other questions. The lack of positive results may, therefore, be more due to shortcomings in the questions and not to the irrelevance of the issue at hand.

QUESTION EFFECTIVENESS

In the determination of whether the subject had a tool or replacement view of the prosthesis Question J in its present form would seem to be the most useful. Question F was not specific enough and did not give the subject sufficient cues as to the kind of answer that was required. It may be possible to modify Question F to elicit a more specific response by limiting the answer to a choice from among a set number of definitions of the prosthesis. Definitions such as, a tool, a replacement for a natural arm, or other variations on these themes may be presented to allow the subject to choose the one which most accurately describes his or her prosthesis.

The issue of how good, or bad, the prosthesis is seen to be was raised by Mr. X. It was thought that if poor performance was attributed to a poor prosthesis then the prosthesis would not be worn. This possible effect could be measured in two ways. The first would be through the modification of Question H. The subjects could be asked how useful they felt each of the different terminal units were, as opposed to which they preferred. This question would then give the subjects the opportunity to discuss the capabilities of the units disclosing their perceptions of the quality of the prosthesis. Secondly a new question could be introduced asking,

"How well do you think your prosthesis works?"

If an open ended response format is used then subjects would be free to express either pleasure or displeasure with the capabilities of the prosthesis.

PERCEPTIONS OF INDEPENDENCE

Mr. X. stated that he needed assistance in less things when he was wearing the prosthesis than when he was not wearing it. This answer was qualified by the indication that he only wore the prosthesis in those situations where he knew he would not need any help. Mr. Z. felt that there was no difference in the help he needed between when

he was and was not wearing the prosthesis.

FACTOR USEFULNESS

It was expected that low-users would see the prosthesis as either, not affecting their independence or making them less independent. Mr. X., the low-user, indicated through his answers that he felt the prosthesis made him more independent. This unexpected result could possibly be explained by saying that Mr. X. wore his prosthesis only in situations where he was sure it would increase his independence and would not wear it where he was not sure it would increase his independence. Therefore any situation where he needed help was approached without the prosthesis. Mr. Z. showed that independence did not seem to be a factor affecting his use of the prosthesis. While these results give indications of the potential usefulness of independence, as a factor affecting prosthesis use, they show it operating in specific instances and not with a wider effect on prosthesis use.

QUESTION EFFECTIVENESS

Questions C and G were ineffective in eliciting desired responses to the question of the wider effect of independence. However, because they revealed the specific effect for Mr. X. their continued inclusion in the interview can be justified in an attempt to measure the possible presence of this effect for other subjects.

The wider issue of independence still needs to be measured. One possible way of doing this is to determine if the prosthesis has changed the subjects' life style. A useful question would be to ask directly,

"How has having a prosthesis affected your life style?"

If the prosthesis makes the recipient more independent then the answer would be along the lines of it having

given the person a new freedom to do things or expand the range of things they could do. If the prosthesis makes the recipient less independent then the answer would be more likely to be in terms of the limitations imposed by the prosthesis.

PERCEPTIONS OF STIGMA

Both Mr. X. and Mr. Z. felt that in general people reacted positively to them when they were not wearing the prosthesis. Both mentioned an initial tendency for people to stare at them. Mr. X. felt that this tendency may not have actually existed but was really just him being overly sensitive. Mr. Z. felt that the tendency of people to stare soon stopped. Mr. Z. did mention that he had met the odd sarcastic person but that most people reacted well.

In answer to the question relating to how people reacted when they were wearing the prosthesis Mr. Z. said that people reacted the same as when he was not wearing the prosthesis, with people often not noticing the prosthesis. Mr. X. said he could not comment on how people reacted as he did not wear the prosthesis in public.

FACTOR USEFULNESS

It was expected that if stigma had an effect on prosthesis use then one of two patterns of response would occur. The first was that low-users would say that they got more negative responses from people when they were wearing the prosthesis as opposed to when they were not wearing it. The second pattern was that high-users would say that they got less negative responses from people when they were wearing the prosthesis than when they were not wearing it. Neither of these response patterns occurred. This suggests that there is little indication that stigma is a major causal factor in the non-use of prostheses but this needs further investigation. However, the responses to these questions may be open to contamination by social

desirability factors with subjects feeling that the mention of positive reactions would be a more acceptable answer.

QUESTION EFFECTIVENESS

The present questions have proved effective in the eliciting of usable information. The one concern is to get around the problem raised by Mr. X. saying that he never wore the prosthesis in public. One possible way of doing this would be to have the subject rate the way he or she would act in different situations. Specific questions would be asked such as, "Would you wear your prosthesis to a job interview?" This may elicit whether or not the subject saw the prosthesis having a negative effect on social interactions. Such questions would still be open to strong social desirability factors and would need careful development if usable responses were to be obtained.

The final question in the interview (Question K, Appendix D) cannot really be commented on for its validity as neither subject consented to perform the sketch drawing task. These refusals were verbalised in terms of a lack of artistic ability.

As an interesting measure the question could be retained, however samples of drawings by other people (elicited before-hand) may be needed to demonstrate what was required. If these were simple outlines of people then the question of artistic ability may be overcome. Another possibility may be a series of outlines allowing the subject to pick the one which most accurately depicts how they see themselves.

MODIFIED INTERVIEW

It is suggested that the interview (Appendix D) include the following modifications in its final form.

Question A: Could you outline the things that happened to you between losing your limb and when you finally received your prosthesis?

Question F: Which of these statements most accurately describes your prosthesis?

- A tool
- Something to help me do things
- A replacement for my arm

Question H: How useful do you find each of these terminal units?

- narrative responses

Question K: Supply sample sketches for interviewees to view.

The following questions should be added to the schedule.

Question L: How well do you think your prosthesis works?

- narrative responses

Question M: How has having a prosthesis affected your life style?

- narrative responses

On the basis of the pilot study and with these modifications incorporated into the interview design, the writer considers that usable data can be obtained to measure the theoretical questions of interest.

CHAPTER 8. GENERAL DISCUSSION

- Summary of Findings
- Application of Findings
- Possible Interventions
    - Types of prostheses
    - Education
    - Rehabilitation Processes
- Future Developments
    - Target population
    - One handedness

GENERAL DISCUSSION

SUMMARY OF FINDINGS

This study has been able to demonstrate that at least 20 per cent of the target population are low-users of their prostheses (this value being the number of low-user respondents expressed as a proportion of the total population) and that this proportion may be as high as 40 per cent (Chapter 6).

The variance in reactions to prostheses between low-users and high-users could be partially explained by the type and length of prosthesis owned by the recipient. The myoelectric and mechanically powered prostheses were owned, in the main, by high-users who also tended to have shorter prostheses, usually of below elbow length. Low-users tended to own cosmetic prostheses and to have either full arm or above elbow units. These two variables of type and length together accounted for 44 per cent of the variance between high-users and low-users (Chapter 6).

APPLICATIONS OF FINDINGS

The results of the questionnaire, in the form of comprehensive descriptive statistics were submitted to the Artificial Limb Centre, a summary of this report can be found in Appendix E. The writer also discussed these results with the staff of the Limb Centre.

The results received a positive reception from the Artificial Limb Centre staff who highlighted aspects which reinforced their own observations. Some of these observations were as follows: Bilateral amputees were seen to be dependent on their prostheses while unilateral amputees were often able to adapt to a one-handed life style. The site of amputation was also viewed as being important in that a person with a minimum of 2" stump length below the elbow should be able to make efficient use of a prosthesis. This observation was quantified

through our regression analysis (Chapter 6).

The Limb Centre staff also observed that different people had different requirements for the prosthesis with some individuals just wanting a sleeve filler while others definitely wanted a working prosthesis. Unrealistically high expectations of what a prosthesis could do was another factor which was seen to affect their use. This observation was further support for the issues chosen for examination in the follow-up study (Chapers 4 and 7).

POSSIBLE INTERVENTIONS

TYPE OF PROSTHESIS

Examining the findings of the questionnaire (as previously summarised) it can be seen that the type of prosthesis fitted can have a substantial effect on the later use of that prosthesis. It is therefore important that each recipient receive the type of prosthesis which will give them the greatest functional capability allowing for their particular needs and circumstances. This could mean that myoelectric and mechanical units are fitted wherever possible. The Artificial Limb Centre have recognised this and have an established policy for deciding the type of prosthesis to give any particular client.

While the site of amputation is often predetermined, especially in trauma and congenital cases, there is some room for choice of site in those cases where the arm is to be surgically removed. In these cases prior consultation with the Artificial Limb Centre, as to a choice of site for amputation, could mean that a site could be determined which would meet the medical requirements and would also allow the most functional prosthesis available to be fitted.

These interventions would allow each recipient to be fitted with the prosthesis which was of most use to them.

EDUCATION

The pilot study designed to examine psychological factors (Chapter 7) indicated that one of the most profitable areas for examination would be that of the expectations of recipients prior to receiving their prosthesis. If realistic expectations lead to fuller use of the prosthesis then ways of developing such expectations would be beneficial. One way to do this would be through an education programme.

In those cases where amputation is to occur through surgery or when a congenital defect exists, visits to the Artificial Limb Centre prior to surgery or the fitting of a prosthesis may be useful. These visits could give the recipient an understanding of what prostheses are, their uses and their limitations. The knowledge obtained from such visits would be the basis upon which the recipients would form their expectations and from which they would evaluate the performance of the prosthesis. Such knowledge would be classed as realistic and would overcome any expectations of the prosthesis being as good as a natural arm, a false expectation which leads to its rejection.

Publicity materials, films, pamphlets, and so on which could be given or shown to all amputees are other educational mediums that could be used. Such material would need to highlight the fact that the prosthesis is not a replacement for the missing arm, explain its capabilities, which are different to those of a natural arm and to which the recipient must adapt. These approaches would have the dual effect of giving the recipient an opportunity to establish realistic expectations and to prepare him/her for the effort and time needed in adapting to using a prosthesis.

Applying such means to develop realistic expectations should result in recipients having more positive views about the prosthesis and the training received. This according to indications of the present study should lead

to a higher level of use. These interventions could be instigated if a follow-up study along the lines of the pilot study does indicate that expectations actually affect use.

REHABILITATION PROCESSES

Of the respondents to the questionnaire only one indicated use of any rehabilitation service other than the Artificial Limb Centre, this individual also having visited a physiotherapist. Such a pattern of responses indicate that the Artificial Limb Centre is in the position of having to meet the full rehabilitation needs of each recipient.

The full rehabilitation process is necessarily a long one. It starts at the loss of the limb and the acceptance of the loss, continues through to the receiving of a prosthesis and learning to use it. It is not completed until a stable independent lifestyle has been achieved and the recipient's social and occupational niches have been re-established. During such a process, a variety of different services should be available; Psychologists, Physiotherapists, Artificial Limb Centre, Occupational therapists, and Social Workers. These should be involved in dealing with the recipient's emotional and social needs, meeting specific training requirements, and providing any aids or environmental modifications to facilitate the recipient becoming independent.

Meeting such needs is an ongoing process for which the Artificial Limb Centre was not designed and for which it does not have the resources to provide for any recipients who do not reside in Wellington. Involving the rehabilitation services of the recipient's home hospital at all stages would help meet these needs. They could prepare the recipient to receive a prosthesis and liaise with the Artificial Limb Centre to provide follow-up services to ensure that the recipient is able to receive full benefit from the prosthesis. Adopting this

procedure should have the dual benefit of making it easier for amputees to become rehabilitated and to minimise the rejection of prostheses.

FUTURE DEVELOPMENTS

Researchers who wish to further examine the needs of amputees should be aware of certain methodological concerns and also of some key issues which could be usefully pursued.

TARGET POPULATION

The target population for the present study was those amputees who had received a prosthesis from the Artificial Limb Centre. This population was further defined by the decision to include only those who were aged 5 years or more in April 1982 and had received a prosthesis at some time between 1975 and 1982. Even within these limitations contacting the members of the population was difficult with individuals scattered over a wide geographical area. Finance and time restrictions combined with the mobility of the target population to further limit the number of contacts made.

While the target population was relevant for the present study, there were groups which were not included. The existence of these groups should be recognised as future research may apply to them thus requiring their inclusion in target populations. Of the two such groups known one is those individuals who have owned a prosthesis for longer than seven years. Among this group those with a limb loss as a result of World War Two would make up a major proportion. The second group would be those individuals who, while suffering a limb deficiency, have made no attempt to obtain a prosthesis.

Both groups could supply researchers with relevant information especially in the area of how people cope with the psychological affect of losing a limb. It must

be acknowledged that the identification and contact of these groups would be difficult, especially in the case of those individuals who had never received a prosthesis. If the resources were available the inclusion of these groups in future research should prove profitable.

ONE-HANDEDNESS

One-handedness describes the situation where an amputee develops a lifestyle using only the remaining limb and not a prosthesis. This situation usually involves the learning of a wide range of techniques allowing the individual to perform most tasks using only one hand. The existence of such a phenomenon is well recognised with Rastorfer (1983) stating that, "They (amputees) become very good at using one arm for almost everything." (P.1)

The occurrence of one-handedness raises questions about the aim of rehabilitation. If rehabilitation is a process of enabling the individual to live as near to normal a life as possible then one-handedness must be viewed as one way of achieving this.

Accepting this means that rehabilitation for the amputee should first involve the exploration of the functional uses of the prosthesis. If this should prove to be an unsuccessful approach then training in daily living using only one hand could be considered. This process should involve the introduction of the amputee to the range of helping aids available, such as the 'helping hand' so that any which proved useful could be adopted. The evaluation of such a rehabilitation process should hinge on establishing how well the amputee functions in every day life.

The awareness of such alternative approaches to rehabilitation could be useful in the future evaluation of any rehabilitation programmes.

CHAPTER 9. CONCLUSION

CONCLUSIONS

The present study was designed to examine the question of recipients' reactions to their prostheses, to design and implement quantitative measures of these reactions, to establish if any dimensions of the prosthesis or demographic characteristics of the recipients explained differences in reactions, and to pilot further research into psychological factors affecting the reaction of recipients.

Quantitative measures of the use made of prostheses were developed using the dimensions of the amount of time the prosthesis was worn, the places to which they were worn, the tasks performed using the prosthesis, and the recipient's satisfaction with the number of tasks he or she could perform and how well they could be performed.

The analysis of these measures showed that from 29.4 to 55.9 per cent of respondents indicated non-use of the prosthesis on different dimensions. These results led to the conclusion that within the population of recipients there exists a significant group of low-users who have reacted negatively to the prosthesis.

The variance between these low-users and high-users could be partly explained by the nature of the prosthesis they owned. Forty four per cent of the variance was accounted for by the two dimensions of prosthesis type and prosthesis length. This result re-inforced the need to ensure that all prostheses fitted are of a type that would give the recipient maximum functional use.

In piloting the follow-up study, the areas of the recipients' expectations prior to obtaining the prosthesis and their perceptions of the training they received were indicated as being most likely to give significant results. The effectiveness of the interview format for the follow-up study was evaluated with a number of questions being modified and further areas such as the functionality of the prosthesis and the effects it had had on the subject's lifestyle being added. These modifications should allow

for more complete, usable, data to be collected.

All of these results mean that the aims of the research were met and the conclusions arrived at allow for a continued, more detailed, examination of the issues raised.

APPENDIX A. GLOSSARY

GLOSSARY

This Glossary would give a more detailed background as to the nature of amputations and prosthesis.

A) AMPUTATIONS

1. Levels of Amputation. There are seven different classifications.

   (1) Forequarter: This is where the full arm and the shoulder are lost. The importance of this is that without the shoulder a different support needs to be arranged to hold the prosthesis in place.

   (2) Shoulder Disarticulation: This is where the full arm has been lost up to and including the joint in the shoulder.

   (3) Above Elbow: Amputation between elbow and shoulder. The use of the Ball joint at the shoulder and a short stump enables greater control of the prosthesis.

   (4) Elbow Disarticulation: Amputation to the elbow and a loss of the use of the elbow joint. Similar in effect to above elbow but requires an external elbow joint on the prosthesis because of the length of the stump.

   (5) Below Elbow: Loss is between elbow and wrist. This length of stump retains the use of the elbow and shoulder joints in controlling the prosthesis. It also has good load bearing qualities for continual wearing of the prosthesis.

   (6) Wrist Disarticulation: Loss to the wrist and including the joint at the wrist. This is similar to -
   Below elbow but with a longer forearm stump.

(7) Partially Mutilated Hand: A loss of part of the hand, fingers, thumb, or the hand at a lower level. Usually fitted with a sprung tool to allow grasping.

2. Other classifications.

(1) Unilateral Amputee: The loss of a limb is restricted to either left or right hand side.

(2) Bilateral Amputee: Where there has been loss to both right and left arms.

(3) Dominant/Non-Dominant: Whether the loss is on the dominant or non-dominant side for the individual.

3. Cause of Limb Deficiency.

(1) Congenital: There is a small proportion of children born with a limb deficiency of some degree or other. This can range from totally malformed arm, such as in thaledamide victims, through to individuals with missing or mis-shapened hands.

(2) Medical: This is where amputation is elective and planned as corrective surgery. The removal of major cancer growths or the removal of an arm suffering from permanent neural damage, resulting in complete loss of function are two major reasons for this kind of amputation. More often among the older age bracket.

(3) Trauma: Loss of limb directly through the result of some accident. This form of loss is usually found with young men and as a result of a vehicle accident.

B) PROSTHESES The prosthesis can be classified by its power source or by the nature of the terminal unit used.

1. Power Source.

(1) Mechanical: In this case the prosthesis is powered by cables attached to spring loaded joints. The cable is pulled by the use of a shoulder harness on the opposite shoulder. This causes the terminal unit to either open or close.

(2) Myoelectric: This type of unit is driven by miniature electric motors which are battery operated. These motors are controlled by the perception of motor neuron impulses by electrodes placed on the stump. The recipient is trained in the control of these impulses. This kind of prosthesis is most usefully fitted to the below elbow amputee.

(3) Cosmetic: This is a prosthesis designed purely to look like an arm. This type occurs mainly with forequarter and shoulder disarticulation amputees.

2. Terminal Unit Used.

(1) Hook: This is a unit with two prongs and an opposing prong. The control allows the user to exert force to grip objects. As the force is relaxed so does the grip. Variations on this format are the most efficient terminal unit.

(2) Functional Hand: The functional hand is similar to the Hook in that it uses the opposed thumb and the index and middle finger in the same way as a hook. The other two fingers are flexible so they bend in out of the way, when pressure is applied. The hand is covered by a glove which is sculptured to resemble a hand - including

ridges, troughs, nail and hair.

(3) Cosmetic Hand: This is a nonfunctional unit designed to look like a relaxed hand. It is covered with a glove the same as for the functional hand. The sole purpose of this kind of unit is to create the illusion of the presence of a hand.

APPENDIX B. QUESTIONNAIRE VALIDATION

- Validation task sheet
- Sample questions sheet
- χ^2 calculations

I am designing a questionnaire to look at how much arm amputees use any prosthesis they have been fitted with. I would appreciate your help in determining the relevance or usefulness of possible questions for the questionnaire.

To do this I would ask you to make certain specific judgements concerning the questions (which are on the attached sheet of paper). Please make all judgements in relation to a unilateral amputee.

The first five questions are concerned with the time amputees wear their prostheses.

A) Please read each question and judge how IMPORTANT the dimension it measures is to seeing how much amputees wear their prostheses. (tick the appropriate column).

	Important	Useful but not Important	Irrelevant
Question 1.			
Question 2.			
Question 3.			
Question 4.			
Question 5.			

B) Which of the first two questions do you think is the better for measuring the amount of time a person wears their prosthesis (tick). Question 1 ☐ Question 2 ☐

The last four questions (6 to 9) deal with the situations and ways in which a person uses a prosthesis and how they feel about this use.

C) Please read each question and judge how IMPORTANT the dimension it measures is. In relation to the use, or attitude to use, of a prosthesis. (tick the appropriate column).

	Important	Useful but not Important	Irrelevant
Question 6.			
Question 7.			
Question 8.			
Question 9.			

D) The following activities are options in question 6. Please rate how ESSENTIAL it would be for an amputee to use a prosthesis while performing this task. (Please tick).

	Essential	Useful but not Essential	Unnecessary
Answering Phone.			
Dressing.			
Driving a Car.			
Eat with Knife and Fork.			
Hang out Clothes.			
Hold cup and saucer.			
Make a Bed.			
Peel an orange.			
Pick up coins.			
Slicing food.			
Taking banknote out of wallet.			
Take lids of Jars.			
Taking match out of a matchbox and lighting it.			
Tying shoelaces.			
Using tools.			
Washing dishes.			
Writing.			

E) Are there any other activities where you feel a prothesis would be:

Essential: .....

.....

Unnecessary: .....

.....

F) The following situations are options in question 7. Please rate how often you would expect an amputee to wear a prosthesis in each situation. (Please tick).

	Often	Sometimes	Never
Bed.			
Home.			
In public.			
Meals.			
Movies			
Social Occasions.			
Travelling.			
Work.			

G) Are there any other situations in which you think the wearing of a prosthesis would occur:

Often: .....

.....

Never: .....

.....

H) Are there any other comments you would like to make regarding these questions .....

.....

.....

Thank you for your co-operation.

S. Burrough.

Q1.

How many hours a day would you usually wear the prosthesis (tick one).	Never	
	1-3 hours	
	3-6 hours	
	6-9 hours	
	12-15 hours	
	15+ hours	

Q2.

During which hours of the day do you usually wear the prosthesis (tick).	Before 6 a.m.	
	6-9 a.m.	
	9-12noon.	
	12-3 p.m.	
	3-6 p.m.	
	After 9 p.m.	

Q3.

What days of the week do you normally wear the prosthesis (tick).	Monday	
	Tuesday	
	Wednesday	
	Thursday	
	Friday	
	Saturday	
	Sunday	

Q4.

Do you think you should wear the prosthesis more often (tick one).	Yes ☐	No ☐

Q5.

If yes to Q4. then how much more often.	Hrs per day.
	Days per Week.

Q6.

Which of these things do you use the prosthesis for. (please tick)	writing	
	car driving	
	eating	
	washing	
	answering phone	
	using tools	
	tieing shoelaces	
	hanging out clothes	
	cooking	
	holding cup & saucer	

Q7.

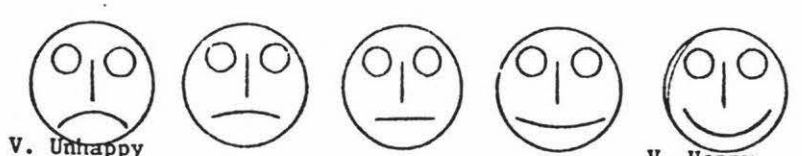
Do you wear the prosthesis in any of the following places (please tick)	work	
	home	
	travelling	
	bed	
	mealtime	
	social occasions	

Q8.

Are you satisfied with the NUMBER of things you can use the prosthesis for? (please tick the appropriate face).

Q9.

Are you satisfied with how WELL you can do things with the prosthesis? (please tick the appropriate face).



CALCULATIONS

Chi squared test for significant differences in judges preference for Q1 over Q2 in validation task.

	Q1	Q2
observed frequency of preference	6	4
expected frequency of preference	5	5

Formula: $\chi^2 = \sum_{J=1}^{k} \frac{(|O_j - E_j| - \frac{1}{2})^2}{E_j}$ df=k-1

$$\chi^2 = \frac{(|6-5|-\frac{1}{2})^2}{5} + \frac{(|4-5|-\frac{1}{2})^2}{5} \qquad df=2-1=1$$

$$= \frac{(0.5)^2}{5} + \frac{(0.5)^2}{5}$$

$$\chi^2 = 0.1$$

with df=1 $P(\chi^2 \geq 0.1) > .05$ There is no significant difference in judges preferences between Q1 and Q2

APPENDIX C. QUESTIONNAIRE INFORMATION

- Questionnaire
- Sample size calculations
- Regression analysis

PROSTHESIS USE QUESTIONNAIRE

☐☐ (1)

Please tick the appropriate box or boxes for each question.

A) This section is about how often you wear the prosthesis.

How many hours a day would you usually wear the prosthesis. (Tick one)	Never	☐	(2)
	1-3 Hours	☐	
	3-6 Hours	☐	
	6-9 Hours	☐	
	9-12 Hours	☐	
	12-15 Hours	☐	
	15+ Hours.	☐	

During which hours of the day do you usually wear the prosthesis. (Tick)	Before 6 a.m.	☐	(3)
	6-9a.m.	☐	(4)
	9a.m.-12noon	☐	(5)
	12noon-3p.m.	☐	(6)
	3-6p.m.	☐	(7)
	6-9p.m.	☐	(8)
	after 9p.m.	☐	(9)

B) This section is about the things you use the prosthesis for

Which of these things do you use the prosthesis for (Tick)	Eat with knife and fork	☐	(10)
	Hang out clothes	☐	(11)
	Hold a cup and sauce	☐	(12)
	Make a bed	☐	(13)
	Pick up coins	☐	(14)
	Take note out of wallet	☐	(15)
	Using tools	☐	(16)
	Washing dishes	☐	(17)
	Writing	☐	(18)

Do you wear the prosthesis in any of the following places (tick)	Meals		(19)
	Work		(20)
	Movies		(21)
	Travelling		(22)
	Bed		(23)

Are you satisfied with the NUMBER of things you can use the prosthesis for? (please tick the appropriate face). (24)

Are you satisfied with how WELL you can do things with the prosthesis? (please tick the appropriate face). (25)

C) This section is about your prosthesis.

Is your prosthesis (tick one)	Myoelectric		(26)
	Mechanical		
	Cosmetic		

Is your prosthesis (tick one)	Full arm		(27)
	Above elbow		
	Below elbow		
	Hand		
Specify	Other		

What kind of terminal unit do you have (tick)	hook		(28)
	hand		
	Special Attachment		

If you have a special attachment is it used for (tick)	Work		(29)
	Sport		
	Hobby		
	General Use		

How long have you had the prosthesis	_____ yrs _____ months.	(30)

To which of these places/people did you go while getting your prosthesis (tick)	Limb centre		(31)
	Physiotherapist		(32)
	Occupational Therapist		(33)
	Rehabilitation Unit		(34)

D) This section is about yourself

What is your age	yrs months.		(35)
sex	Male		(36)
	Female		
Ethnic group	European		(37)
	Maori		
	Polynesian		
Specify	Other		
occupation			(38)
Highest Educational Qualification			(39)
Dominant Hand	Left		(40)
	Right		

Do you have any further comments on prostheses.

.....

.....

.....

THANK YOU FOR YOUR CO-OPERATION.

CALCULATIONS

Required sample size for significant results at 5 per cent level with population size N=70 and P set to 0.5.

Formula. $$n = \frac{\chi^2 . N . P(1-P}{(d)^2 . (N-1) + \chi^2 . P(1-P)}$$

For: d=.05 P=0.5 χ^2(1df.p.05) = 3.89

$$n = \frac{3.89 \ . \ 70 \ \cdot \ 0.5(1-0.5)}{(.05)^2 \ (70-1) + 3.89 \ . \ 0.5 \ (1-0.5)}$$

$$n = \frac{272.3 \ . \ 0.25}{0.1725 + 0.9725}$$

$$n = \frac{68.075}{1.145}$$

$$n = 60$$

required sample size for significant results is 60.

TERM 2.043 0.878

N OF CASES = 23

CORRELATION

	USELEVEL	TIMEHAD	SEX	OCCPTN	EDLEVEL	DOMHD	HOSBD	AGECAT	TYP	LGTH	TERM
USELEVEL	1.000	0.020	-0.059	-0.019	0.458	0.108	0.115	0.005	-0.519	0.204	-0.189
TIMEHAD	0.020	1.000	-0.057	0.352	0.022	-0.193	-0.148	0.484	0.191	0.199	-0.341
SEX	-0.059	-0.057	1.000	-0.314	-0.114	0.127	-0.073	-0.221	0.197	0.230	-0.145
OCCPTN	-0.019	0.352	-0.314	1.000	0.591	0.075	-0.276	0.875	-0.027	0.070	0.214
EDLEVEL	0.458	0.022	-0.114	0.591	1.000	0.296	-0.040	0.494	-0.366	0.331	0.160
DOMHD	0.108	-0.193	0.127	0.075	0.296	1.000	-0.067	0.066	-0.359	-0.132	0.030
HOSBD	0.115	-0.148	-0.073	-0.276	-0.040	-0.067	1.000	-0.183	-0.429	-0.272	-0.006
AGECAT	0.005	0.484	-0.221	0.875	0.494	0.066	-0.183	1.000	-0.065	-0.033	0.004
TYP	-0.519	0.191	0.197	-0.027	-0.366	-0.359	-0.429	-0.065	1.000	0.434	-0.094
LGTH	0.204	0.199	0.230	0.070	0.331	-0.132	-0.272	-0.033	0.434	1.000	-0.131
TERM	-0.189	-0.341	-0.145	0.214	0.160	0.030	-0.006	0.004	-0.094	-0.131	1.000

* *

EQUATION NUMBER 1.

DEPENDENT VARIABLE.. USELEVEL

BEGINNING BLOCK NUMBER 1. METHOD: STEPWISE

VARIABLE(S) ENTERED ON STEP NUMBER 1.. TYP

MULTIPLE R	0.51850
R SQUARE	0.26885
ADJUSTED R SQUARE	0.23403
STANDARD ERROR	40.36140

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	1	12979.02645	12979.02645
RESIDUAL	21	34209.89135	1629.04245

F = 7.72173 SIGNIF F = 0.0113

VARIABLES IN THE EQUATION

VARIABLE	B	SE B	BETA	T	SIG T
TYP	-38.22565	13.75617	-0.51850	-2.779	0.0113
(CONSTANT)	84.31528	30.49108		2.765	0.0116

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
TIMEHAD	0.12326	0.14150	0.96356	0.639	0.5299
SEX	0.04536	0.05201	0.96118	0.233	0.8182
OCCPTN	-0.03327	-0.03889	0.99928	-0.174	0.8636
EDLEVEL	0.30914	0.33642	0.86588	1.598	0.1258
DOMHD	-0.08934	-0.09752	0.87121	-0.438	0.6659
HOSBD	-0.13157	-0.13898	0.81583	-0.628	0.5374
AGECAT	-0.02949	-0.03441	0.99573	-0.154	0.8792
LGTH	0.52918	0.55746	0.81141	3.003	0.0070
TERM	-0.23990	-0.27933	0.99125	-1.301	0.2080

* *

VARIABLE(S) ENTERED ON STEP NUMBER 2.. LGTH

MULTIPLE R	0.70432
R SQUARE	0.49606
ADJUSTED R SQUARE	0.44567
STANDARD ERROR	31.33561

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
REGRESSION	2	23210.23767	11605.11883
RESIDUAL	20	23378.68013	1178.93401

F = 9.84374 SIGNIF F = 0.0011

VARIABLES IN THE EQUATION

VARIABLE	B	SE B	BETA	T	SIG T
TYP	-55.16751	12.99139	-0.74831	-4.246	0.0004
LGTH	23.62317	7.86668	0.52918	3.003	0.0070
(CONSTANT)	58.76317	27.29682		2.153	0.0437

VARIABLES NOT IN THE EQUATION

VARIABLE	BETA IN	PARTIAL	MIN TOLER	T	SIG T
TIMEHAD	0.06052	0.08296	0.79741	0.363	0.7207
SEX	-0.03515	-0.04789	0.76968	-0.209	0.8367
OCCPTN	-0.07696	-0.10793	0.80479	-0.473	0.6415
EDLEVEL	0.01511	0.01608	0.51970	0.070	0.9448
DOMHD	-0.10385	-0.13649	0.71889	-0.601	0.5552
HOSBD	-0.07658	-0.09689	0.70705	-0.424	0.6761
AGECAT	-0.02704	-0.03801	0.80880	-0.166	0.8700
TERM	-0.19375	-0.27036	0.80322	-1.224	0.2358

APPENDIX D. INTERVIEW QUESTIONS

INTERVIEW QUESTIONS

The following are the interview questions in the order that they were presented to the interviewee. The order was semi-random within the bounds of, the separation of similar questions to minimise any cross question influence on answers, and to present psychologically sensitive questions later in the interview to allow the interviewee to have time to relax before being faced with them.

Preamble.

I would like to ask you a few questions please answer them as accurately as you can. If you do not want to answer a question just say so and we will go on to the next one.

QUESTION A.

Could you briefly outline the steps you went through in getting your prosthesis?

QUESTION B.

How satisfactory was the training you got in using the prosthesis? Please use one of the options on the card. (See Card A).

QUESTION C.

How much help do you need when you are not wearing the prosthesis? Please use one of the options on the card. (See Card B).

QUESTION D.

For what reasons do you wear the prosthesis?

QUESTION E.

How do strangers react to you when you are wearing the prosthesis?

QUESTION F.

What kind of thing would you call your prosthesis?

QUESTION G.

How much help do you need when you are wearing the prosthesis? Please use one of the options on the card (See Card B).

QUESTION H.

If you had a choice of terminal units which would you prefer? Please use the options on the card (See Card C).

QUESTION I.

How do strangers react to you when you are not wearing the prosthesis?

QUESTION J.

Before getting the prosthesis how well did you expect to be able to use it?

QUESTION K.

Would you be prepared to draw a sketch of yourself on this piece of paper?

CARD A.

Very unsatisfactory

Unsatisfactory

adequate

Satisfactory

Very Satisfactory

CARD B.

No Things

Few things

Some things

Most things

All things

CARD C.

Hook

Mechanical hand

Cosmetic hand

Special attachment

APPENDIX E. PRELIMINARY REPORT

- Summary
- Extract 1: Population size
- Extract 2: Use variables distribution

The following summary and extracts are from a report submitted to the Artificial Limb Centre November 1983.

UPPER LIMB PROSTHESIS USE LEVELS SURVEY

SUMMARY OF REPORT

Arm amputees in the Lower North Island and Upper South Island regions of New Zealand were surveyed for their use of prostheses. Those surveyed were over 5 years of age and had received a prosthesis from the Limb Centre at some stage since 1975. The population consisted of 71 individuals and 34 responses were received to the postal questionnaire. Data was collected on six measures of use, details of prosthesis type, and on background demographic variables.

SURVEY

The main demographic feature in the population was the high number of males. Almost all these males had limb loss due to trauma and were between the ages of 15 and 34 years. Females were almost all younger or older and suffering from congenital or medically caused deficiencies.

It was discovered that a relatively large proportion of respondents indicated low use levels, 38.2 per cent indicating they didn't usually wear the prosthesis, 55.9 per cent indicating no functional use of the prosthesis, 38.2 per cent not wearing the prosthesis in public, 38.2 per cent unhappy or very unhappy with the number of things they could do with the prosthesis and 29.4 per cent either unhappy or very unhappy with how well they could do things with the prosthesis.

Those respondents with full arm prostheses were all low users while those with other lengths of prosthesis exhibited a range of use levels. Those with myoelectric and mechanically powered prosthesis would wear it more, do more things and be more satisfied with its functioning than those with cosmetic units. This did not apply to where they would wear it. Of terminal units those with hooks used them most and were most satisfied with their performance. Those with access to both a hook and hand

indicated low use and general dissatisfaction. The longer the prosthesis had been had over 4 years then the more use was made of it. Those with trauma or medical causes seemed to wear the prosthesis less than those with congenital limb deficiency. Those with medical causes also generally did few things and were less satisfied with the prostheses' performance than were the others.

Males tended to wear the prosthesis more and to more places than did females. Females tended to do more things with the prosthesis and were slightly happier with its performance than males. In general the younger respondents, under 15 years, and older respondents, over 40 years tended to be lower users of the prosthesis. The exception to this was in regard to places where they would wear it. Five occupational groups were retained in the survey. School, Unskilled and Non-manual categories all showed high use, especially in relation to amount of time the prosthesis was worn and the things done with it. Unemployed and Retired showed generally low use on all measures. The higher the education level of the recipient then the greater the use made of a prosthesis. This pattern was consistent across all measures. The larger the centre the respondent came from, as shown by the referring Hospital Board, then the less the use. Also only one respondent indicated any utilisation of any rehabilitation service other than the Limb Centre while getting and adapting to the prosthesis.

CONCLUSIONS.

The results indicate that there is a significant proportion of individuals who do not utilise their prostheses. This may be cause for concern.

The level of use should however be evaluated in terms of how well the recipient is functioning and whether they are making as much use of the prosthesis as they need. Accepting the prosthesis as a rehabilitation aid it is important to be aware of its use in making

living easier for the user. If it can and is not being used then there is cause for concern.

Low use could relate to three areas, no functional need, a negative psychological reaction to the prosthesis or a low skill level with the prosthesis. The levels of expressed dissatisfaction with the prosthesis indicates either of the two later options. As skill can be a product of practice, identifying and dealing with the psychological reactions would be a key aspect in creating an environment in which skills could be developed.

The survey results could also be used to identify those recipients of prostheses who would be more at risk of becoming non-users. This identification prior to the fitting process will enable these people to have an especially intensive training and follow up. The at risk group would seem to exhibit some or all of the following characteristics.

(a) Unemployed or Retired.
(b) Under 19 years or over 40 years.
(c) Limited education.
(d) Live in larger population centre.
(e) Have a trauma or medical cause for limb deficiency.

The policy of the Limb Centre to fit myoelectric prostheses wherever practical and to encourage the use of one general purpose terminal unit has been strongly reinforced by the results of this survey.

A follow up survey has been designed to examine recipient attitudes to training, self-perception, prostheses and other psychological areas which may be contributing factors in prosthesis rejection.

EXTRACT 1. POPULATION SIZE

2. DESIGN

2.1 POPULATION

The population used for this report consisted of all primary recipients of Upper Limb Prosthesis in the period from 1975 to April 1982, that is, all the people who received their first prosthesis within that period. From within this population all those recipients whose age would be less than five (5) years at April 1982 were excluded from the study. Using that criteria a population of seventy (70) individuals remained.

The target population was able to be examined along five variables available through the records of the Artificial Limb Centre in Wellington. These variables were sex, age, referring Hospital Board, cause of loss of limb and site of amputation or limb loss. Incomplete records meant that not all totals equalled the population size.

2.1.1. AGE

A useful categorisation of age was in five year intervals from age five (5) to forty (40), then in ten year intervals from age forty (40) to sixty (60) with a further category for those over sixty.

Table 1: Ages of Recipient Population Members

AGE	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-59	60+
NUMBER	8	6	5	7	13	8	1	8	1	9

As can be seen from Table 1, the age distribution is highest around the twenty to thirty-five age range, with a relatively high number of people in the over sixty age bracket. This distribution bears comparison with the other

available variables to examine possible explanation.

2.1.2. SEX

Table 2: Sex Distribution of the Recipient Population

SEX	MALE	FEMALE
NUMBERS	47	17

It can be seen that a disproportionate number of recipients were male (47) in comparison to the number of females (17). This may be related to the concern that the male lifestyle within New Zealand means that they be more susceptible to the loss of a limb than are females.

2.1.3. HOSPITAL BOARD

All patients processed by the Artificial Limb Centre in Wellington are referred by the different Hospital Boards within the region.

Table 3: Numbers of Recipients referred by each Hospital Board.

BOARD:	WELLINGTON	PALMERSTON NTH	HAWKES BAY	WANGANUI	TARANAKI	NELSON	WAIRARAPA
NUMBER	17	11	9	5	4	6	2

The numbers of patients referred by each Hospital Board would seem to be consistent with the relative serviced populations within each of those areas.

2.1.4. CAUSE

The reason a person requires an Upper Limb Prosthesis is given in terms of the cause of the absence of the natural limb. These causes generally fall into one of three categories. Congenital, which is a lack of limb due to a defect present from birth, Trauma, the loss of the limb through accident or injury, Medical, the removal of the limb on medical grounds unrelated to a trauma situation.

Table 4: Causes of Lack of Limb among Recipients

CAUSE	CONGENITAL	TRAUMA	MEDICAL
NUMBER	18	33	5

In the majority of cases the cause can be related to a trauma situation with thirty-three cases, congenital causes and medical causes accounted for fewer cases with eighteen and five respectively.

2.1.5. SITE OF LIMB LOSS

The type of prosthesis fitted is directly related to the type of limb deficiency experienced by the patient. Deficiency can be at four general levels: Forequarter or full arm, above elbow, below elbow, to wrist and partially mutilated hand. This information can also be related to which limb is suffering from the deficiency.

Table 5: Site of Loss of Limb

	Right	Left
Fore Quarter	4	1
Above Elbow	9	8
Below Elbow	12	12
To Wrist	5	7
Part. M.H.	5	2

Within the population there were also three individuals with bilateral loss. One bilateral forequarter and one with right above elbow and left below elbow.

2.1.6. COMPARISONS

There are a number of comparisons that can be made between pairs of the above given variables. These comparisons will be valuable in the way in which they enable a clearer picture of the nature of the recipient population to be achieved.

Table 6: Sex by Age Distribution of Recipient Population

	AGE									
SEX	5-9	10-14	15-19	20-24	25-29	30-34	34-39	40-49	50-59	60+
MALE	3	2	4	6	12	4	1	6	1	5
FEMALE	5	3	-	1	-	-	-	2	-	4

This table shows that the majority of female recipients are either very young (less than 15 years), or in the older age brackets (above 40 years). The males, however, while to a large extent filling the middle age range, had as many individuals in the extreme groups as the females. The reasons behind this distribution may become clearer if we examine the sex by cause of lack of limbs distributions.

Table 7: Sex by Cause of Loss of Limb for Recipient Population.

	Cause		
	Congenital	Trauma	Medical
Male	3	32	7
Female	2	1	10

Table 7 shows definitely that the majority of Trauma causes fell within the male group. While numbers of recipients due to congenital or medical causes seem to be more evenly spread across the two sexes. From the nature of this data, it might be suggested that the life style of young adult males means that they are far more susceptible to loss of limb through trauma than are females. It would also indicate that both sexes would seem to be equally susceptible to congenital and medical problems.

If this supposition is a possibility, it would be expected that there would be definite age groups associated mainly with each cause of limb deficiency.

Table 8: Age & Cause of Limb Loss for Recipient Population.

AGE	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-49	50-59	60+
CAUSE CONGENITAL	1	6	3	2	1	1	1	-	-	3
" TRAUMA	-	-	1	2	6	9	5	5	3	2
" MEDICAL	1	-	1	-	-	-	-	-	-	3

As was suggested there seems to be marked age differences among those whose loss of limbs were

from different causes.

The final question for comparisons would be whether any given cause is more closely related to a certain type of deficiency in the limb.

Table 9: Cause of Limb Deficiency by Site of Loss Distribution for Recipient Population.

	RIGHT					LEFT				
	F/Q	A/ELBOW	B/ELBOW	WRIST	P.M.H.	F/Q	A/ELBOW	B/ELBOW	WRIST	P.M.H.
Congenital	-	3	3	1	1	-	-	4	4	1
Trauma	1	3	5	3	2	1	5	8	3	1
Medical	1	2	1	-	-	-	1	-	-	-

For the three cases with bilateral limb deficiency, one was a result of trauma (above elbow/below elbow), one congenital (fore quarter), while the cause for the third was unknown.

From examination of Table 9 and comparing that with the over-all distribution from Table 5, it would seem that there is not really any unusual pattern of level of limb deficiency across the different causes.

2.1.7. POPULATION SUMMARY

It would seem, therefore, that the recipient population can be said to comprise of mainly males, with an uneven sex distribution across ages; females tending to be either older or younger. This distribution relates to the cause of limb deficiency with males comprising the majority of trauma cases with both sexes being evenly distributed across the other causes.

EXTRACT 2: USE VARIABLES DISTRIBUTION

N.B. Not all respondents answered all questions so not all totals added up to 34 individuals.

4.2 MEASURES OF PROSTHESIS USE.

Prosthesis use has been measured along three dimensions, the amount of use, the kind of use and satisfaction with that use.

4.2.1 The actual level of use can be seen from Table 15 to be low with 50 per cent of respondents using their prosthesis less than three hours a day. There did not seem to be a pattern of use with equal number using it at different times throughout the day. The greatest number being 41 per cent using it between 9 a.m. and noon.

Table 15: Number of Hours a day for which Prosthesis is usually used.

Hours a day	Number Using	Percentage
None	13	38.2
up to 3	4	11.8
3 to 6	4	11.8
6 to 9	1	2.9
9 to 12	5	14.7
12 to 15	2	5.9
over 15	5	14.7
Total:	34	100

Table 16: Times a day at which Prostheses Usually Used

Time of day	Number Using	Percentage
6 a.m. to 9 a.m.	10	29.4
9 a.m. to noon	14	41.2
noon to 3 p.m.	10	29.4
3 p.m. to 6 p.m.	11	32.4
6 p.m. to 9 p.m.	10	29.4
after 9 p.m.	6	17.6

4.2.2 This low level of use can be seen to carry over into the dimensions of the kinds of tasks performed with the prosthesis. Only small numbers of subjects performed any given task. With the biggest group being thirteen who used the prosthesis to hold tools.

Table 17: Activities performed with Prosthesis

Activity	Number Using	Percentage
Eat with knife & fork	4	11.8
Hang out clothes	7	20.6
Hold a cup & saucer	3	8.8
Make a bed	4	11.8
Pick up a coin	1	2.9
Take notes out of a wallet	6	17.6
Using tools	13	38.2
Washing dishes	7	20.6
writing	5	14.7

The low levels of use are even more vividly demonstrated when these activities are collapsed into a single measure of different tasks performed. This was done by weighting each activity by its likelihood of being performed and then summing the achieved values. A score of 0 meant no use, while a score of 18 meant that the individual used the prosthesis for all things.

Table 18: Amount of things Prosthesis Used for

Amount	Frequency	Percentage
None=0	19	55.9
1	2	5.9
2	2	5.9
3	1	2.9
6	3	8.8
8	1	2.9
9	2	5.9
10	1	2.9
11	1	2.9

As can be seen from the Table 55.9 per cent of recipients performed none of the named tasks with their prosthesis. Considering a possible score of 18 it can be seen that the overall use that the prosthesis is put to is minimal in the majority of cases.

A second measure of kind of use can be seen in the kinds of places that a recipient would normally expect to wear their prosthesis. This involved responses from the respondents with regards to five different places. One place, to bed, was dropped from the analysis as no individuals indicated using that option.

Table 19: Places to which a Prosthesis is Worn

Place	Number Wearing	Percentage
Meals	10	29.4
Work	14	41.2
Movies	13	38.2
Travelling	13	38.2

This question did not demonstrate as clearly the low level of use shown in the other questions. However, the numbers wearing the prosthesis to any place was low with 14 to work being the most frequently occurring. When collapsing this variable, as previously explained, it was discovered that there was again a high number (38.2 per cent) who didn't wear their prosthesis to any of the named places but there was a higher number who wore it in a majority of places.

The summated variable gives 0 as none of the places and 6 as all of the places.

Table 20: Places Prosthesis worn: Summated variable

Amount	Frequency	Percentage
0	13	38.2
1	6	17.6
2	3	8.8
4	3	8.8
5	2	5.9
6	7	20.6

4.2.3 Satisfaction with the prosthesis while not a direct measure of its use level does give valuable information. It can be assumed that the higher the level of satisfaction with the prosthesis the higher the amount of use it will be put to.

Two measures of satisfaction were taken. The first of these is related to the satisfaction with the number of things that could be done with the prosthesis. The other was satisfaction with how well these things could be done.

The evaluation used a five point scale anchored by very unhappy and very happy at opposite ends of the scale.

Table 21: Satisfaction among recipients with the number of things that could be performed with the Prosthesis

Level of Satisfaction		Number	Percentage
Very unhappy	1	8	23.5
	2	5	14.7
	3	8	23.5
	4	5	14.7
Very happy	5	2	5.9

Table 22: Satisfaction among recipients with how well things can be done with the prosthesis

Level of Satisfaction		Number	Percentage
Very unhappy	1	6	17.6
	2	4	11.8
	3	7	20.6
	4	7	20.6
Very happy	5	4	11.8

As can be seen from Table 21, responses to the number of things that were able to be performed with the prosthesis were quite negative with only seven respondents indicating a positive reaction and thirteen indicating various levels of unhappiness. Satisfaction with how well things could be done was more favourable with eleven respondents giving positive reactions. There was not, however, wholesale satisfaction with ten individuals still indicating that they were unhappy.

4.2.4 SUMMARY

It could be said that these measures indicate that there is definitely a group within the population who are low or non-users of prosthesis. According to some of the measures obtained, this group could be in the vicinity of thirty to forty per cent of respondents. Bearing in mind the similar configurations of individuals between the respondents and the population this value could be applied to the population quite readily.

The next step in the survey therefore is to examine the relationship between these use variables and measures of the types of prosthesis and the demographic configurations of the respondents. This should enable us to see how the use levels relate to these measures and to see if any can be used in explaining the low use levels.

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