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RESEARCH PAPER

Developing consensus on important factors associated with lower limb prosthetic prescription and use

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Purpose: There is an ongoing concern in lower limb prosthetic rehabilitation with underuse and nonuse of prosthetic technology. The aim of this study was to gather expert opinion on the most important outcomes, predictors and facilitators of lower limb prosthetic prescription and use, with a long-term goal of improving satisfaction with prosthetic technology. *Method:* An electronic Delphi study was conducted using an expert panel of 21 service providers and users and was undertaken over three iterations. *Results:* The process resulted in the identification of 13 outcomes, 19 predictor and 34 facilitator factors. *Conclusions:* Psychosocial factors related to service provision and prosthetic use have not been widely recognized or incorporated into clinical practice. We highlight the need for creating standardized measures that incorporate psychosocial factors and that can contribute to a broadly applicable evidence base for optimal prosthetic prescription.

Keywords: Lower limb amputation, prosthetic, psychosocial factors

Implications for Rehabilitation

- A key component of the rehabilitation process of persons with lower limb amputation is the prescription of a prosthesis.
- Nonuse and underuse of prosthetic technology is of increasing concern.
- This research aims to improve the quality of life for people with lower limb amputation by developing consensus on important outcomes, predictors and facilitators of lower limb prosthetic prescription and use.
- These findings emphasize the importance of psychological and social factors when considering prosthetic prescription and use and are an important step in informing the tailoring and evaluation of interventions to facilitate the use of a prosthesis, the delivery of services and appropriate outcome measurement.

Introduction

A key component of the rehabilitation process of persons with lower limb amputation is the provision of prosthetic care. However, reported rates of prosthesis use can vary as much as from 49% to 95% [1–3], indicating that as an intervention it may not always be effective or the most appropriate. Further to this, the technology may not always be used to its full potential. For example, in one study on US war veterans, all persons with transfemoral or higher level amputation who had identified themselves as primarily wheelchair users were also in possession of microprocessor-controlled knee joints. It would appear therefore that for those individuals who had received an expensive functional prosthesis, they were not utilizing it to its full capability for much of the time [4]. Nonuse and underuse of prosthetic technology is of increasing concern to those within physical rehabilitation due to technological advances increasing the costs associated with their provision and the increasing prevalence of lower limb amputation [5,6].

Typically, the goal for patients with limb loss is "to restore function and quality of life to the fullest extent possible with prostheses, wheeled mobility and other assistive devices [3]." From the perspective of prosthetic provision, it is important to have an understanding of why individuals will use, underuse or not use a prosthesis, as this contributes

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to promoting the quality of life for service users, and for maximizing the potential of the service to meet the needs of users. Users should be matched with the best technology to not only meet their physical needs and restore functionality to the fullest extent possible but also to ensure they are satisfied psychologically and socially [7]. It is also recognized that it is no longer sufficient to simply measure hours of time wearing the prosthesis or frequency of use as sole indicators of outcome [8,9].

Identifying the important outcomes, predictors and facilitators of lower limb prosthetic prescription and use is an important step in meeting the needs of service users. Currently, there is no consensus on the most important outcomes in lower limb prosthetic prescription. Commonly agreed on outcomes of prosthetic prescription would make it easier to compare different treatments, interventions and service delivery; enhance accountability in prosthetic services; indicate which outcome measures to use; and help to justify the provision of expensive prosthetic technology and contribute to cost effectiveness [10–12]. However, further improvement could also occur by establishing the important predictors of lower limb prosthetic prescription and use, that is, the factors that are seen to effect whether an individual will get a prosthetic limb, and to what extent they will use it. Some measures, such as the Amputee Mobility Predictor [13] have found good interrater reliability and good prediction of the 6-min walk test. However, although it can predict functional use of a prosthesis, it does not predict if an individual will continue to use the prosthesis after discharge from rehabilitation, or similarly using the prosthesis to its fullest potential. As there are currently a large number of physical, psychosocial and demographic factors seen to affect prosthetic use and prescription, ascertaining the most important of these predictors is essential, as it could provide support for using certain interventions and providing certain componentry, as well as justifying prosthetic rehabilitation more generally. Finally, it is important to understand how other factors can facilitate the use of a prosthesis following its prescription. For example, feelings of embodiment (feeling the prosthesis is part of the users own body) may increase use and satisfaction with the technology [14], but would not be present prior to its prescription. Identification of these facilitating factors could further ensure that prosthetic technology will be used effectively.

One method to determine which factors are considered the most important and influential in prosthetic prescription is to gather expert opinions systematically. Systematically combining available evidence-based literature and expert opinions can make an important contribution to creating knowledge-based measures [15]. Formal consensus methods offer one means to do this. These methods have been defined as "group facilitation techniques designed to explore the level of consensus among a group of experts by synthesizing and clarifying expert opinions [16]." Their main purpose is to define levels of agreement on different subjects by an expert panel. Formal consensus methods have become common tools for solving problems in health and medicine [17]. They have also been widely used as part of the development of International Classification of Functioning, Health and Disability (ICF) core sets for different disabling conditions [18].

The Delphi Technique, one widely used formal consensus method, involves sending a questionnaire (structured or unstructured) to an expert panel, collating the responses to create a revised questionnaire, which is then recirculated to the panel, along with a summary of the results and feedback on how their ratings compared with the rest of the group. Panelists may then modify their previous response if they wish. This process is repeated until a sufficient synthesis of expert opinion has been achieved. Crucially, the expert panel is polled anonymously. Literature around the expert panel acknowledges that it is "crucial to secure the participation of the right kinds of experts, who understand the issues, have vision, and represent a substantial variety of viewpoints [19]." Delphi studies in health care have used this approach, by including a number of different professions and in some cases also including patients in their expert panels [20–24]. In identifying important factors to consider in lower limb prosthetics prescription and usage, it is important to reflect the reality of the clinical environment in the research. That is, the service user plays a role along with the varying members of the multidisciplinary team in discussing, for example, options for prosthetics prescription and what helps or hinders use. Consequently, it is important that the service user viewpoint is considered along with other viewpoints in identifying important factors. The inclusion of service providers and users in the expert panel in this study is in keeping with recent expert advisory panels for research studies where service providers, academics and users are included to guide the study, to inform recommendations and to maintain a focus on the realities of limb loss [3,25]. Sigeford [26] prioritizes the person centeredness of care and states that the person receiving care must drive the process and set the goals. Finally, in the description of an amputation specialty program, the Commission on Accreditation of Rehabilitation Facilities (CARF) indicates a person-centered interdisciplinary team approach where the person served "actively participates as a member of the interdisciplinary team to develop and understand the services provided and the impact on his or her functional activities [27]."

The Delphi Technique is particularly useful when the research population, such as those involved in prosthetic rehabilitation, are geographically diverse and present diverse experience and expertise, and the research problem benefits from obtaining a broad spectrum of opinion which, due to the iterative process of the method, recreates the sharing of views and opinions that would occur if participants had been brought together in a group [28,29]. A research group in the Netherlands has also previously developed national clinical guidelines for the prescription of lower limb prostheses using the Delphi Technique with relation to the choice of specific prosthetic components [30]. The current study hopes to build on and expand the primarily physical- and component-focused research to date, by identifying important outcomes, predictors and facilitators from a broader physical and psychosocial perspective, with an international multidisciplinary expert panel of service providers and prosthesis users.

Method

Participants

The inclusion criteria were defined for the expert panel prior to the commencement of the Delphi. In identifying the initial list of potential participants, purposive sampling was employed using these criteria so that those included would be able to meaningfully answer the research questions. Potential participants were identified by (i) undertaking a 10-year database search of Medline, PsychInfo and pertinent journals (e.g. *Disability and Rehabilitation*, *Prosthetics and Orthotics International* and *Rehabilitation Psychology*) for authors, with valid email addresses, of relevant peer-reviewed publications; (ii) reviewing relevant conference proceedings; (iii) drawing on professional networks; (iv) contacting amputee support groups via group chairpersons or secretaries who forwarded information to group members and (v) "snowballing" where participants were encouraged to pass the questionnaire onto other eligible participants that they knew in the area. Inclusion criteria included currently working in the provision of lower limb prostheses, have been using a lower limb prosthesis for at least 2 years or having considerable recognized knowledge of the prescription of lower limb prosthetics through academic research or specialization; being over 18 years of age and having sufficient spoken English for the demands of the study.

In total, 81 expert panel members were contacted to take part in the Delphi. Of these, 26 completed the first round of inquiry, 23 completed the second round and 21 the third round. These response rates are typical of previous studies [23,30,31]. Participants were predominantly from not only England, Scotland and Northern Ireland but also the USA, Canada, Sweden and the Netherlands. The time as a prosthetic user ranged from 2 to 38 years, ($\bar{x}$ = 12.31 years, σ = 12.40). Of the users who completed all three rounds (n = 6), 83.3% had a unilateral transfemoral amputation, and 16.7% had a unilateral transtibial amputation. Of the service providers who completed all three rounds (n = 15), 60% identified themselves as physiotherapists, 20% as a lecturer in prosthetics, 33.3% as an academic or researcher in the prosthetic field, 13.3% as a prosthetist, 13.3% as a consultant, 13.3% as a clinical psychologist, 6.7% as a doctor in rehabilitation, 6.7% as a occupational therapist, 6.7% as a counselor in rehabilitation and 6.7% as a rehabilitation engineer. Years of experience working with prosthetics ranged from 2 to 53 years, ($\bar{x}$ = 17.47 years, σ = 11.47).

Reaching consensus

There are multiple ways of reaching consensus regarding the importance of items in the Delphi process [15,30,32–34]. In this study, for a factor to be considered important, it had to have an average rating of 4.5 or higher, without any negative ratings, that is, ratings of 1 or 2, on the 5-point Likert-type scale (1 = very unimportant/not at all useful to consider to 5 = very important/very useful to consider). Factors with an average rating of 4.0 or higher, which also had 80% of the participants rating it as important or very important, again without negative ratings, were also included as important. This ensured that not only factors which had the most agreement

on importance or usefulness were included but also factors which had not achieved many ratings of 5, but had many ratings of 4, therefore lowering the average, were not excluded.

Procedure

The Dublin City University Ethics Committee approved this research. A full diagram of the procedure is in Figure 1. Individuals who met the inclusion criteria were contacted by email prior to the start of the study to inform them about the study and to gain their informed consent to partake in the study.

Delphi Round 1

In this study, the Delphi was conducted using email to direct participants to a web link (www.SurveyMonkey.com), which provided an electronic version of the questionnaire. The first round of the Delphi questionnaire was developed using data from 12 semistructured interviews with multidisciplinary service providers within the amputation rehabilitation setting [35] and six focus groups with 24 prosthesis users to identify the outcomes and predictors of prosthetic prescription from both the patient and professional perspective. The qualitative data, combined with a detailed review of existing professional and research literature, formed a comprehensive basis for identifying and developing items to be included in the first round of the Delphi. Eighty-six items were divided into three sections: outcomes of prosthetic fitting, factors that influence prosthetic fitting and use and factors that facilitate prosthetic use.

Participants were asked to rate each factor on a 5-point Likert-type scale for how important it is as an outcome of prosthetic fitting, how important it is as a predictor of prosthetic fitting and use or how useful it is to consider in facilitating prosthesis use. They were also asked to leave a comment explaining their choice if they gave a negative rating (<3). When consensus was reached on an item, it was removed from the next round of the Delphi. Factors that reached consensus on unimportance, that is, with an average rating ≤2.0 and 0% of positive ratings were also removed. Suggestions of any important factors that might be missing from the round were also requested. The data were collated, and the means for each factor were calculated to show the group opinion of the panel. The percentage of replies to each response (1–5) were also calculated to ascertain, which factors reached consensus on being important or useful within prosthetic prescription and facilitating use. All comments received were also compiled for use in the next round of the study.

Delphi Round 2

Factors that reached consensus on importance or usefulness (n = 39) were removed for Delphi Round 2. Factors that reached an overall consensus of unimportant or very unimportant were discarded (n = 1). Those factors that did not reach consensus in Round 1 (n = 46) along with new factors, which had been suggested by the participant in Round 1 (n = 39) were included in Delphi Round 2 and presented back to participants. A total of 85 factors were then available for rating in the second round. All the average ratings from Round 1 were also sent to the
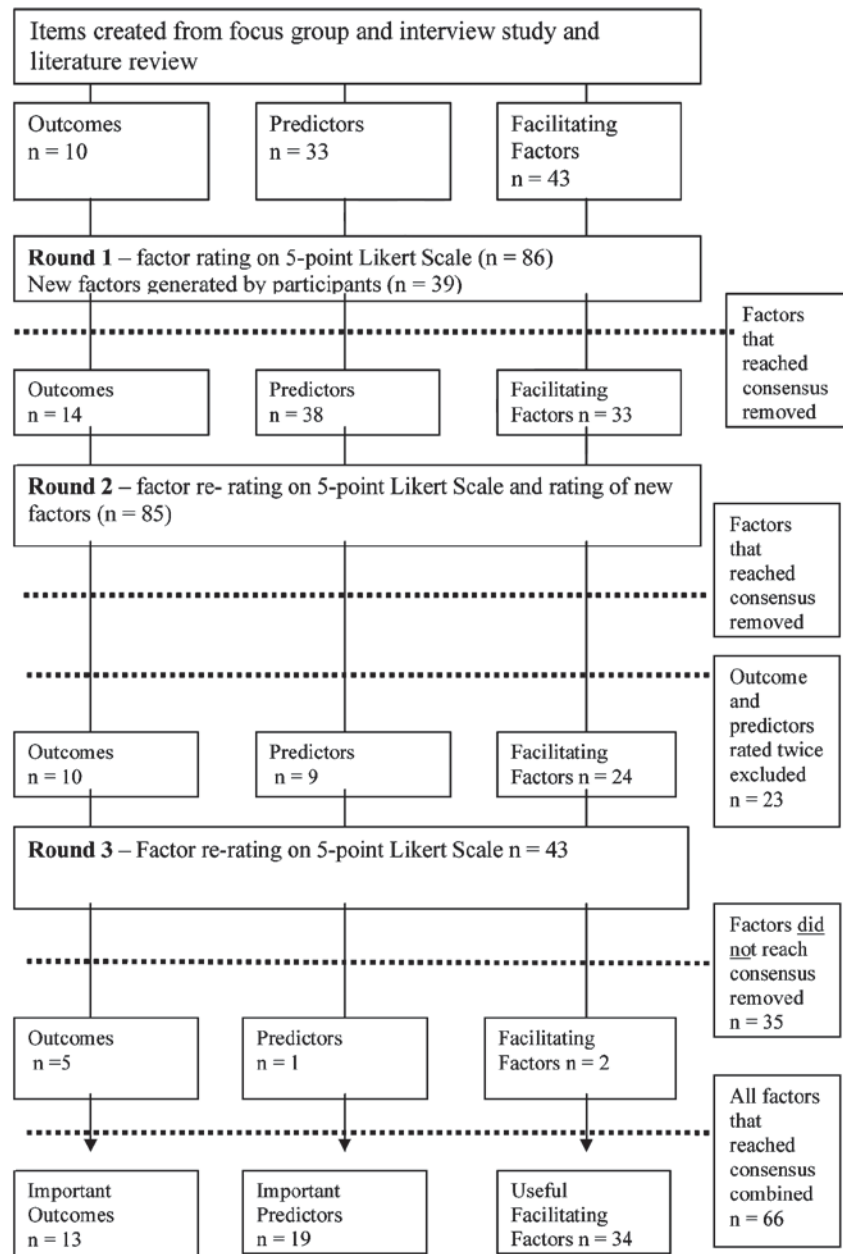
Figure 1. Diagram of the Delphi method. Adapted from Baker et al. [48].

participants along with their original responses. Comments from other panelists were also included to provide extra information on factors where panelists had been unsure before. Participants were again asked to rate each factor on a 5-point Likert-type scale. They were also asked to leave a comment explaining their choice if they gave a negative rating (<3). The means and percentage ratings for each factor in Delphi Round 2 were calculated. All comments received were also compiled for use in the next round of the study.

Delphi Round 3
For the construction of Delphi Round 3, all factors that had already reached consensus were omitted from this round as agreement had already taken place, and therefore they were included in the final list. All factors that had been rated twice by the participants but did not reach consensus were also removed.

There were then only 43 factors to be rated in this last Delphi round. All the average ratings from Rounds 1 and 2 were sent to the participants along with their original responses for both rounds. Comments from other panelists were also included to provide extra information on factors where panelists had been unsure before. Participants were again asked to rate each factor on a 5-point Likert-type scale. They were also asked to leave a comment explaining their choice if they gave a negative rating (<3). The means and percentage ratings for each factor in Delphi Round 3 were then calculated.

Results

From an eventual list of 125 factors (86 generated from the initial study and a further 39 created during the study), 13 factors were identified as important outcomes of prosthetic

prescription, 19 factors were identified as important predictors of outcomes of prosthetic prescription and use and 34 factors were identified as useful in facilitating prosthetic use.

Fifty-eight factors were excluded due to lack of consensus. The full final means and percentages of these factors are in the Tables I, II, III, IV, V and VI below.

Table I. Average ratings of outcomes that reached consensus.

Outcomes	Round 1	Round 2	Round 3
Improved quality of life	4.92	–	–
Regaining independent movement (i.e. movement without help of other people)	4.85	–	–
Regaining sense of freedom	4.73	–	–
Self-reliance	4.73	–	–
Walking with safety	4.73	–	–
Balance when walking	4.69	–	–
Living at home rather than in care facility	4.62	–	–
Comfort while walking and sitting	–	4.70	4.90
Capability and competence when using the prosthesis	–	4.43	4.71
Meeting individual needs of the service user	–	4.57	4.71
Community access and improved socialization (avoiding isolation)	–	4.22	4.52
Participation in valued activities	–	4.39	4.48
Return to previous hobby or work	–	4.35	–

Table II. Outcomes that did not reach consensus.

Outcomes	Mean	% Agreement importance	Negative rating <3
User has knowledge and understanding of prosthetics	4.05	71.4	No
Minimizing use of walking aids	3.95	76.2	Yes
Normalization of gait	3.95	84.7	Yes
Tolerating limitations in speed and so forth	3.90	81.0	Yes
Meeting established rehabilitation goals	3.87	82.6	Yes
Not relying on a wheelchair	3.57	52.2	Yes
Not being obviously disabled	3.38	52.4	Yes
Meeting the expectations of health care providers regarding walking and physical ability	3.13	39.1	Yes

Table III. Average rating of predictors reaching consensus.

	Round 1	Round 2	Round 3
Age and illness predictors			
Renal disease/dialysis	–	4.26	–
Joint-related conditions or illness	–	4.13	–
Visual impairment	–	4.13	–
Decline of functional ability due to age or illness	4.08	4.09	–
Physical condition predictors			
Condition of the residual limb/stump	4.54	–	–
Condition of contralateral limb (remaining leg condition, may also be amputated)	4.50	–	–
Residual limb pain (stump pain)	4.42	–	–
Ability to donn and doff prosthesis if carers are not available	–	4.35	–
Severity of pain experienced (phantom pain, joint pain and residual limb pain)	–	4.22	–
Current physical ability	4.15	4.04	–
Residual limb length/amount of limb below joint	–	4.04	–
Range of motion	–	4.00	4.00
Psychological and social predictors			
Determination to walk	4.50	–	–
Social support	4.46	–	–
Motivation in rehabilitation setting	4.46	–	–
Optimistic outlook/positive thinking	4.42		–
Feeling in control of the situation	4.27	–	–
Attending clinic regularly/returning for more fittings	4.19	–	–
Avoiding acknowledging the situation	3.92	4.13	–

Table IV. Predictors that did not reach consensus.

	Mean	% Agreement importance	Negative rating <3
Age and illness predictors			
Respiratory illness	3.74	69.5	Yes
Coronary illness (heart-related illness)	3.74	69.5	Yes
Reason for amputation (trauma vs. illness/disease)	3.52	56.5	Yes
Many operations or amputation before fitting	3.52	60.9	Yes
Age	3.04	34.8	Yes
Physical condition predictors			
Physical ability previous to amputation	4.00	78.2	No
Contractures	3.96	87.0	No
Strength	3.95	85.7	No
Feeling in residual limb	3.81	76.2	Yes
Stamina	3.71	66.6	Yes
Other pain (e.g. back or hip pain)	3.70	65.2	No
Ability to stand on one leg	3.52	42.8	No
Phantom limb pain	3.39	39.1	Yes
Gender	1.96	0.0	Yes
Psychological predictors			
Enthusiasm for rehabilitation	4.00	78.2	No
Ability to learn	3.96	78.3	Yes
Previous lifestyle and routine	3.90	80.9	No
Body image issues	3.86	77.3	No
Memory ability	3.78	69.6	Yes
Anxiety	3.73	72.7	No
Suffering from posttraumatic stress disorder	3.70	69.5	Yes
Depression	3.70	56.5	No
Seeking help from others	3.65	60.9	Yes
Learning disabilities	3.62	57.2	No
Addiction problems (e.g. alcoholism, drug addiction)	3.55	50.0	Yes
Psychiatric disorder	3.48	57.8	Yes
Culture/ethnicity	3.19	28.5	Yes

Discussion

The aim of this study was to create a consensus on the most important outcomes of lower limb prosthetic prescription, the most important predictors of prosthetic prescription and use and the most important factors in facilitating the use of lower limb prostheses. Consensus on importance was reached on 13 outcomes of prosthetic prescription. Many were physical in nature, representative of previous research and expected of a user of prosthetic technology, for example, "comfort while walking and sitting," "walking with safety" and "balance when walking." However, there were also a number of psychosocial outcomes identified such as "improved quality of life," "self-reliance," "a sense of freedom" and "participation in valued activities." Quality of life (QOL) is often noted as an outcome of rehabilitation medicine [36]. However, there is difficulty in understanding how QOL is most appropriately operationalized within the prosthetic setting due to its multidimensional and subjective nature and the large amount of QOL measures that have been used in the literature [37]. In the absence of a consensual definition and gold standard measurement, it is advised that at a service level, the definition of QOL that is subscribed to is explicated and that at an individual level, there is the opportunity to identify domains of QOL of most relevance to the person.

Previous research on outcomes has been more focused on clinical outcomes rather than outcomes that affect the individual in their own personal context such as how it affects their daily living, their work life and their family life. This can devalue and disregard important human and social outcomes [38]. The findings recognize the importance of understanding and measuring the impact of the prosthesis on the individual's life rather than solely measuring its impact on the individual's functional ability. However, measuring this type of outcome can be challenging in the absence of universally recognized standardized instruments. Consequently, further work is required in ascertaining which measures are the most suitable to be used within the prosthetic setting for measuring these outcomes and to also incorporate patient-reported measures in this context due to the importance of the patients' opinion on their own outcomes.

In terms of predictors of prosthetic fitting and use, there was agreement on the importance of 19 factors. Of these, 12 were physical in nature and predominantly consistent with previous research [39–41]. It was of particular note that "decline due to age and illness" reached consensus as opposed to "age," and other specific illness. "Severity of pain" emerged as an important predictor whereas the presence of

Table V. Average ratings of facilitating factors reaching consensus.

	Round 1	Round 2	Round 3
Facilitating use: Acceptance and goal-setting factors			
Setting achievable goals	4.65	–	–
Making sure expected goals are achievable	4.58	–	–
Returning to work	4.31	–	–
Facilitating use: Social factors			
Family accept the amputation	4.38	–	–
Family understand limitations of user	4.19	–	–
Family accept and understand the expected potential of user	4.19	–	–
Establishing/continuing romantic relationships	4.12	–	–
Ease of getting about in public (ramps, uneven surface etc.)	–	4.39	–
Supportive work environment	–	4.30	–
Specific movements needed for job/leisure/home life aided by prosthesis	–	4.26	–
Facilitating use: Prosthesis factors			
Having a comfortable prosthesis fit	4.96	–	–
Confidence in walking ability and using prosthesis	4.85	–	–
Feeling the prosthesis has become part of the user's own body	4.46	–	–
Understanding and managing changes in the residual limb/stump	–	4.35	–
Fear of falling due to loose prosthesis	3.92	4.26	4.33
A shrinking residual limb (stump)	4.00	4.26	4.29
Facilitating use: Service factors			
Limb alterations done in reasonable time	4.88	–	–
Multidisciplinary support (different professions involved in helping the prosthetic user)	4.77	–	
A returned leg is usable and altered properly for the user	4.77	–	–
Patient and prosthetist relationship	4.73	–	–
Limb alterations done on-site	4.73	–	–
Suitable walking space in fitting centre to test legs	4.69	–	–
Amount of time allocated to fitting process	4.65	–	–
Entrance to building suitable for wheelchairs and prosthetic walking	4.65	–	–
Patient involvement in prosthetic choice	4.54	–	–
Choice in components of the limb (e.g. not restricted to a certain manufacturer)	4.42	–	–
Available transport for users who cannot drive	4.35	–	–
Accountability for service (e.g. complaints service available)	4.35	–	–
Communication between private-contracted prosthetists and public service employees in same fitting centre	4.27	–	–
Sufficient time spent on different surfaces with walking training (e.g. slopes, grass and gravel)	–	4.74	–
Access to all members of multidisciplinary team if needed	–	4.52	–
Use of trial periods outside of clinic environment for new fittings	–	4.35	–
Access to active user group/support group	–	4.30	–
Use of check sockets (see-through sockets to check fit on residual limb)	–	4.22	–

a specific pain (i.e. phantom, residual limb, back or hip) did not. Consensus on importance was reached on seven psycho-social predictors. The emergence of both "determination to walk" and "motivation" as important predictors indicates how personal factors can play a role in the rehabilitation process. Unlike motivation, a common predictor of outcome in the rehabilitation literature, determination to walk has not been looked at in previous studies. However, caution must be taken due to the difficulty in measuring these factors: determination and motivation do not have their own specific measures and there are issues relating to the conceptualization of motivation within rehabilitation [42]. Recently, the Hopkins Rehabilitation Engagement scale has been developed to measure participation in rehabilitation, which could arise from determination and motivation to rehabilitate. Research has shown it to be a valid and reliable measure of engagement and

is related to intermediate-term outcomes [43], though more research is needed before it can be used to predict prosthetic outcomes. Unexpectedly, "ability to learn" did not emerge as an important predictor of prosthetic prescription outcomes and use despite being shown in previous research to predict prosthetic rehabilitation [44]. However, previous research has shown that if given extra time and attention in rehabilitation, patients with cognitive deficits can achieve function with a prosthesis [45]. It is clear then that to improve prosthetic prescription, rehabilitation should be tailored to accommodate for each individual and their specific needs. Factors, such as ability to learn, could be addressed in rehabilitation to pre-empt a negative effect.

Factors associated with facilitating the use of the prosthesis were not concerned with predicting the prescription of a limb but rather the effect on whether the limb is worn and

Table VI. Facilitating factors that did not reach consensus.

	Mean	% Agreement usefulness	Negative rating <3
Facilitating use: Acceptance and goal-setting factors			
Accepting the amputation as part of life	4.10	76.2	No
Emphasizing the positives that have come from amputation	3.90	66.7	No
Attitude of society to disability	3.76	71.5	Yes
Taking up a hobby	3.67	57.1	Yes
Spirituality	3.38	47.6	Yes
Comparing self with those worse off	2.71	33.3	Yes
Comparing self with those better off	2.48	23.8	Yes
Facilitating use: Social factors			
Place of residence	3.62	57.2	No
Self-consciousness with prosthetic in social situations	3.48	57.1	Yes
Type of job	3.33	47.6	Yes
Overprotective family	3.24	47.6	Yes
Receiving disability allowance/benefits from the state	3.24	38.1	Yes
Employment status	3.14	78.1	Yes
Education level	2.86	19.0	Yes
Earnings	2.67	9.5	Yes
Facilitating use: Prosthesis factors			
Understanding prosthetic maintenance and function	4.05	71.4	Yes
User has knowledge and understanding of prosthetics	4.05	71.4	No
Facilitating use: Service factors			
Prosthetist who speaks same language as user	4.19	75.2	No
Enough space to deal with many people	3.81	61.9	Yes
Privacy in fitting rooms	3.67	52.3	Yes
Fitting centre adjacent to primary amputation wards	3.57	52.4	Yes
Choice in fitting services available in area/country	3.57	47.6	Yes
Restriction on components available	3.19	33.3	Yes

used to the best of the user's capacity. Consensus was reached on 34 factors important in facilitating the use of the prosthesis. Almost half were service related factors suggesting how service related factors can impact on the way an individual engages in prosthetic rehabilitation, and potentially affects how an individual will do with their prosthesis depending on the standard, quality and delivery of care within the initial fitting process and follow-up appointments. Previous research while looking at how satisfied people are with their service, or how important facets of the service are to users, has not investigated whether these influence prosthetic outcomes or how an individual engages with the rehabilitation process. An exception to this is Berke et al. [46] who found strong correlations between prosthetic device satisfaction and issues surrounding fit and delivery systems. Further work investigating the relationship between aspects of care delivery and differing outcomes is warranted. Among other psychosocial facilitators, the impact of close social networks such as the user's family on prosthetic use was identified as important. Although the specific role of the family in prosthesis use has not been examined previously, understanding how to mediate the relationship between the family and the service user for a positive effect merits consideration.

There were potential limitations to the Delphi study including the low response rate. However, it is noted that the response rate is similar to those of other Delphi studies [23,30,31]. Furthermore, as the aim of a Delphi study is to obtain consensus from a group of expert panel members, a Delphi does not depend on a representative sample of the population, but instead requires panel members to have a deep understanding of the issues under study [47]. Consequently, sample size is irrelevant, as long as the panel is composed of valid experts according to clear criteria as delineated in this study. The Delphi itself also has limitations as a method, such as having to arbitrarily choose a definition of consensus, and the potential bias that might be created by the expert pool. To overcome these limitations we chose a definition of consensus that comprised the best points of previous studies (a high percentage of participant agreement, a high average rating on a named, 5-point Likert-type scale, not including factors with any negative ratings) and that created a diverse expert pool, comprising individuals from different service settings, in different disciplines, and also by including service users. Additional detail on participants (e.g. the type and level of use of prosthetic components of service users) may impact their choices of what was considered to be important and recording of this in future studies is advised.

There were strengths to this study. First, by conducting the Delphi online it was possible to collate the information from users and create Delphi rounds easily. Further to this, invitations and reminders for the Delphi could be sent by email so notification of delivery was immediate, and it was possible to contact experts from a number of different countries to take part to access a wider base of knowledge. The study was also unique in its approach to using the Delphi in the amputation

literature by including psychosocial factors within the study, and also by including service providers from a variety of disciplinary backgrounds and service users in order to incorporate a diversity of opinions in the Delphi rounds leading to consensus. It is important to reflect on the role of the patient in the rehabilitation team and as partners in research. The experiential knowledge is an important form of knowing that can be combined with other types of knowing to provide more holistic and meaningful outcome measures. Outcomes need to be meaningful to users in addition to service providers/ professionals. There is an ongoing and appropriate emphasis in the Veteran's Administration and CARF to promote client-centered care [3,25–27]. This study suggests that it is both feasible and essential to get a diversity of perspectives and that users can and should be included in these expert consensus panels and processes.

Conclusions

This is the first time a structured approach to consensus has been sought on the most important outcomes, predictors and facilitators of lower limb prosthetic prescription and use. Furthermore, this is the first time that outcomes, predictors and facilitating factors have been looked at from a physical, psychological, social and environment perspective and from the perspective of professionals and service users. Implicit knowledge is being made explicit. Having a list of these factors cements their importance and encourages further research using them as a foundation for future investigations. It is anticipated that this list of important outcomes, predictors and facilitators is an important step in informing the tailoring and evaluation of interventions to facilitate the use of a prosthesis, the delivery of services and appropriate outcome measurement. For example, it can contribute to identifying the most valid measures of outcome and predictors of outcomes for use in the clinical setting, as well as creating operational definitions of the various outcomes and predictors, for example, determination to walk, and how these may then be applied for multidisciplinary use. The compilation of the list of predictors as a screening tool in the clinical setting could also be explored. Being aware of important predictors of prescription and use that need to be addressed in the fitting process, even in checklist form, ensures that the most important areas are addressed. This research promotes a focused client–practitioner interaction. It does not purport to have identified a universal solution appropriate for all but rather a first step in standardizing a way of identifying which interventions or components a person needs depending on their individual evaluations.

Ultimately, this research has highlighted how psychosocial factors play a role in the prescription of prosthetic limbs, as well as psychosocial outcomes being important for those who use the technology. This study has indicated how service providers should tailor rehabilitation research and services to address the holistic needs of the user, rather than focusing mainly on improving functional outcomes through functional measures and technological advances. By taking into account the psychosocial, there is a real possibility to improve the satisfaction and quality of life of many prosthesis users and optimize use of prosthetic technology.

Acknowledgments

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