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Master of Health Sciences

Masterthesis

Health indicators related to prosthesis use and quality of life in elderly trans-femoral amputees

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List of acronyms and abbreviations

ADL	Activities of Daily Living
AOK	Allgemeine Ortskrankenkasse
BP	Bodily Pain (SF-36)
FES-I	Falls Efficacy Scale - International
GARS	Groningen Activity Restriction Scale
GH	General Health (SF-36)
HIRP	Health Indicators Related to Prosthesis use
HRQoL	Health-Related Quality of Life
IADL	Instrumental Activities of Daily Living
KD	Knee Disarticulation
LCI	Locomotor Capabilities Index
LLA	Lower Limb Amputation
MCS	Mental Component Score (SF-36)
MH	Mental Health (SF-36)
MOS	Medical Outcomes Study
OPS	Operationen- und Prozedurenschlüssel
PCS	Physical Component Score (SF-36)
PF	Physical Functioning (SF-36)
ProFaNE	Prevention of Falls Network Europe
PVD	Peripheral Vascular Disease
QoL	Quality of Life
RE	Role-Emotioanl (SF-36)
RP	Role Physical (SF-36)
SD	Standard Deviation
SF	Social Functioning (SF-36)
SPARG	Scottish Physiotherapy Amputee Research Group
TFA	Trans-Femoral Amputation
TTA	Trans-Tibial Amputation
VT	Vitality (SF-36)
WHO	World Health Organization
WHOQoL	World Health Organization Quality of Life

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Abstract

Background: The geriatric population of persons aged 65 and older is growing rapidly and is estimated to double in the next 30 years. The amputation of a limb in elderly people is a significant intervention. In addition to changes in body structure and functions, the affected person is confronted with a number of physical limitations, participation restrictions and risks, which influence the general health as well as quality of life and are related to prosthetic use. But, very little is known about health issues and prosthesis use related to amputation in the elderly population.
Aim: The aim is to give a descriptive analysis of amputee characteristics and health indicators related to prosthesis use (HIRP) as well as of health-related quality of life in a population of elderly individuals with unilateral trans-femoral amputation and low grade of mobility.
Method: The study used a descriptive design and was performed as an explorative cross-sectional survey. A questionnaire with a compilation of standardised measurement tools (GARS, Houghton Scale, LCI, FES-I, SF-36) was used to collect objective-related primary data in a convenience sample of elderly trans-femoral amputees in structured interviews. The interviews were conducted in different settings.
Results: Twenty-six eligible individuals were interviewed. Their mean age was 72.35 ± 6.9 years. The male female ratio was 5.5:1 in the sample. Defined as mobility grade 1 were 46.2% (N=12) and 53.8% (N=14) as mobility grade 2. The dominant aetiology was vascular disease (69.2%, N=18). Participants scored as followed: 52 (range 24 to 67) on GARS; 1 (range 1 to 11) on Houghton Scale; 23 (range 0 to 49) on LCI; 41.19 ± 9.57 on FES-I; from 20.9 ± 16.7 to 80.8 ± 35.5 on all eight dimensions of the SF-36.
Discussion: GARS revealed that amputees with TFA are dependent on the help of others in many activities. Successful prosthetic ambulation was only achieved in four participants. Individuals reported restricted mobility and problems with activities of daily living. Regarding this, successful prosthetic ambulation was low. Elderly amputees tend to have high concerns about falling. QoL of elderly amputees was poor, especially in dimensions with regard to physical components. Comparability of results with other studies is limited**.**
Conclusion: The results of this research may be important to identify areas of potential improvement in the management of elderly people with LLA in order to support further population specific research and development. It is suggested that future investigations in amputees covered by this thesis should focus on the investigation of differences in HRQoL and prosthetic function due to gender, grade of mobility as well as due to the type of prosthetic and rehabilitation treatment.

1 INTRODUCTION

Mobility is an import part of live, regardless of age. How much we take our own mobility for granted and what the loss of physical freedom can mean is rather hard to discover. However, disability can suddenly become a fact of life that is difficult to cope with rationally. Examining physical disabilities and the opportunities offered by modern medical technologies are essential to people who have undergone an amputation. Today's prostheses are high technology medical devices after having progressed from the first developed prostheses made of wood. But, prosthetic treatment can vary substantially depending on the localisation and level of the amputation and the individual requirements of the affected person. Especially elderly people with trans-femoral amputation and reduced physical capabilities are provided with rather simple devices.

Very little is known about health issues and prosthesis use related to amputation in the elderly population. Measuring the amount of prosthetic use is not satisfactory in order to explain the situation for amputees using a prosthetic device. The assessment should also include measurements of quality of life, mobility and further problems related to amputation (Hagberg, 2006). Relevant studies have, among others, researched the influence of an amputation on health-influencing factors, prosthesis use and quality of life. However, a literature research found that there are several studies on amputees, but there is no data on less mobile elderly trans-femoral amputees. The studies reported in the literature were more general and included patients without reference to age, level of amputation and grade of mobility. Differences between studies on amputees may be due to the heterogeneity of the investigated samples. So far, there were no informative surveys with findings on elderly amputees with trans-femoral amputation and limited mobility to ascertain how this population is characterized in terms of health, prosthesis use, quality of life, activity limitations and other potentially health influencing factors. Consequently, this thesis aims to give a descriptive analysis of amputee characteristics and health indicators related to prosthesis use (HIRP) as well as of health-related quality of life in a population of elderly individuals with unilateral trans-femoral amputation and low grade of mobility.

In the first part of the thesis background information is given in order to get a more detailed understanding of the topic. Then, the study is described starting with the presentation of the aim and objectives, followed by a comprehensive description of the methodological approach. Subsequently, the results and the discussion of those are reported. A conclusion and outlook will be the final part of this thesis.

2 BACKGROUND

The amputation of a limb is a significant intervention for the person concerned. In addition to changes in body structure and functions, the affected person is confronted with a number of physical limitations and risks. Individuals with a lower limb amputation are often particularly affected by multimorbidity, limited mobility and increased risk of falling. Moreover, persons with amputations may also experience a wide range of activity limitations and participation restrictions, which typically relate to self-care activities, mobility and numerous other issues.

The geriatric population of persons aged 65 and older is growing rapidly and is estimated to double in the next 30 years (Miller and Zylstra, 2007). The effect will be especially profound to the health care profession as well as to prosthetic care. This is due to a variety of factors including physiologic changes and associated degenerative diseases. These have a direct affect on strength, motion, and balance as well as general health issues, which decrease the ability to perform everyday activities and have impact on prosthetic use (Stark, 2009).

2.1 Lower limb amputation

2.1.1 Definition

Amputation is among the oldest surgical procedures. Hippocrates (460-377 BC) described the first surgical amputation of a leg. Improvements of surgical techniques such as haemostasis, anaesthesia and better perioperative conditions have followed, but rather minor technical improvements have been made (Van der Meij, 1995). Lower limb amputation (LLA) is still often viewed as a failure of medical treatment. Besides, amputation is often done to salvage the limb after a severe injury (e.g. war injury, traffic accident), but also when there is tissue loss because of vascular occlusive disease, or to control an infection (Engstrom and Van de Ven, 1999).

The localization of the amputation depends on the particular disease or incident and its spread. An amputation is defined as “the removal of a limb or other appendage or outgrowth of the body” (Dorland and Anderson, 2003). A LLA can be separated in a minor or major amputation. A major amputation is performed through or proximal to the ankle joint, whereas a minor amputation is performed distal to the ankle joint. The three most common levels for a major LLA are trans-tibial

amputation (TTA), knee disarticulation (KD) and trans-femoral amputation (TFA) (Hagberg, 2006). Trans-femoral, which are of special interest in this thesis, are amputations defined as “amputation of the lower limb between the knee and the hip” (Dorland and Anderson, 2003). The ratio of above-knee amputations to below-knee amputations has changed a lot from 70:30 in 1965 to 30:70 a quarter century later. This is because the value of retaining the knee joint and the greater success was more appreciated (Ertl, 2010).

2.1.2 Aetiology

Amputation of the lower extremity is often the treatment of choice for a not reconstructable or functionally unsatisfactory limb. Amputations must be performed with great care and be considered as reconstructive procedures. Numerous causes have been identified for major lower limb amputations. Among the most prevalent are peripheral vascular diseases, traumata, tumours, infections and congenital malformations (Ertl, 2010).

More detailed, lower-extremity amputations may be performed for the following reasons:

- Peripheral vascular diseases (PVD): Most amputations performed are caused of ischemic diseases, mostly elderly person with diabetes mellitus are affected. Affected individuals often experience peripheral neuropathy that proceeds to leg ulcers and consequently to gangrene and osteomyelitis.
- Traumata: Severe open fractures with popliteal artery and posterior tibial nerve injuries are possible to be treated with existing medical procedures in some individuals. But, the treatment is costly and multiple surgeries are required. Moreover, the treated leg is often painful, non-functional and less efficient than a prosthesis.
- Tumours: Amputation is performed less frequently with advanced limb-salvage methods.
- Infections: Treatments of sepsis may lead to vessel occlusion and subsequent extremity necrosis, requiring an amputation. Next to that, the eradication of infection from many difficult sources can require the removal of the affected digit or limbs.
- Congenital limb deficiency: Amputations because of congenital limb deficiencies are performed mostly in the paediatric population to readjust a failure of partial or complete formation of the limb (Ertl, 2010).

The risk of limb loss increases with age. Seniors aged 65 and older have the greatest risk of amputation. As with diabetes and heart diseases, smoking, poor nutrition and lack of exercise may also increase the risk of amputation (Amputee Coalition of America, 2005). Around 70% of non-accidental amputations in Germany are performed in diabetics (Standl et al., 1996). In individuals up to the age of 60, traumata and cancer seem to play a more important role than vascular diseases as reasons for amputation (Narang et al., 1984). Detailed overviews, however, of the reasons for amputations in large groups of younger amputees have not been documented (Schoppen et al., 2002).

2.1.3 Prevalence and incidence

The epidemiological data situation for the prevalence of amputations of the lower extremity is poor (Ephraim et al. 2003). Usually, there are only estimations on the numbers of thigh amputations available, just like in Germany and Austria. Routine data from the General Local Health Insurance (AOK – Allgemeine Ortskrankenkasse) from 2001 revealed an incidence of 44,252 primary amputations at the lower limb, including 10,068 trans-femoral amputations (OPS 5-864.3-.5) in Germany. This number only applies for 90% of all hospitals that perform amputations, for AOK-insured persons and does not include any revisions (WIdO, 2001). Thus, the actual number is much higher. Unfortunately, an amputation register such as in Denmark is missing (Ebskov, 1986).

Due to the overall ageing of the population, it is expected that the prevalence of amputations in the elderly increases as a consequence to the high prevalence of dysvascular diseases, especially diabetes mellitus and arteriosclerosis (Adunsky et al., 2001). In the United States, there were an estimated 1.6 million individuals living with an amputated limb in 2005. It is expected that these estimations of such individuals will more than double to 3.6 million by the year 2050 (Ziegler-Graham, 2008). Internationally, the rate of LLA is reported to vary significantly. There are varying numbers due to different approaches in inclusions and exclusions of individuals, for example with diabetes. Differences also occur because some data includes first, ever or all amputations. Also, the level of an amputation and the use of different data sources to identify amputations lead to significant differences (The Global Lower Extremity Amputation Study Group, 2000).

2.1.4 Survival and mortality

Lower limb amputation is also associated with high mortality. The survival rate varies a lot across countries but it is reported that the mortality rate is generally high (Papazafiropoulou et al., 2009). Older age and higher level of lower limb amputations are related to poor survival. In both, people with and without diabetes the mortality rate after amputation is higher in elderly amputees compared to younger amputees (Papazafiropoulou et al, 2009). Papazafiropoulou and collegues reported (2009) that 50 % of elderly persons who undergo amputations survive the first 3 years. Moreover, the mean survival of older individuals with lower limb amputations is very low and ranges between two and five years. The mortality rate within one year is ranging from 26% in the USA to 39% in Finland (Pernot, 1997).

In particular, an older study found that amputees are more physiologically frail with mortality rates 67%-55% after amputation. It was also reported that two years after an amputation 18-20% of diabetics and non-diabetics lose the opposite leg too. Moreover, after five years this is called for 66% diabetics and 28% non-diabetics. Another study found that 20% of non-diabetics and 28% diabetics lost both legs after two years. Whereas, 28% non-diabetic and 46% diabetic amputees were bilateral amputated after five years (Mazet, 1962).

2.2 Prosthetic restoration for lower limb amputees

Every LLA is a drastic experience for the individual and the fact of loss and replacement of the lower limb lead to different concerns for each person. For all concerned, it is a paramount goal to secure a prosthesis that returns what is missing in a functional manner following the amputation (Legro et al., 1999).

In medical literature from Ancient Times prostheses are not mentioned, although they were definitely made and used which has been noticed from non-medical books and pictures (Van der Meij, 1995). For a prosthetic restoration of the lower limb, it is important to consider the individual issues of the amputee. Especially, old people suffer from multiple disabilities. Some of them are already quite close to their maximum of their physical resources and an amputation at any level is an additional burden on the elderly individual. Additionally, the changes in health related to age like „debility, impaired vision, poor balance, neuropathy, compromised circulation and joint function in the remaining lower limb“ remain, also problems after the amputation of the limb (Burgess and

Zettl, 1969). Hence, to restore the walking ability with a prosthesis, the health situation of the amputee has to be taken into account for prosthetic restoration (Caine, 1972).

Proper walking is highly important in everyday living. A study revealed that a person after lower limb amputation must be able to perform 600 steps during the day to achieve independency inside a one-level home, where an adequate amount of support is provided by family members or social services. In a one- or two-level house or apartment the person should be able to perform 1450 steps per day to live independent. These are daily minima and do not include any activities outside, for example shopping (Holden and Fernie, 1987). The requirements for employed people are much higher. Throughout the day, a secretary walked on average 2842 steps, a schoolboy 2899 steps, a porter 5317 steps and a postman 9500 steps (Marsden and Montgomery, 1972).

Nowadays, prosthetic fitting and walking is achievable for a greater number of persons after LLA because of modern prostheses. Prostheses are made of lightweight materials, are mechanically efficient and have a smaller energy cost during movement. Nevertheless, it was reported that for a lot of people after an LLA the everyday outdoor mobility is limited. That means such people are unable to participate in various leisure activities (Nissen and Newman, 1992).

The primary aim of rehabilitation in individuals with LLA is to restore the walking ability with prosthesis, but not all individuals are able to receive a prosthesis after amputation. The amputee who has been fitted with an above-knee prosthesis must develop the balance and stability to be able to maintain control over the prosthesis and particularly has to learn new patterns of muscular activity to control the prosthetic knee. This may be very demanding for the capacity of some older amputees (Caine, 1972). Next to that, one of the major difficulties for a person after the amputation is to overcome the psychological stigma that is associated with the loss of a limb. Individuals with an amputation are often considered as incomplete by the society. Although the diseased limb can be amputated, the care requires attention to resolve the problem. It is important that the surgery is performed well to ensure that the individual is able to wear prosthesis comfortably. Compared to trans-femoral amputations, knee joint salvage improves the efforts during rehabilitation and decreases the energy expenditure which is required for ambulation (Walters et al., 1976) After removal of the diseased lower limb and the provision of a fitted prosthesis, the individual has the potential to return as a participating member of the society and is able to maintain an independent lifestyle (Ertl, 2010).

The usual way to connect a prosthetic limb to the body is with a socket (Kapp, 1999). The purpose of the socket is to distribute the load from the residual limb to the prosthetic components. To provide “comfort, function, stability and cosmesis” are the basic goals for prosthetic fitting (Schuch and Pritham, 1999). In this case, characteristics of the stump are also of importance for the successful prosthetic fitting. Problems with healing of the residual limb and limited mobility in the joint proximal to the amputation lead to a delay in prosthetic fitting (Moore et al., 1989) and indicate a poor stump condition (Larsson et al., 1998). In order to achieve these goals, the best accomplishable fit of the socket to the residual limb is required (Legro et al., 1999). The decision which type of socket and other components are going to be used depends on the needs of the individual amputee and the expertise of the clinician (van der Linde et al., 2004). The prosthesis needs to be replaced over the years because of issues such as residual limb volume changes, bad fit, broken parts or other reasons.

Amputees can be classified into mobility grades to enhance the provision of a fitted prosthetic device to the person. Depending on the individual mobility the amputee can be classified into four different mobility grades. The Ottobock Mobility System MOBIS® was introduced in 1994. It focuses on the individual and his or her need for increased quality of life (Otto Bock HelathCare GmbH, 2003). Mobility of grade 1 describes indoor walkers whereas mobility grade 4 is appropriate for unrestricted outdoor walkers with particularly high claims *(see appendix, figure 1: The Otto Bock Mobility System, p.71)*. All of them have different functional requirements regarding their mobility and the current standard for elderly people with limited mobility are rather simple devices where no natural locomotion is possible.

The different aspects of prosthetic mobility are reported in literature in terms of prosthesis use, use of walking aids, walking or mobility skills, walking distances, walking speed and walking efficiency (Hagberg, 2006). Examples for walking or mobility skills are to be able to walk on stairs, slopes and uneven terrain. Amputees with a successfully fitted prosthesis can differ in the amount of time they use the prosthesis and in the type of activities they can perform with their prosthesis (Davis and Datta, 2003). The described rate of prosthetic use after LLA as for example related to peripheral arterial disease or diabetes in literature varies from 32% to 43% (Enroth and Persson, 1992; Fletcher et al., 2001; Johannesson et al. 2004). Successful prosthetic ambulation is “prosthetic usage for ambulation on a daily basis with or without external support” (Moore et al., 1989). A few years later, a prosthetic user was defined as “a person who wears a prosthesis at least once a week” (Grise et al., 1993).

Satisfaction with prosthesis is another reported issue. The satisfaction of the individual with prosthesis depends, next to the prosthetic device, also on the degree of dependency in activities of daily living, general heath condition, psychological status and social circumstances. Young people have shown to be usually less satisfied with their prostheses. Reasons for that could be the higher need for involvement in demanding activities and the realization of personal goals compared to older people (Poljak-Guberina et al, 2005).

2.3 Mobility and functioning after major lower limb amputation

Individuals with LLA have to face multiple challenges, which can range from learning how to care for the amputated limb, how to ambulate, and how to adjust and cope with the amputation of the lower limb. Functions related to activities of daily living (ADL's) are essential for self-care activities of an individual, for example washing or dressing oneself. Incremental activities of daily living (IADL's) functions refer more to self-reliant functioning in a certain environment, for example shopping and preparing meals (Spector et al., 1987). The distinction of these activities is a result of the fact that in many countries the delivery of care by special agencies or professions is separated into these groups of activities and corresponds to a more institutional point of view (Kempen and Suurmeijer, 1990). However, ADL functions are no less instrumental than IADL functions, at least from the perspective of the individual (Suurmeijer et al., 1994). Highly important functional capabilities of elderly individuals are in their self-care, activities in the household and leisure activities. It has been found that LLA often prevent people from performing several activities of daily living. LLA also limits participation in physical and social activities. Concerning the general functioning of an amputee, age at amputation is particularly important. The younger the individual the more functional they are (Schoppen et al., 2003).

2.3.1 Rehabilitation following lower limb amputation

Mobility is an essential physical need. The best achievable restoration of mobility represents an important goal of rehabilitative efforts (Geertzen, 2001). Besides the improvement of mobility, reintegration in the community is also a final goal of rehabilitation programs for amputees after the amputation of the lower limbs (Gauthier-Gagnon and Grisé, 2006). Other aspects that are contributing as a target for successful rehabilitation are pain management, wound healing,

prevention of contractures, promotion the mobility as well as of the muscle strength (Bak et al., 2003).

After surgery, lower limb amputees have a remaining need of treatment, extensive rehabilitation and nursing care although the medical treatment of these individuals could be completed a short period after the procedure (Rudolphi, 1992). Care after the surgery and subsequent rehabilitation of older amputees is extensive due to the several medical comorbidities, perioperative deconditioning and a rather poor level of preoperative functional abilities (Bäck-Pettersson and Björkelund, 2005).

LLA causes massive functional restrictions. For this reason, efforts to minimize the functional restrictions are essential. During the process of rehabilitation, individual targets are set to improve the functional capabilities of the subject with the amputation. These include for example targets for independence in self-care activities and the optimal participation in rehabilitation activities to regain mobility (Schoppen, 2002a).

The rehabilitation process is demanding for the amputee. The individual needs to learn to walk with prosthesis, to apply and remove the prosthesis, to care for the prosthesis, to monitor the skin and the presence of any pressure points, to ambulate on difficult terrain and use the commode at night. Due to the complexity of these issues, a multidisciplinary treatment team is required. The Team should include the surgeon, the primary care physician, a physical therapist, a prosthetist and a social worker (Matsen, 2000).

One advantage of the rehabilitation, in addition to the restoration of functional capabilities, is the particular level of support from other participants at different stages of the rehabilitation process. For this reason, the gait training of amputees is nowadays organized in groups. Group discussions are also advantageous, in which the people concerned can share their problems, fears and experiences. It has been shown that these discussions have a supportive effect on the individual during rehabilitation. In elderly amputees, fatigue is often discouraging to the individual during gait training. Therefore, shorter periods of activity must alternate with adequate rests, because 20-30 minute periods of demanding treatments often fail to meet the capability of elderly amputees (Caine, 1972).

The ability to walk with prosthesis depends on several factors. Included is the physical and mental status of the individual, “the surgical method used, postoperative care, nutrition and pain relief as well as the rehabilitation and prosthetic fitting procedures”. Especially elderly individuals with LLA

have multiple medical disorders and the rehabilitation can be negatively influenced by other illnesses such as stroke and heart failure or vascular problems in the non-amputated leg (Larsson et al., 2009).

Numerous predictors for the functioning of amputees are mentioned in literature. Generally, the functional capabilities of individuals with a high amputation level and a older age are worse compared to younger amputees with a lower amputation level. Additionally, it is known that the physical situation and the presence of comorbidity predict the functioning after an amputation at the lower limb. Particularly, cardiopulmonary disorders can cause a lack of extra energy that is necessary to walk with prosthesis. Diseases where the locomotor system is affected can also diminish the functional potential of amputees. Next to that, the level of amputation is reported to be an important predictor for the outcome of the rehabilitative treatment (Schoppen et al., 2003). More precisely, the higher the level the amputation at the lower limb and the older the individual, the worse is the outcome of rehabilitation (Geertzen et al., 2001). That is due to the fact, that when the level of the amputation is higher, it was found that the walking speed of the amputee declines and that the oxygen consumption increases. In individuals with trans-femoral amputation, the energy required for walking is 50-65% higher than the oxygen required for individuals without lower limb amputation. Additionally, individuals with amputations as a consequence of PVD may have cardiopulmonary or systemic disease and require a maximum of energy to walk. This makes independency in activities difficult to retain (Ertl, 2010).

Overall, there are concerns about prosthetic use and the problems confronted by persons with trans-femoral amputation in the time after discharge from the rehabilitation centre, because little is known about the use of the prosthesis after discharge (Gauthier-Gagnon and Grisé, 2006).

2.3.2 Psychological impact of amputations

Amputation remains one of the leading causes of permanent disability. Individuals experience severe changes in their body image which can cause high anxiety or depression. Moreover, dissatisfaction with body image can be the reason for emotional distress (Fisher and Hanspal, 1998). Hence, the loss of the lower limb is often related to anxiety, isolation and depression. This can influence the social and leisure activities of the person with LLA (Deans et al., 2008) and has also a negative impact on the whole psychological situation of the individual (Godwlana, 2009). Researchers found that amputees who are dissatisfied with a prosthetic device, which is of

objectively good quality, have psychological issues. In a survey, these individuals tend to have higher scores when they were evaluated for depression and anxiety (Poljak-Guberina et al, 2005). One can conclude that „if a person is dissatisfied with a prosthesis, although ist of good quality, this is usually related to the fact that they are in a state of anxiety and depression“ (Godwlana, 2009).

Taking all forms of amputations into account, family support as well as professional intervention provides the basis to cope with the loss of a limb.

2.3.3 Pain after limb loss

The prosthetic industry has made significant improvements. Nevertheless, pain is still a problem for numerous amputees who have undergone an amputation of the lower limb. Prosthetists were needed to correct and relieve the painful and sensitive areas. Here, a symptomatic or tolerable improvement is often achieved. Still, additional surgical intervention could be necessary. Pain in individuals who have undergone LLA can be caused from bone, muscle, nerve, or skin issues. Painful symptoms mostly lead to significant disabilities, difficulties with activities of daily living and a decreased ability to wear the prosthetic device (Ertl, 2010). A negative association between stump pain and/or phantom pain and physical functioning is reported in literature (Pohjolainen, 1991). The postoperative phantom pain seems to limit the restoration of physical function and quality of life (van der Schans, 2002). However, there is no evidence that the level of pain immediately after the amputation is a predictor of a worse functional outcome (Schoppen, 2003).

2.3.4 Falls in amputees

Falls are among the most leading causes of morbidity and mortality in the elderly. About one third of individuals' aged 65 and above fall every year with sometimes severe consequences of injuries (Tinetti, 1988). Regardless of the general health status falls in the elderly result in reduced mobility or limitations in the fulfilment of important everyday activities. An accompanying symptom of a fall is the fear of falling, whether a fall was already experienced or not. In older adults with prior fall experience prevalence rates of 29-92% were reported for fear of falling. For persons without prior fall experience prevalence rates are still at least 12-65% (Schott, 2008). The wide range of the reported data is probably a result of the very different methods of data collection for fear of falling (Legters, 2002).

Physical, psychosocial and functional well-being is rather negatively influenced by the fear of falling. Thus, fear of falling is, among others, associated with the avoidance or decrease of activities of daily living (ADLs). In addition, problems with balance control, temporal and spatial changes in gait parameters, the decrease in quality of life, social isolation and depression are also associated with fear of falling. Meanwhile, it was found that in healthy older adults not the potential fear of falling is crucial for changes in balance and mobility. Because it rather seems the fall-associated self-efficacy, which means the anticipated ability of a person to perform activities of daily living without a fall, to be an important factor in maintaining exactly these ADLs and IADLs (Schott, 2008). The concept of self-efficacy of Bandura (1997) is a subjective measure in which a person believes to have control over a situation. This gives the feeling of security, which in turn counteracts strongly the feeling of fear. In a situation with risk to fall is the subjective assessment of the individual, based on the perception of own abilities or own or others' experiences, very important. This can either lead to the fact that the older person with high self-efficacy experiences oneself as able to act or effective in dealing with the environment. But it can also cause that the person with low self-efficacy thus reacts with anxiety or fear of falling and limits the own physical and social activities (Seemann et al., 1999).

Of all community dwellers aged 65 years and older, 30% fall at least once per year (Lord et al., 1994). The consequences for older adults after an event of falling include having a fear of falling in 31% to 48%, reducing the activity level in 19% to 26%. Injuries after a fall occur in 46% to 60% of all falls (Dite et al., 2007). In contrast to that, it has been reported that the percentage of community-dwelling people with amputations who fall is 50%. Comparable consequences after a fall were described in this population. Here, 49% reported fear of falling and 40% of fallers experienced injuries. Nevertheless, a reduction of participation in daily activities as an effect of falling was considerably higher. Seventy-six percent of individuals with amputations avoided activities after a fall (Miller et al., 2001a). The inability to step rapidly in different directions and the inability to turn around safely and efficiently while walking has been identified as high-risk factors for falls and fall-related injuries. It is very likely that the performance of these two movements represents substantial challenges for individuals with a trans-femoral amputation (Dite et al., 2007).

2.3.5 Quality of life in people with a lower limb amputation

Quality of life (QoL) refers often to a general sense of well-being which is related to the individual health perception and ability to function as a person. Health-related quality of life (HRQL) is a normative concept "concerning the perception of an individual of his or her degree of physical, psychological and social well-being and the effects that illness and treatment have on daily life" (Muldoon et al., 1998). The World Health Organisation (WHO) defined health as "a state of complete physical, mental and social well-being, and not merely the absence of disease" (WHO 1978). Next to that, the World Health Organization Quality of Life (WHOQoL) Group describes QoL as the perception of the individuals' situation in context of the culture and values the individual lives with regard to their goals, expectations, principles and concerns (The WHOQoL GROUP, 1998). QoL is operationalized as an individual state of the characteristics, satisfaction, adaptation to the changes, or perceived health and well-being of the person (Asano et al., 2008).

For some time, QoL is also recognized as an important parameter for rehabilitation (Streppel et al., 2001). QoL is not only applied for people who have undergone LLA but also for individuals after a stroke or traumatic spinal cord injuries (Asano et al., 2008), because they all experienced sudden changes and challenges in life. Furthermore, QoL is more and more accepted as an indicator to consider the adjustment to prosthesis. But still, QoL remains a relatively poorly studied concept in individuals with trans-femoral amputation (Gallagher and MacLachlan, 2002).

The Short Form SF-36 has previously been used as a measurement instrument to assess HRQoL in amputees (Eiser et al., 2001; Hoogendorn and van der Werken, 2001; Tekin et al., 2009; Zahlten-Hinguranage et al., 2004). It was found, that mobility and daily living are important aspects of HRQoL. Consequently, low mobility can impact HRQoL more negative than other distinct disease states (Groessl et al, 2007). Furthermore, Sinha and collegues (2011) found that individuals with LLA have worse QoL than the general population and that an amputation is a major event in life, which possibly still affects QoL many years after the amputation.

3 AIM AND OBJECTIVES OF THE STUDY

On the basis of the discrepancy between different groups of individuals with LLA, for example due to age, it has been argued that the different subgroups should be reported separately (Hermodsson et al., 1994; Pernot et al., 1997; Kent and Fyfe, 1999). While most studies focus on diverse groups of amputees, the purpose of this thesis is to increase the general body of knowledge on a subgroup of individuals with lower limb amputation in order to support further target group specific research and development.

Therefore, the aim of this thesis is to give a descriptive analysis of amputee characteristics and health indicators related to prosthesis use (HIRP) as well as of health-related quality of life in a population of elderly individuals with unilateral trans-femoral amputation and low grade of mobility.

Consequently, the objectives are:

1. To describe demographic and clinical characteristics of less mobile elderly trans-femoral amputees.

2. To assess HIRP such as mobility, physical functioning, prosthesis use, pain, falls and fall-related consequences in less mobile elderly trans-femoral amputees.

3. To investigate HRQoL in less mobile elderly individuals with trans-femoral amputation.

In order to achieve these objectives in the following, the methodology of the research is explained first. Then, the results are presented and discussed. Finally, a conclusion will summarize the findings of this research.

4 METHODS

This section of the thesis describes all relevant methodological aspects of the research. First, findings of the literature search are presented. Then, the study design, population, details of the protocol, measurement instruments for the questionnaire, statistics and ethical issues are described.

4.1 Literature search

The basis for the proposed research builds a literature search to find all research evidence relevant to the topic. For this purpose keywords were developed based on the previously defined objectives. Single word search and keyword AND/OR combinations were utilized to search and gather the literature.

amput*: amputation, amputee
elderly, geriatric*: geriatric, geriatrics, older, senior
lower limb, lower extremity, trans*femoral: trans-femoral, transfemoral, trans femoral
prosth*: prosthesis, prostheses, prosthetic, artificial limb
health
quality of life

Existing literature, published in English or German, on the general lower limb amputee population as well as literature on elderly amputees were searched via PubMed in Medline. Additionally, databases like DIMDI, The RECAL Legacy, Chrochane Library, Elsevier Science Direct and the Archives of Physical Medicine and Rehabilitation were used. The reference lists of existing publications and theme-related professional journals as well as a free web search with the search engine Google were used for manual search. A reference management and knowledge organization software called Citavi® was used.

For justification of further proceedings it is important to note that relevant studies have, among others, researched the influence of an amputation on health-influencing factors and prosthesis use. Differences in data of the studies may be due to the heterogeneity of the amputee samples investigated. However, after literature research it was found that there are several studies on amputees, but there is no sufficient data on less mobile elderly individuals with trans-femoral

amputation. Most studies focus on the whole lower limb amputee population. These surveys are unspecific and without reference to different levels of amputation, age and mobility grade. So far, there are no satisfying surveys with findings about older amputees with limited mobility.

4.2 Study design

The study used a descriptive design and was performed as an explorative cross-sectional survey. A questionnaire with a compilation of standardised measurement tools was used to collect objective-related primary data of elderly trans-femoral amputees in structured interviews. The interviews were conducted in different settings.

4.3 Study population

4.3.1 Inclusion and exclusion criteria

Subjects with a unilateral trans-femoral amputation aged 60 years and older were included. They had to use a lower limb prosthesis and had to be classified as mobility grade 1 or 2. Additionally, participants had to give (written) informed consent to participate in the survey.

Excluded from the study were subjects who had problems to understand and answer the questions due to mental restrictions or on account of insufficient German language skills. Subjects were also excluded if they had additional amputations that further compromised mobility.

4.3.2 Participants

Fifty-four individuals were screened for participation, 26 of them met the inclusion criteria and gave written informed consent to participate.

4.4 Protocol of the study

4.4.1 Recruitment

It was necessary to identify adequate institutions with contacts to the target population in advance for the recruitment of participants. Institutions like geriatric clinics, rehabilitation centres, prosthetic clinics or similar ones were considered. Finally, existing contacts to medical professionals allowed the cooperation with four institutions, which are either specialised in the area of prosthetic care or in-patient rehabilitation. These institutions are namely the Otto Bock Competence Centre in Göttingen, the Centre for Orthopaedic Technologies of the John+Bamberg GmbH & Co. KG at Annastift in Hanover, the “SKA Zicksee” and the “Geriatriezentrum am Wienerwald” in Vienna.

The cooperating institutions are briefly introduced below:

- Otto Bock Competence Centre:

The Competence Centre, Research- and Development Workshop, is located in Göttingen and was founded in 1993. As a part of the Otto Bock Group, two of its major responsibilities are the professional provision of orthopaedic devices to individuals and the counselling to clinics, physicians, therapists or other prosthetic clinics to guarantee a maximum quality of orthopaedic services.

- John+Bamberg GmbH & Co. KG:

The centre for orthopaedic technologies is located in Hannover and cooperates with the orthopaedic clinic “Annastift”. They provide individuals with orthopaedic products and services since 1974. In addition to orthpaedic and rehabilitation technologies, they have competencies in bespoken footwear technology.

- SKA Zicksee:

The “Sonderkrankenanstalt Zicksee” is an orthopaedic rehabilitation centre located in St. Andrä at Zicksee in Austria. The centre is specialized in the management of individuals after total hip and knee replacements, and after amputation for individuals with disorders of the musculoskeletal system. A wide range of medical treatments is offered as part of the rehabilitation program of the individual to ensure the achievement of individual therapy goals. The internal gait rehabilitation school provides orthopaedic aid and support for the restoration of mobility to all individuals at SKA

Zicksee with a lower limb amputation. Individuals typically attend the program for 4 to 6 weeks to learn and practice skills related to prosthetic ambulation.

- "Geriatriezentrum Am Wienerwald":

The geriatric centre "Wienerwald" (GZW) is a geriatric institution, opened in 1904 in the 13th district of Vienna and is now managed by the Vienna Hospital Association. It provides inpatient support in a 24-hour service from physicians and nursing professionals. Dependent people, whose care and assistance needs are required in such a large extent that home care is no longer possible, will be cared for and medically treated in this institution.

Once the structural framework of the individuals' survey was clarified, the search for appropriate participants could start by utilizing the support of partners. For this purpose, different approaches were used due to different circumstances at the institutions:

The cooperation with the Otto Bock Competence Centre allowed the identification of potential participants. Individuals were considered as potential participants if their medical records fulfilled the previously defined eligibility criteria and if they gave a first informal agreement to participate to the company. The individuals' contact data were then transmitted to personally contact potential participants by phone. At this point, each person was asked for an appointment to get interviewed. It was possible to be interviewed in ones' home environment, at the Otto Bock Competence Centre or at any other adequate place.

Further individuals were recruited with the help of John+Bamberg. Therefore, eligible individuals were asked to participate at the time when they had an appointment for prosthetic care with the local branch at "Annastift" during the survey period.

The recruitment at the SKA Zicksee was carried out directly on site through personal contacting. Therefore, special recruitment days were arranged under consideration of admission and discharge of individuals. All potential participants were approached during their rehabilitative treatment at the gait rehabilitation school. Hence, if the addressed individual fulfilled the inclusion and exclusion criteria, they could be directly interviewed.
Additionally, individuals could be recruited with support from the institute for physical medicine and rehabilitation at the geriatric centre "Wienerwald". On the one hand, all individuals were pre-selected by the institute who received care by the institute in the last two years or are still receiving care at the centre and on the other hand met the eligibility criteria based on stored patient records.

These individuals were contacted by the institute and were informed about the possibility to participate in that survey. Furthermore, the willingness to participate was requested. With positive feedback and with the agreement of data forwarding, the Institute transmitted the contact information of potential participants. Subsequently, these individuals were contacted by phone and an interview appointment in the domestic environment or a preferred location was arranged.

Figure 2 (appendix, p.72) illustrates the procedure of gathering the study population.

In total, 26 of 54 potentially eligible individuals participated in the survey. Of those 26, 11 participants were recruited with the help of the Otto Bock Competence Centre, three participants with John+Bamberg, one participant from the geriatric centre “Wienerwald” and 11 participants at SKA Zicksee *(see table 2)*.

Table 1: Number of recruited participants at each location

	N	Percent %
OB Competence Centre	11	42,3
John+Bamberg	3	11,5
geriatric centre "Wienerwald"	1	3,8
SKA Zicksee	11	42,3
Total	**26**	**100,0**

4.4.2 Setting

Depending on the location of recruitment, individuals could either be interviewed in the clinical surrounding of SKA Zicksee, at the institute of the geriatric clinic, at John+Bamberg, at the Otto Bock Competence Centre or in their home environment. Participants without a need of inpatient care, like those at SKA Zicksee, could choose to be interviewed at home, in facilities of the recruitment partner or at any other preferred location. The gait rehabilitation school at SKA Zicksee provided a separate barrier-free room for the interviews.

4.4.3 Data collection

The descriptive study was performed in the home or clinical environment of the participant by using a questionnaire. Therefore, data collection was carried out in a structured interview during the period from 19th March 2012 to 26th June 2012.

Data at SKA Zicksee could be collected on four specially arranged recruitment days during that duration. All other potential participants were interviewed after arranging an appointment. Prior to the interview, each participant received full information about the survey and subsequently was requested to provide written consent for the interviews in the clinical setting. The enlightenment of all participants was carried out ethically compliant, and with ethical approval for the inpatient clinics. Individuals were only surveyed if they fulfilled the inclusion and exclusion criteria. Each interview took about 35 to 45 minutes to administer. This was a one-time voluntary survey. Every interview could be terminated or interrupted on request of the participant at any time and without consequences for the individual.

4.4.4 Data management

All questionnaires were pseudonymised with a consecutive number coding. The data were, only provided with this code, stored in a SPSS data sheet on a PC with limited access and subsequently evaluated. The data acquisition was performed using a questionnaire, but there is no possibility to draw conclusions about the participants from it. The collecting, processing and storing of data were also carried out by the student study responsible. The data processing was not personalized. Access to further individuals' data, which were not recorded by the questionnaire or has been provided with the agreement of participants by the cooperating partners, was not possible.

4.5 Measurements

A questionnaire was utilized to realize the objectives of this study in a cross-sectional survey. There is no validated or previously published questionnaire suitable for this kind of research and study population. Hence, it was required to identify adequate measurement instruments based on population specific dimensions of relevance. The final questionnaire consists of a number of standardised measurement instruments and was applied in structured interviews.

4.5.1 Criteria-based selection of measurement instruments

For the identification and selection of appropriate measurement instruments, it was necessary to consider which particular information of the target population should be measured and to which extent. Measuring disability, for instance, is predisposed to a wide disagreement about what aspects should be measured and what is the best approach to capture the information (Miller et al., 2001). While no consensus exists on which measurement instruments should be used, most investigators advocate that a variation of characteristics relating to quality of life, including functional limitations, needs to be taken into account (Kent and Fyfe, 1999). One criticism of measurement instruments for amputees is that many instruments have no known published psychometric properties (Miller et al., 2001).

All of the variables selected for this research are based on factors that were deemed important to prosthesis use in the general amputee population based on both literature search and counselling from experienced experts for amputee rehabilitation and geriatric care. It was possible to identify 12 dimensions of importance *(see figure 3)* concerning the objective of the study. Some of the most regarded dimensions relevant to the population of amputees include mobility, function and quality of life (Pasquina et al., 2006).

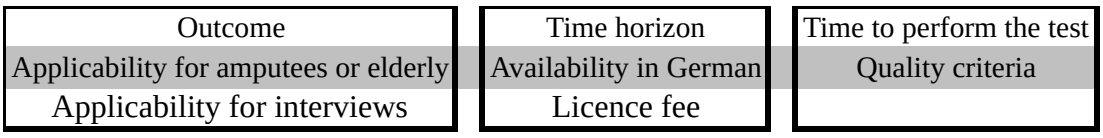
Figure 3: Identified dimensions of relevance

Demographics	Living conditions	Health status
Use of nursing services	Mobility	Fall-related self-efficacy
Activities of daily living	Pain	Falls and fall-related consequences
Use of walking aids	Prosthesis use	(Health-related) quality of life

After the review of available instruments to measure those dimensions in amputees or in the general population it was found that there is no existing questionnaire or instrument that involves all dimensions, which have to be considered to represent health-related aspects of elderly amputees related to prosthesis use. In order to describe the situation of elderly amputees it would not be sufficient to focus on a single measurement. For this reason, it was required to design a customized questionnaire. Due to that, it was most reasonable to use a combination of well-recognized generic and amputee specific measurement instruments to capture all relevant dimensions in the survey. This approach has been used already several times in amputee research. To find out which instruments would be appropriate to apply, it was essential to know which are available and how they have performed in populations of previous studies. Therefore, several resources like studies and reviews of literature, books and online instrument databases have been used. Additionally,

different criteria were applied to make the selection of instruments more rational *(see figure 4)*. A first and obvious criterion was the outcome or characteristic that is measured, followed by the applicability to amputees or elderly. The survey method of the instrument was required to be applicable in interviews. It was also necessary to consider how much time the instrument would need to be assessed and if the time horizon of the questions would be compliant with the clinical background of the participants. Additionally, the availability in German was considered as well as the instrument-related quality criteria and potential fees for licences. Instruments were taken into account when they had shown to be applicable for the survey.

Figure 4: Criteria-based Selection of Instruments



4.5.2 Instruments

Large numbers of measures are in use, but there is no gold standard. Additionally, there is little agreement regarding which measure to use and when (Condie et al., 2006). Based on the previously described criteria-based selection of instruments, it was possible to identify five different appropriate instruments for the questionnaire, which covered all dimensions of relevance concerning the objective and seemed to be most suitable for the population of interest. Included are instruments for the general population as well as amputee specific measurements. The use of disease-specific instruments allows obtaining more detailed information about the individuals' problems. Hence, the following measurement instruments were used for the collection of quantifiable target figures: SF-36v2, LCI-5, Houghton Scale, GARS and FES-I *(see table 2)*.

Table 2: Identified instruments

Authors (year)	Name	Target figure
Morfeld, M. et al. (2011)	Short Form (SF) -36v2	Health-related quality of life (HRQOL)
Franchignoni, F. et al. (2004)	Locomotor Capabilities Index (LCI) -5	Ambulatory skills with prosthesis and level of independence
Houghton, A. et al. (1989)	Houghton Scale	Prosthetic use
Suurmeijer, T. et al. (1994)	Groningen Activity Restriction Scale (GARS)	Disability in ADL or IADL
Dias, N. et al. (2006)	Falls-Efficacy Scale-International Version (FES-I)	Fall-related self-efficacy

The Short Form-36 Health Survey (SF-36) is a widely used generic self-report measure and was developed for the assessment of HRQoL within population surveys in the general population and all rehabilitation, severity of illness, and socio-demographic groups. It is a standardized, multidimensional health status questionnaire (Bullinger et al., 1998), which is not disease-specific. Thus, results can be applied for individuals with and without any particular impairment or disease. Furthermore, this survey instrument has been used in many diverse clinical research studies and has demonstrated good reliability and validity (Bullinger et al., 1998). There is no reported validity or reliability data for use with amputees (Condie et al., 2006). But, the SF-36 for the general population has been already used successfully in research with lower limb amputees (Bak et al., 2003). It has 36 items measuring health across eight quality of life dimensions or domains: physical functioning (PF), role functioning from a physical perspective (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role functioning from an emotional perspective (RE) and general mental health covering psychological distress and well-being (MH). In addition, a question to assess the current state of health as compared to last year is included *(see appendix, table 3: Table of the scales of the SF-36 and their content and relationship to physical and mental components of health, p.73)* (Bullinger et al., 1998). The eight health concepts were selected from 40, which have been integrated in the Medical Outcomes Study (MOS) (Stewart & Ware, 1992). The domains represent multiple operational definitions of health, including function and dysfunction, distress and well-being, objective reports and subjective rankings, and both favourable and unfavourable self-evaluations of general health (Ware et al., 2005). Results are presented in an individual score for each of the eight subscales and can be also presented in two summary measures. These measures are called the physical component score (PCS) and the mental component score (MCS). Furthermore, the instrument comprises the most frequently represented health concepts, whereof each of the domains covered in the instrument is likely to be relevant for

individuals with trans-femoral amputation. The PF, RP, BP and GH scales mainly represent physical health domains, while the VT, SF, RE and MH scales primarily represent domains of emotional well-being. The responses on each subscale are summed and scored on a scale ranging from 0 to 100, where a higher score indicates better quality of life. A value of 100 indicates optimal quality of life. The SF-36 is suitable for self-administration, computerized administration, or administration by an interviewer in person or by telephone, to persons age 14 and older. This instrument has proven to be useful in surveys of general and specific populations, in comparing the relative burden of diseases to norms of the general population, and in differentiating the health benefits produced by a wide range of different treatments. It can be administered in 7-15 minutes with a high degree of acceptability and data quality. This research uses the validated standard (4-week) German version 1.3 for the administration by an interviewer in person of the SF-36 (Bullinger et al., 1998). A first dataset from a normative German sample for comparisons with population based norms is available since 1994 and was updated with data from the German National Health Survey in 1998. That survey included the SF-36 questionnaire to measure the subjective health-related quality of life of the German population. The new normative population sample consists of 6964 participants (Ellert and Bellach, 1999). The SF-36 was chosen as an overall measure of health status and functioning because it is widely used and because normative values are available for further comparison.

The Locomotor Index (LCI) -5 is part of a more detailed assessment measure known as the Prosthetic Profile for Amputees (PPA) developed by Gauthier-Gagnon and colleagues at the University of Montreal. The Locomotor Capabilities Index is an amputee specific measurement and measures one general construct, the walking ability with prosthesis in lower limb amputees. According to its developers the LCI "computes the global, basic, and advanced locomotor skills of the lower limb amputee with the prosthesis and assesses the level of independence" (Gauthier-Gagnon and Grisé, 2006). It consists of 14 items divided into two subscales: basic abilities (7 items) and advanced abilities (7 items). The items cover different transfer and motor activities. These include walking at home and outside in a variety of circumstances, going up and down stairs, getting up from the floor and from a chair, and picking up an object from the floor. These activities were chosen primarily from the locomotor impairment classification of the World Health Organization (WHO, 1980). Each of the 14 items is scored on a 5-point ordinal scale expressing: 0 (not able to), 1 (yes, if someone helps me), 2 (yes, if someone is near me), 3 (yes, alone, with ambulation aids) and 4 (yes, alone without ambulation aids). The total LCI-5 score is the sum of the item scores and can range from 0 (worst) to 56 (best). Similarly, subscale scores for basic and advanced capabilities with the prosthesis can range from 0 to 28. Higher scores reflect greater

locomotor capabilities with the prosthesis and less dependence on assistance. In contrast to the prior developed LCI with a four-point ordinal scale, the upper ordinal level of the LCI-5 is split into two portions according to the use or no use of walking aids (Franchignoni et al., 2004). The LCI-5 is intended for self-administration but can also be administered in a face-to-face or telephone interview. The time needed to complete the LCI-5 is approximately five minutes. Respondents are asked to indicate the statements that best describe their situation at the moment the LCI is assessed. It has been translated into several languages and is widely used in international research. Both the LCI and LCI5 demonstrate good internal consistency, test-retest reliability and construct validity, and the LCI5 has been shown to reduce the ceiling effect associated with the LCI by 50%. It is recommended for clinical and research use (Gauthier-Gagnon and Grisé, 2006). Overall, study findings of Franchignoni et al. (2004) suggest that both LCI versions can capture and monitor the global locomotor ability of people with lower-limb amputation while wearing a prosthesis. The LCI-5 represents a greater ability to encompass the actual mobility range of subjects with lower-limb amputation (Franchignoni et al., 2004). Moreover, the Scottish Physiotherapy Amputee Research Group (SPARG) recommends the LCI as the measurement that should be considered as an appropriate measure of functional outcome for lower limb amputees (Treweek and Condie, 1998).

The Houghton Scale is a quantitative tool that measures prosthetic use in everyday life of amputees quickly and reliably. The instrument considers only the prosthetic use in people with lower-extremity amputations. It reflects a persons' perception of prosthetic use, rather than a health professionals' viewpoint, and consists of four questions. It is quickly administered and easy to score. The first three items are scored on a 4-point ordinal scale and attempt to capture prosthetic wearing habits like the amount of time the prosthesis is used, the manner in which it is used and whether an assistive device to ambulate is used outside. The fourth question has three dichotomous (yes/no) items that assess an individuals' perception of stability while walking outside on a variety of outdoor surfaces. Results are reported as a total score out of 12. Higher scores indicate greater performance and greater comfort (Devlin et al., 2004). Scores above 8 indicate a successful prosthetic ambulation (Houghton et al., 1992). The Houghton Scale appears to measure performance or "did do" issues, as opposed to the LCI scale, which evaluates capability or "could do" issues. Hence, the Houghton Scale provides a measure of prosthetic mobility performance, whereas LCI assesses mobility capability. Furthermore, it is suggested to be beneficial when assessing low-end prosthetic mobility (Miller et al., 2001). The reliability, validity and responsiveness to change of this score have been confirmed. It is recommended, but not relevant for the aim of this survey, to exclude question four of the Houghton Scale to increase the effect size

associated with changes over time and thereby to improve the capacity to detect clinically significant changes (Devlin et al., 2004). The Houghton Scale has been used in previous studies within the amputee population and is recommended for clinical use, although it shows some floor and ceiling effects (Condie et al., 2006).

The Groningen Activity Restriction Scale (GARS) is a non-disease-specific instrument to measure both, disability in activities of daily living (ADL) as well as instrumental activities of daily living (IADL). It was partially developed on existing measurements by Kempen and Suurmeijer (1990) in studies of Dutch samples consisting of elderly or chronically ill people. The psychometric properties of the GARS revealed in these studies were highly satisfactory (Suurmeijer et al., 1994). The GARS instrument is a short questionnaire with 18 items assessing disability in the area of ADL (Activities of Daily Living including mobility) and also IADL (Instrumental Activities of Daily Living). It has a four-point-category response format:

1, independent to perform the activity without any difficulty;
2, independent to perform the activity with some difficulty;
3, independent to perform the activity with great difficulty and
4, unable to perform the activity independently.

The sum of points forms the total score, which varies from 18 to 72. A score of 18 implies that the person can perform all the activities without any difficulty. Opposed to that, with a score of 72 the person cannot perform any activity without the help of others (Schoppen et al., 2003). The items refer to activities which respondents are able to do and not to their actual performance. When an item refers to more than one activity (for instance item 5), the activity, which causes the greatest problems to the individual, is determining the response. The instrument has been already applied in several studies and has proven to be a very useful because it makes it possible to (1) accurately describe the severity of the disablement caused by different chronic conditions, (2) reveal changes in disablement over time, (3) differentiate exactly between degrees of disability, and (4) improve the assessment of the need for professional care, if applicable. The GARS is a quite strong unidimensional and hierarchical scale. The same applies to the separate ADL and IADL scales. The fact that the GARS items are in a hierarchical order means that individuals with the same score have the same difficulties with ADL and IADL. Nevertheless, Kempen et al. (1995) warn against the use of cutpoints or single questions to categorize people. Certainly, further instruments have been developed to measure disabilities in ADL or IADL. The GARS, as an advantage, measures both simultaneously and is a very reliable and valid instrument with hierarchically ordered,

polychotomous items. These characteristics would make the GARS also very useful for comparative and longitudinal research (Suurmeijer et al., 1994).

The Falls Efficacy Scale-International (FES-I) is a simple to administer instrument that measures the level of concern about falling when the individual would perform certain social and physical activities inside and outside the home. The FES-I was developed in a collaborative effort with members of the Prevention of Falls Network Europe (ProFaNE) focusing on fall prevention and the psychology of falling (Yardley et al., 2005). The instrument was designed as a modification of the original FES to eliminate its methodological weaknesses. The instrument consists of 16-items measuring fall-related self-efficacy based on the FES (10 items), which was extended by 6 additional items including higher functional issues and social aspects of falls. Hence, FES data can be calculated from the first 10 items of the FES-I score (Hauer et al., 2010). The instrument is able to assess concerns relating to basic and more demanding activities, both physical and social. The revised instructions require respondents to indicate how concerned respondents are about the possibility of falling when performing different everyday life activities. They are asked to answer even if they are unable to actually perform the activity for some reason, to assess fear of falling rather than their functional abilities (Yardley et al., 2005). The level of concern is measured on a four point Likert scale, which comprises 16 items with four categories (1 = not at all concerned, 2 = somewhat concerned, 3 = fairly concerned and 4 = very concerned). Higher values indicate less fall-related self-efficacy and more concern about falling (Hauer et al., 2010). A total score is calculated by adding the score of each item. This gives a total that will range from 16 (no concern about falling) to 64 (severe concern about falling). The questionnaire is suitable for self-administration as well as for structured interviews. All items including the original FES items have been formulated for common translation into different European languages (for example German) in accordance with a standardized translation protocol (Kempen et al., 2007). Its psychometric properties are excellent (Yardley et al., 2005). The FES-I has been successfully validated in different older populations. Here the FES-I showed improved psychometrical properties compared to the original FES (Hauer et al., 2010). Moreover, the instrument is able to predict future falls and decline in functional capacity. Incidentally, the FES has proven to be sensitive to change in fears following clinical interventions (Yardley et al., 2005).

4.5.3 Final questionnaire description

The goal of the amputee-specific compilation of measurements is to address issues that are highly relevant to the population of interest. Therefore, the final questionnaire consists of five standardized and well-recognized instruments (GARS, Houghton Scale, LCI, FES-I, SF-36) and added questions to assess all the dimensions of relevance to objectives (see appendix: Fragebogen für den Patienten, p.84). The dimensions of relevance are sectioned in the questionnaire as follows:

(1) demographic and amputation related aspects
(2) family and home environment
(3) activities of daily living
(4) prosthesis use and assistive devices
(5) mobility
(6) pain
(7) falls- and fall-related consequences
(8) health-related quality of life

In detail, the questionnaire asks for **(1) demographic and amputation related aspects** like: date of birth, gender, weight, height, localization of the amputation, cause of amputation, time since amputation and prosthetic fitting, level of care dependency, utilization of care services, diseases, and other disabilities. The response formats vary from open-ended (e.g. age) to close-ended questions with nominal scales (e.g. gender) and one ordinal scale (level of care dependency). The **(2) family and home environment** of the participant includes questions on: family status, one- or more-person household, housekeeping, necessity for care of family members, type of housing, and amount of stairs to negotiate in daily routine. Again, the response formats vary from open-ended (e.g. number of persons in own household) to close-ended questions with nominal (e.g. family status) or ordinal scales (amount of stairs to negotiate in daily routine). The next important part of the questionnaire considers **(3) activities of daily living**. Here, the Groningen Activity Restriction Scale (GARS) is applied to present data on participants' ability to perform activities of daily living (ADL) and incremental activities of daily living (IADL). Following that, **(4) prosthesis use and use of assistive devices** was covered by the Houghton Scale and five supplementary questions. The last mentioned item was expanded in the questionnaire to get more information on assistive devices, but the change has no consequences on the original scoring of the Houghton Scale. The fourth question has three dichotomous (yes/no) items that assesses an individuals' perception of stability while walking outside on a variety of outdoor surfaces. Next to that, the supplementary questions

ask for satisfaction with prosthesis, reasons for not wearing the prosthesis at all, waking hours, walking distance with prosthesis, activities which would like to be performed but are not achieved, and whether an assistive device is used inside. The response formats for the supplementary questions vary from three open-ended (e.g. walking distance with prosthesis) to two close-ended question with one nominal scale (e.g. assistive devices inside) and one interval scale (satisfaction with prosthesis). The **(5) mobility** section follows after that and enquires the walking ability with prosthesis in lower limb amputees utilizing the Locomotor Capabilities Index (LCI). Additionally, a scale for **(6) pain** was added to the questionnaire to measure pain related to amputation through six items (e.g. stump pain). The items are scored on a 5-point-ordinal scale with the following answer possibilities: 1 (no pain), 2 (mild pain), 3 (moderate pain), 4 (severe pain), and (worst pain). Another important part was considered to be **(7) falls- and fall-related consequences** and was consequently included as well. Again, supplementary questions were entered to enquire the prevalence of falls and the consequences if falls have already been an issue. The final part of the questionnaire focuses on **(8) health-related quality of life**. The Short Form (SF) -36 was of relevance at this point. The response formats vary from close-ended questions with a dichotomous nominal scale to ordinal scales with three, five or six answer possibilities.

The questionnaire was pretested for comprehensibility and temporal extent. Permission was granted when required.

4.6 Statistical analysis

4.6.1 Sample size

It was expected that the whole convenience sample will consist of approximately 30 individuals and therefore is in line with extend of this thesis. The number of cases was obtained retrospectively from the number of cared individuals in the setting. This is a purely exploratory and descriptive study. The sample has an investigative character and is intended to provide a first overview of the current situation of less mobile elderly people with trans-femoral amputation.

For additional analyses, a formal power calculation computed a sample size of 24 with alpha of 0.05 and power of 0.85. In the final sample, 26 persons provided full information.

4.6.2 Data analysis

Scoring for each of the measurement instruments was computed according to the instructions from developers. Descriptive values for score distributions such as the mean, median, standard deviation (SD), and the minimum and maximum values for each measure were computed for each scale. All data management and analyses were calculated using SPSS, version 18 for Windows. Data is presented in mean +/- SD for normal distribution and in median and range for no-normal distributed data.

A probability value of 0.05, as the level of statistical significance, would be recommended for additional statistical tests.

4.7 Ethical considerations

All participants were informed about the objectives and conduct of the study in detail. Additionally, participants from clinics received written and oral information and gave a written confirmation of their willingness to participate in the survey. Here, the Human Ethics Board Burgenland and the Human Ethics Board of the town Vienna in Austria approved the protocol.

Most information on patients is very sensitive data. For this reason, it was not only important to consider whether an ethics vote is necessary, but also to note that it was required from the clinical centres where the individuals were interviewed. The following documents have been submitted: complete application form, summary of the study, patient information and informed consent form, CV and certificates, study protocol and case report form.

The subjects' participation or non-participation had no influence on their treatment. The questions were easy to answer and demanded the participant to a particular degree neither physically and mentally, nor emotionally. Nevertheless, if any participant would have felt not able to answer the questions, it was always possible to skip single responses or even to break or stop the survey without any consequences. Since the survey was executed in the domestic environment of the participants or directly in the clinical setting there was also no increased effort for the participant. Moreover, the findings of this study may be used as a source for further hypothesis generation for additional studies. Accordingly, a high benefit with very little to no risk could be recorded for the survey in the application to the ethics committee.

5 RESULTS

This section presents the findings of the survey. It starts with the participants' demographic and clinical characteristics. Then, the main study results are presented in terms of the targeted measurement results. These furthermore include: family and home environment, activities of daily living, prosthesis and assistive devices use, mobility, pain, falls- and fall-related consequences, and health-related quality of life. Fortunately, there is no missing data in the survey results due to the study design.

5.1 Demographic and amputation related sample characteristics

Twenty-six of 54-screened individuals were eligible. Twenty-two participants were male and four female. They met the inclusion criteria and gave written informed consent to participate. Their mean age was 72.35 ± 6.9 years and mean BMI was 25.96 ± 5.48. Defined as mobility grade 1 were 46.2% (N=12) of the participants and 53.8% (N=14) as mobility grade 2. Either the right leg was amputated in 61.5% (N=16) of the 26 trans-femoral amputees or the left leg in 38.5% (N=10) of the cases. The dominant aetiology was vascular disease, which accounted for 69.2% (N=18) of the individuals. The remaining amputations resulted from traumata (19.2%, N=5) and infections (11.5%, N=3). Not present in the sample were amputations in consequence of tumours or other causes. The median time since amputation at the interview was 13.5 months (range 2 to 321) and the median time since prosthetic fitting was 10 months (range 0 to 319). Most participants reported to be beneficiaries of the satutatory health insurance (92.3%) whereas 7.7% of the individuals had a private health insurance (7.7%). Level of nursing care varied, while nursing care level 1 was most common with 42.3%, followed by level 2 with 23.1% and level 3 with 11.5%. Three participants had no level of care and additional three individuals applied to be assigned to a nursing care level. However, it has to be taken into account that there are differences in the German (3 levels) and Austrian (7 levels) care system. Individual levels are not comparable. Nevertheless, participants from Austria stated only levels from 1 to 3. According to this, most individuals received financial benefits (50%) from their care insurance company. In-kind benefits were received from one individual (3.8%) and a combination of both by 6 participants (23.1%). Another 6 individuals have not utilized any kind of care service. Care was delivered by professional nursing services (19.2%) or by family members (57.7%). Again, 6 participants (23.1%) used no service at all. An overview of participants' demographic and clinical data is shown in table 4.

Table 4: Sample demographics and amputation-related aspects

	N	Percent %	Mean / SD Median	Min - Max
Total	26	100		
Age			72.35 ± 6.9	60 - 88
Gender:				
male	22	84.6		
female	4	15.4		
BMI			25.96 ± 5.48	14.69 - 45.18
Mobility grade:				
1	12	46.2		
2	14	53.8		
Site of amputation:				
right	16	61.5		
left	10	38.5		
Cause of amputation:				
vascular disease	18	69.2		
tumour	0	0		
trauma	5	19.2		
infection	3	11.5		
other	0	0		
Months since amputation			13.5	2 - 321
Months with prosthesis			10	0 - 319
Health insurance:				
private	2	7.7		
statutory	24	92.3		
Level of nursing care:				
None	3	11.5		
Level 1	11	42.3		
Level 2	6	23.1		
Level 3	3	11.5		
Proposed	3	11.5		
Care services:				
None	6	23.1		
Monetary payments	13	50		
Payment in kind	1	3.8		
Combination of both	6	23.1		
Type of care services:				
None	6	23.1		
Professional service	5	19.2		
Care by family members	15	57.7		

Every individual of the whole sample reported to suffer from at least one of the considered comorbidities in the questionnaire. On average, the number of comorbidities per participant was 2.38 ± 1.67. Most prevalent comorbidities in this population were hypertension (76.9%), PVD

(65.4%), diabetes mellitus (42.3%) and venous insufficiency (30.8%). Other additional diseases were reported from four participants (e.g. gout, Parkinson's disease, liver cirrhosis). Table 5 *(see appendix, p.74)* presents the prevalence of all diseases and disabilities in the questionnaire.

5.2 Family and home environment

The majority of the sample was married (73.1%). Whereas 11.5% had a partner and another 11.5% were widowed. Only one (3.8%) participant stated to be single. Three individuals lived alone (11.5%) and 23 (88.5%) live in a household with 1 to 6 persons. The median number of persons in one household was 2 (range 1 to 6). All things considered, 2-person households were most frequent with 61.5%. Only 34.6% of the participants were able to take care of their home either alone (3.8%), partially with relatives (23.1%) or partially with nursing care services (7.7%). Around 65% are not able to run a house, even with help. Therefore, relatives take care of the home in 61.5% and care services in 3.8%. One participant was even responsible to take care of a family member. The most common type of housing was a flat with 50%, followed by a house in 42.3% of the cases. An inpatient care facility and day care centre was utilized once each. The daily amount of steps differed a lot. Eight (30.8%) participants reported that there are no steps in their daily routine, 9 (34.6%) participants had to take 1 to 10 steps, five (19.2%) reported 11 to 20 steps per day, and four (15.4%) had to take more than 20 steps per day *(see appendix, table 6, p.75).*

5.3 Activities of daily living

Participants reported to have the slightest difficulties with the activity "feed yourself" (median = 1, rang 1 to 2), followed by "wash face and hands" (median = 1, range 1 to 3) and "get in and out of bed" (median = 1, range 1 to 4). "Feed yourself" was the activity where 96.2% had no difficulties in performing at all. In contrast to that, most difficult was "take care of your feet and toenails" (median = 4, range 1 to 4), followed by "walk outdoors" (median = 4, range 1 to 4) and "go up and down the stairs" (median = 4, range 1 to 4). "Take care of your feet and toenails" could not be executed by 73.1% of the sample. Representing related activities, "stand up from sitting in a chair" and "get on and off the toilet" were both rated similar with a median of 2 (range 1 to 4). A median of 2 (range 1 to 4) was also calculated for "get around in the house", "dress yourself" and "wash and dry your whole body" *(see appendix, table 7, p.76).*

Next to that, the instrumental activity scale contains 7 more demanding activities. With 100% “do heavy household activities” (median = 4) was the only activity, which could not be performed by anyone of the participants. Also all other instrumental activities were rated with a median of 4 (range 1 to 4) and with rather similar distributions. Here, “prepare dinner”, was followed by “prepare breakfast or lunch” and “do light household activities”, “wash and iron your clothes”, “do the shopping”, and “make the beds” *(see appendix, table 8, p.77)*.

Participants scored on average 24.77 ± 5.9 for the activities of daily living scale and with a median of 28 (range 10 to 28) at the incremental activities of daily living scale. Next to that, the median on the total Groningen Activity Restriction Score was 52 (range 24 to 67), *(see table 9)*.

Table 9: GARS Scores and ADL Sum

	N	Percent %	Mean ± SD	Median	Min / Max
GARS	26	100			
ADL Score			24.77 ± 5.9	25	11 / 39
IADL Score			25.19 ± 5.22	28	10 / 28
ADL Sum			**49.96 ± 9.75**	**52**	**24 / 67**

5.4 Prosthesis use and assistive devices

The median score of the sample for the Houghton Scale was 1 (N = 5, 19.2%) with a minimum of 0 and a maximum of 11. At this scale, 84.6% scored 7 or below. Two (7.7%) scored 0 and only four (15.4%) participants scored a value of 8 or above *(see table 10)*.

Table 10: Houghton Score frequencies and percentage

	N	Percent %	Cumulative %
Houghton Score	26	100	
0	2	7.7	7.7
1	5	19.2	26.9
2	3	11.5	38.5
3	2	7.7	46.2
4	4	15.4	61.5
5	2	7.7	69.2
6	2	7.7	76.9
7	2	7.7	84.6
8	2	7.7	92.3
9	1	3.8	96.2
10	0	0	96.2
11	1	3.8	100
12	0	0	100

In addition to the prosthesis use, participants were asked how satisfied they were with their current prosthesis. An interval scale from 1 to 10 measures satisfaction with prosthesis. Value 1 represents "extremely unsatisfied" and 10 "extremely satisfied". The mean satisfaction with prosthesis in general was 5.96 with a minimum value of 2 and a maximum of 10. On the whole, 50% of the participants were rather unsatisfied with their current prosthesis *(see table 11)*. Type of prosthesis or manufacturer was not ascertained in the survey.

Table 11: Satisfaction with prosthesis

	N	Percent %	Cumulative %
Satisfaction with prosthesis	26	100	
1	0	0	0
2	1	3.8	3.8
3	2	7.7	11.5
4	2	7.7	19.2
5	8	30.8	50
6	5	19.2	69.2
7	2	7.7	76.9
8	1	3.8	80.8
9	3	11.5	92.3
10	2	7.7	100

Most participants (57.7%) stated that the amount of time the prosthesis is used per day was less than 25% (1-3 hours) of waking hours. In contrast to that stated 26.9% that they wear their prosthesis all waking hours (12-16 hours). Further two (7.7%) participants reported that they wear their prosthesis either between 25% and 50% of waking hours (4-8 hours) and another two (7.7%) wear their prosthesis more than 50% of waking hours (> 8 hours) *(see table 12).* In those participants, who were not wearing the prosthesis all day, reasons were (qualitative question; multiple answers possible): socket discomfort (N = 6), prosthesis use was only allowed at gait rehabilitation school for some of the individuals screened at SKA Zicksee (4), causes pain (while seating) (N = 3), uncomfortable (N = 3), heavy weight of the prosthesis (N = 2), unhandy (N = 2). Mentioned once each were: convenience, does not fit properly, excoriates, is warm, immobility, more concentration required than in wheelchair, annoying, liner is uncomfortable and problems with cubital joint (participant uses crutches to ambulate). Anyway, three participants mentioned no reasons for not wearing the prosthesis even though they do not wear the prosthesis all waking hours.

Table 12: Amount of time the prosthesis is used

	N	Percent %	Cumulative %
Amount of time the prosthesis is used	26	100	
Less than 25% of waking hours (1-3 hours)	15	57.7	57.7
Between 25% and 50% of waking hours (4-8 hours)	2	7.7	65.4
More than 50% of waking hours (more than 8 hours)	2	7.7	73.1
All waking hours (12-16 hours)	7	26.9	100

As a part of the Houghton Scale, Participants were also asked where they use their prosthesis. Here, four (15.4%) participants used their prosthesis just when visiting the doctor or limb-fitting centre, 9 (34.6%) at home but not to go outside, five (19.2%) outside the home on occasion and 8 (30.8%) participants used their prosthesis inside and outside all the time *(see table 13).* When walking outside with the prosthesis, 38.5% of the sample stated to feel unstable while walking on a flat surface and 88.5% felt unstable when walking outside on slopes or on rough ground with the prosthesis.

Table 13: Manner in which the prosthesis is used

	N	Percent %	Cumulative %
Manner in which the prosthesis is used	26	100	
Just when visiting the doctor or limb-fitting centre	4	15.4	15.4
At home but not to go outside	9	34.6	50
Outside the home on occasion	5	19.2	69.2
Inside and outside all the time	8	30.8	100

Aside from that, participants were asked if they use assistive devices (crutches, canes, wheelchair, etc.) while wearing the prosthesis. Nearly all the participants (96.2%) used assistive devices indoors to ambulate when wearing the prosthesis. Moreover, all (100%) used assistive devices to ambulate outdoors. The most frequently reported devices indoors (multiple answers possible) were two crutches (53.8%), a manual wheelchair (46.2%) and/or a walker (26.9%). The most frequent reported devices outdoors (multiple answers possible) were the same as indoors, but here, most participants reported to use a manual wheelchair (53.8%) followed by two crutches (34.6%) and/or a walker (30.8%).

The last question in this section of the questionnaire asked if there are any activities, which the individuals would like to perform but were not able to do so. No activity was mentioned by seven (26.9%) participants. The most frequently stated activity was “walking without assistive devices” (N = 6), followed by “walking longer distances (outside)” (N = 4), safer walking and standing (N = 3), and “be able to walk with crutch(es) or cane(s) (N = 2). Mentioned once each was: “walk properly”, “climbing stairs”, “walk inside”, “gardening”, to swim with swimming-prosthesis”, “using a bicycle treadmill” and “natural roll-over of the foot”.

5.5 Mobility with prosthesis

Participants resulted in a median of 3 (range 0 to 4 and 0 to 3) for all basic LCI activities. A few individuals were able to perform some basic ambulation activities alone, without ambulation aids. These activities were: “get up from chair” (38.5%), “go up the stairs with a handrail” (15.4%), “go down the stairs with a handrail” (11.5%), and “walk in the house” (7.7%). Not possible to perform for some participants, even with help or somebody near, were primarily activities like: step up (23.1%) or down (23.1%) a sidewalk curb, go up (19.2%) or down (19.2%) the stairs with a

handrail and “walk outside on even ground (19.2%). 73.1% of the sample are able to walk alone inside the house with or without ambulation aids and 65.4% were actually able to walk outside on even ground with ambulation aids *(see appendix, table 14, p.78)*.

Advanced ambulation skills were scored with a median of 0 to 1.5 (range 0 to 3 or 0 to 4). A median of 0, which means that the activity cannot be performed, was mostly reported for “walk outside in inclement weather” (88.5%), “go up a few steps without handrail” (76.9%), “go down a few steps without handrail” (76.9%) and “walk while carrying an object” (61.5%). Following this, “get up from the floor” (range 0 to 4) and “walk outside on uneven ground” (range 0 to 3) had a median value of 0.5. “Picking up an object from the floor” had with 1.5 (range 0 to 4) the highest median in the group with advanced activities *(see appendix, table 15, p.79)*.

The total LCI-5 score is the sum of the item scores and can range from 0 (worst) to 56 (best). Similarly, subscale scores for basic and advanced ambulation skills with the prosthesis can range from 0 to 28. Higher scores reflect greater locomotor capabilities with the prosthesis and less dependence on assistance. The median LCI basic score was 20 (range 0 to 25). Here, the most frequent score was 22 with 23.1%. Only three participants scored above a score of 22. Fifty percent of the sample resulted in a score below 20 for the LCI basic score. In contrast to that scored the LCI advanced just with a median of 6 (range 0 to 24). The most frequent score was 0 with 30.8%. Eighteen participants scored above a score of 0, but major 61.5% of the participants scored just 6 or below 6 *(see appendix, table 16, p.80)*. The median LCI total score was 23 (range 0 to 49) and had two different modes, 8 and 28, each was scored with 11.5%. Table 18 shows only the smallest mode. Here, 50% of the sample scored 22 or below *(see table 17)*.

Table 17: The locomotor capabilities index (LCI) sum scores

	N	Percent %	Mean ± SD	Median / Mode	Min / Max
LCI	26	100			
LCI Basic Score			16.46 ± 6.89	20 / 22	0 / 25
LCI Advanced Score			6.38 ± 6.75	6 / 0	0 / 24
LCI Total Score			**22.85 ± 12.57**	**23 / 8**	**0 / 49**

5.6 Pain

Pain was measured on a 5-point ordinal scale. Twenty-three of the 26 participants reported to suffer from at least one considered type of pain. Most prevalent was phantom pain (88.5%) that is also the type of pain identified as the most frequent "worst pain" (30.8%) and "severe pain" (19.2%) with a median of 3.5 (range 1 to 5). Back pain was reported with a median of 1.5 (range 1 to 5) and concerns 50% of the participants with mild to worst pain, followed by less frequent and intensive pain at the hip on both sides (median = 1), joint pain in unaffected leg (median = 1, range 1 to 4) and stump pain (median = 1, range 1 to 5). Here, 38.5% suffer from mild to severe joint pain in the residual limb and 26.9% suffer from mild to worst stump pain *(see appendix, table 18, p.81).*

5.7 Falls and fall-related consequences

One fall per year was the median incidence of falls (range = 0 to 6). In detail, 15 participants reported to experience at least one fall per year *(see table 19).* Subsequently, those 15 participants were also asked about fall-related consequences. Here, 6 individuals reported injuries caused by falls. Consequences of falls have been:

- visit to the physician, rib fracture
- hospital stay, bone fracture at the stump
- hospital stay, hip fracture, rehabilitation
- hospital stay, femoral neck fracture, rehabilitation
- bruises, abrasions, emotional burden
- visit to the physician, hospital stay, ruptured amputation wound.

Table 19: Incidence of falls per year

	N	Percent %	Cumulative %
Prevalence of falls per year	26	100	
0	11	42.3	42.3
1	8	30.8	73.1
2	4	15.4	88.5
3	2	7.7	96.2
6	1	3.8	100

In addition, the Falls Efficacy Scale-International (FES-I) was applied to measure the level of concern about falling when the individual would perform certain social and physical activities inside and outside the home. This gives a total that will range from 16 (no concern about falling) to 64 (severe concern about falling). The sample scored 41.19 ± 9.57 on average with a minimum of 19 (3.8%) and a maximum of 58 (3.8%). Most frequent was the score 49 with 19.2% (N = 5) *(see table 20).*

Table 20: Falls Efficacy Scale (FES) – International: Sum scores

	N	Percent %	Mean ± SD	Min / Max
FES	26	100		
FES-Score			41.19 ± 9,57	1 / 4
19	1	3.8		
25	1	3.8		
26	1	3.8		
30	2	7.7		
32	1	3.8		
34	1	3.8		
36	1	3.8		
38	1	3.8		
40	1	3.8		
42	1	3.8		
43	1	3.8		
44	2	7.7		
45	1	3.8		
46	2	7.7		
48	2	7.7		
49	5	19.2		
52	1	3.8		
58	1	3.8		

All activities of the FES-I resulted in a range of 1 to 4, instead of “walking on slippery surface” ranging from 2 to 4. Activities with a median of 4 (very concerned) were “cleaning the house” (76.9%), “walking on slippery surface” (96.2%), “walking in a place with crowds” (61.5%), and “walking on uneven surface” (57.7%). “Not at all concerned” were participants while performing the following activities: “getting dressed or undressed” (53.8%), “getting in or out of a chair” (73.1%), and “visiting a friend or relative” (53.8%) *(see appendix, table 21, p.82).*

5.8 Health-related quality of life (SF-36 v.2)

Individuals of the sample scored on average between 20.9 ± 16.7 and 80.8 ± 35.5 on all eight dimensions of the SF-36. The lowest mean was reported on the physical functioning index with

20.9 ± 16.7. This was followed by role-physical index (33.7 ± 38.7), general health perception index (57.2 ± 21.9), vitality index (57.7 ± 19.9), bodily pain index (60.5 ± 28.6), mental health index (71.1 ± 22.7) and social functioning index (78.4 ± 34.7). The best mean score achieved the role-emotional index with 80.8 ± 35.5 *(see figure 4 and table 22)*.

Figure 4: SF-36 means for each dimension

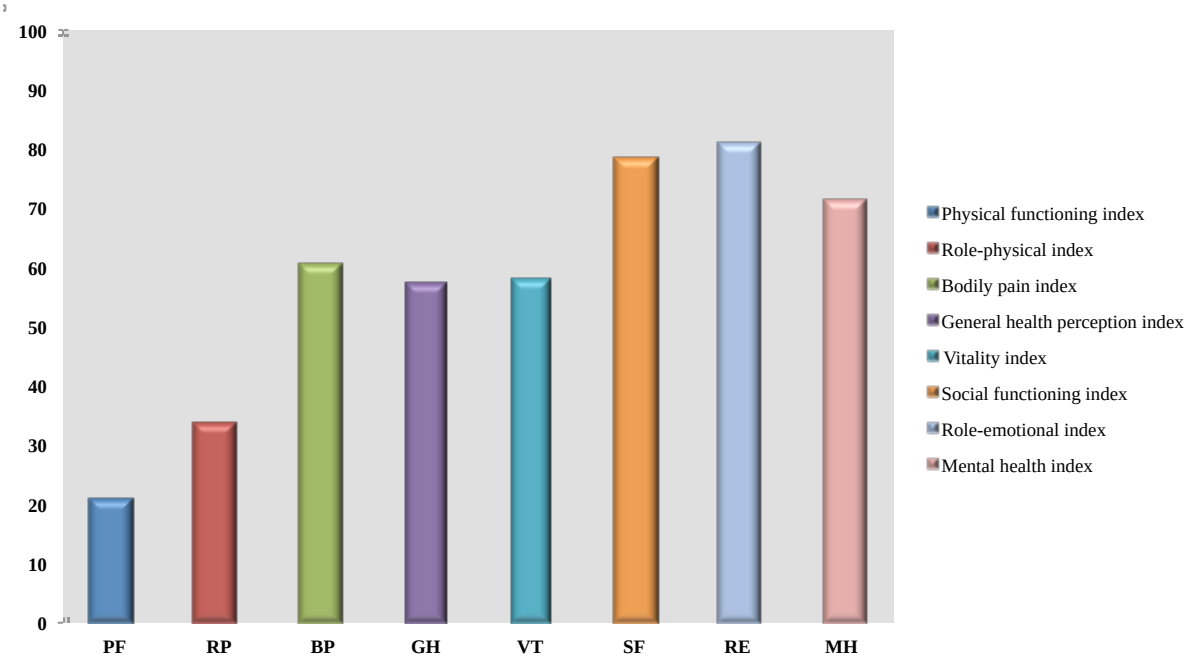


Table 22: SF-36 scores

	N	Percent %	Mean ± SD	Min / Max
SF-36	26	100		
Physical functioning index			20.9 ± 16.7	0 / 65
Role-physical index			33.7 ± 38.7	0 / 100
Bodily pain index			60.5 ± 28.6	0 / 100
General health perception index			57.2 ± 21.9	15 / 92
Vitality index			57.7 ± 19.9	10 / 90
Social functioning index			78.4 ± 34.7	0 / 100
Role-emotional index			80.8 ± 35.5	0 / 100
Mental health index			71.1 ± 22.7	8 / 100

Notable 53.8% of all participants scored up to an index of 15 for **physical functioning**. Besides, an index of 15 for physical functioning was the most frequent (N = 6, 23.1%). The highest index in the

population was reached by one individual (3.8%) with a value of 65. Unfortunately, scored on an index of 0 for physical functioning.

A score of 0 was measured on the **role-physical** index for 12 (46.2%) of 26 participants, which represents the lowest index. Nevertheless, four (15.4%) individuals scored 100, representing the highest index. Other results for role-physical index are distributed to a value of 25 with additional four (15.4%) individuals, 50 with three (11.5%) and 75 with again three (11.5) individuals.

Maximum and minimum scores for the **general health perception** were 92 (N = 1, 3.8%) and 15 (N = 1, 3.8%). Fifty percent (N = 13) of the whole sample resulted in a score of 55 or below. The most frequent score for the general health perception index was 77 with 15.4% (N = 4).

Higher results were achieved for the **vitality** index. The revealed range was 10 (N = 1, 3.8%) to 90 (N = 1, 3.8%). An index of 50 and 60 was most frequent with 15.4% (N = 4) for each. Moreover, 61.5% (N = 16) of the sample scored above an index of 50 for vitality.

Half of the sample (50%, N = 13) scored on an index of 61 or below for **bodily pain**. The lowest value of 0 was calculated for one individual (3.8%). However, the most frequently calculated index for this sample was also the highest achievable with a value of 100 (N = 6, 23.1%).

For **mental health**, the values of this index were ranging from 8 (N = 1, 3.8%) to 100 (N = 2, 7.7%). Here, 50% (N = 13) of the sample scored 80 or above. The most frequently calculated index was 88 (N = 4, 15.4%).

The **social functioning** index was investigated to be 100 for remarkable 57.7% (N = 15) of the participants. But again, the lowest value 0 (N = 2, 7.7%) was present too.

On the **role-emotional** index, 73.1% (N = 19) achieved a value of 100. Anyhow, three (11.5%) participants scored a value of 0 for the role-emotional index. Other scores were calculated for two (7.7%) individuals with a value of 33.3 and additional two (7.7%) with a value of 66.7.

6 DISCUSSION

The aim of this thesis was to give a descriptive analysis of an amputees characteristics and health indicators related to prosthesis use (HIRP) as well as of health-related quality of life of elderly individuals with unilateral trans-femoral amputation and low grade of mobility.

6.1 Interpretation of principal findings

The ratio of participants, who were assessed with mobility grade 1 or 2, was well balanced in the sample. In contrast to that, the sample included much more males than females. This imbalance was previously described in several amputee studies. Vascular disease as the dominant aetiology, which accounted for 69.2% (N=18) of the individuals, was expected and was already described to be the major cause of LLA. The median time since amputation at the interview and hence the median time since prosthetic fitting differed considerably. This is a consequence of the different settings where some individuals have been amputated quiet recently and some have been amputated long ago.

As already mentioned, multi-morbidity is a common problem in the elderly population. This is also true for older amputees. Every individual of the whole sample reported to suffer from at least one of the considered comorbidities with an average of 2.38 ± 1.67 comorbidities per participant. Most prevalent comorbidities in this population were hypertension (76.9%), PVD (65.4%) and diabetes mellitus (42.3%). In another amputee population, Schoppen et al. (2002) found that 58% had diabetes mellitus. Diabetes mellitus can influence the functional abilities of an individual and can cause multiple problems (Schoppen et al., 2002). Almost all participants had comorbidity, besides diabetes.

Predictors for the functional outcome of amputees were found in literature. It is acknowledged that the physical situation and comorbidity predict the functional potentials after an amputation. Cardiopulmonary diseases in particular cause a lack of extra energy, which is required for walking with prosthesis. Generally, the functional capabilities of individuals with a higher level of amputation, for example trans-femoral amputation, and advanced age are worse than of younger individuals with a lower amputation level (Schoppen, 2003).

In this elderly amputee population, only three individuals lived alone (11.5%). A large proportion reported to be married or in a relationship. This explains that family members mostly delivered the care. Therefore, almost all individuals were able to live at home in a house or an apartment more or less independently, because 65% stated to be not able to run a household. Another study reported living situations of amputees where 70% lived independently at home and 19% lived in a nursing home or homes for the elderly (Schoppen et. al. 2003). The importance of social support by family and friends in the functioning of the individual is already emphasized in clinical practice (Schoppen et al., 2003). However, only little information about the predictive value of social support for the functional outcome of the amputee is presented in literature. Previous research, did not find a relation between the social situation of amputees and their functioning (Helm et al., 1986; Nissen and Newmann, 1992).

6.1.1 Activities of daily living

Essential basic activities of daily living like “feed yourself”, “wash face and hands” and “get in and out of bed” represented activities without major difficulties, but these are just really basic activities which still require help of others for some amputees. The results of the Gronongen activity restriction scale have shown that older amputees are not able to even perform some of the basic activities of daily living independently. Two of them where “go up and down the stairs” and “walk outdoors”. The dependence in the execution of these activities affects the individual and limits the actions explicitly to the interior of the own home, or even just on a specific area of the house or apartment.

The instrumental activities of daily living were all rated with a median of 4, which means that elderly amputees with trans-femoral amputation were not able to perform more demanding activities, for example “household activities”, “prepare dinner”, “wash clothes” and “do the shopping”, independently. Here it must be noted that the sample has a high proportion of males. Male amputees often reported that incremental activities, such as cooking, washing clothes and to iron, where also not performed prior to amputation. Therefore, some male amputees reported that they are not “able” to do the activity, because they never did. This is probably because of sex role-specific socialization patterns in elderly people in general. Surmeijer et al. found a similar explanation in 1994, but here, women scored significantly higher than men on the IADL scale. Anyway, the mean difference was very small (means = 14.8 and 13.6). Initially, GARS was partly developed by Kempen and Suurmeijer (1990) in studies of Dutch samples consisting of elderly or

chronically ill people. Aside from that, also the female participants of this study reported to be dependent in instrumental activities of daily living.

The participants' median GARS score was 52. A score of 18 implies that the person can perform all the activities without any difficulty and a score of 72 that the person cannot perform any activity without the help of others (Schoppen et al., 2003). In this sample of elderly amputees, no participant scored below 24. This shows that no participant reported to not be able to perform activities without the help of others. However, a group of individuals in another study showed less restrictions in daily activities, but more than a reference population of healthy subjects in. The mean score of those amputee patients was 41.2 ± 15.4, whereas the healthy reference group scored 22.1 ± 7.6. Here, amputees had more problems in activities of daily living as well as in instrumental activities of daily living (Schoppen et al., 2003). The group of elderly amputees in this showed more difficulties in the ADL sum of GARS. Other researches have shown that older people scored on average significantly higher on the GARS (Suurmeijer et al., 1994). Pell et al. (1993) revealed that individuals with LLA experience problems with activities of daily living (Pell et al, 1993). This survey confirms the finding for elderly lower limb amputees with TFA.

Increasing dependency is associated with lack of opportunities to own decisions. This may results in withdrawal and reduction in social relationships. Moreover, dependency in matters of the personal toilet is a demoralizing experience. Depression and apathy are common as a consequence of increasing dependency (Caine, 1972).

Nevertheless, the GARS measures certain activities, but fails to take into account how people manage to do them. A significant correlation between GARS and prosthetic use has shown that "the overall functioning is seriously influenced by prosthetic use". Individuals "with functional use of the prosthesis were more capable of performing the daily activities as described in the GARS" (Schoppen, 2002). Therefore, activities of daily living of elderly amputees is influenced by the functioning of the individual (Schoppen, 2002a).

6.1.2 Prosthesis use and assistive devices

The assessment of the Houghton Scale resulted in a median of 1, ranging from 0 to 11. The maximum score on the Houghton Scale is 12, which was not achieved by any of the participants. Higher scores indicate greater performance and greater comfort (Devlin et al., 2004). Only four

(15.4%) individuals scored 8 or above, which indicates a successful prosthetic ambulation (Houghton et al., 1992). However, this accounts not for the other 22 (84.6%) individuals of the sample. A score of 6 or more, which was measured for 8 (30.4%) participants, is indicating mobility on the prosthesis around the home (Houghton et al., 1992). Therefore, 30.4% of the initial 26 amputees became mobile on their limb around the home, but only 15.4% of them achieved successful prosthetic ambulation. Schoppen et al. (2003) found functional prosthetic use in 49% of elderly individuals in a sample with different level of amputation due to vascular disease. The percentage was described to be low in that population, because included were also patients who were non-ambulatory except in a wheelchair. Nevertheless, the results of Schoppen et al. were somewhat higher than in the study by Fletcher et al. (2001), who reported 36% geriatric vascular amputees in an unselected population with successful prosthetic ambulation.

The Houghton Scale measures the actual performance of the amputee or “did do” issues. Hence, the Houghton Scale provides a measure of prosthetic mobility performance not mobility capability. Furthermore, the Houghton Scale was previously suggested to be beneficial when assessing low-end prosthetic mobility (Miller et al., 2001). All in all, prosthetic mobility performance in elderly amputees with TFA measured with the Houghton Score was poor.

It is plausible, that the less amount of time the prosthesis was used during waking hours, which was questioned as a part of the scale, resulted in low scores on the Houghton Scale. Here, 57.7% (N = 15) participants stated to wear their prosthesis “less than 25% (1-3 hours) of waking hours”. After all, 26.9% (N = 7) wear their prosthesis all waking hours (12-16 hours), even though they were often ambulating with a wheelchair. In a study with another amputee population of Burger et al. (1997), 74.2% of younger individuals after traumatic amputation wear their prosthesis more than 7 hours per day. The study of Burger et al. furthermore found that present age does not influence the use of the prosthesis per day.

As a part of the Houghton Scale, amputees were also asked if they use assistive devices inside or outside when wearing the prosthesis. Almost all (N = 25, 96.2%) participants used an assistive device inside and all reported to use assistive devices outdoors (N = 26, 100%). In this amputee population, the amount of assistive devices users is much higher than compared to other amputee populations. For example, Hagberg (2006) reported 68.7% non-users inside and 52.2% non-users outside. Individuals may have problems to perform other activities, for example to carry something, while they use assistive devices to ambulate. Their hands are not free, because two crutches were the most frequently (53.8%) used devices indoors. This aspect was also reflected when participants

where asked “if there are any activities which the individual would like to perform, but is not able to do”. Here, the most frequent activity was “walking without assistive devices”.

Satisfaction with prosthesis was quite low. Some would expect it to be higher, due to the potential misbelief that elderly people have rather low demands on their prosthesis. Unfortunately, type of prosthesis or manufacturer was not ascertained. Next to that, it was found that the degree of satisfaction with the prosthetic device is related to the person’s attitude towards it (Poljak-Guberina et al, 2005).

Furthermore, the “use of a prosthesis and comorbidities were the most important factors with influence of the physical health component of QoL” in a study of Sinha et al. (2011). Additionally, the use of prosthesis was found to affect the physical health more positively than the mental health component of QoL (Sinha et al., 2011).

6.1.3 Mobility with prosthesis

LCI was used to measure the walking ability with prosthesis in lower limb amputees. Here, participants resulted in a median of 3 for all basic LCI activities. Only a few individuals were able to perform some basic ambulation activities alone, without ambulation aids. Surprisingly, only 73.1% of the sample was able to walk alone inside their house or apartment with or without ambulation aids. Even worse resulted the advanced ambulation skills with a median of 0 to 1.5. A mean of 0 measures that the activity cannot be performed at all. The median LCI basic score was 20 (range 0 to 25) and LCI advanced score resulted just in a median of 6 (range 0 to 24). Higher scores reflect greater locomotor capabilities with the prosthesis and less dependence on assistance. The median LCI total score was low (23, range 0 to 49).

In another population of amputees with a mean age of 74 years the mean LCI score was 28.5 (Larsson, 2009). A further study found that trans-femoral amputees had a mean LCI 29.2 (Franchignoni et al., 2004). This study reported also a mean LCI of 41 after a rehabilitation program among amputees with a median age of 51 years. These were all different amputee populations, but still elderly trans-femoral amputees in this survey resulted worst. Besides, a study demonstrated that LCI scores are associated with the frequency of prosthetic wear and use of the prosthesis for activities inside and outside (Larsson, 2009).

Dite et al. (2007) found that LCI advanced score of 15 or less is associated with an increased risk of having multiple falls in individuals with unilateral trans-tibial amputation. Hence, it could be assumed that the results are also meaningful for elderly trans-femoral amputees. Even more, because participants of the survey scored in a median of 6 for the LCI advanced score.

It has to be considered that elderly amputees may have stopped to perform some activities and that some may always use their wheelchair to ambulate outdoors. Furthermore, it has to be considered that the LCI measures the perceived capability and not the actual performance in everyday life (Larsson, 2009).

6.1.4 Pain

As the results have shown, every participant suffered from at least one type of pain. Especially, phantom pain was a major issue in elderly lower limb amputees. Unfortunately, phantom pain was often experienced as “worst pain” or “severe pain”. Stump pain was expected to be more severe (median = 1). Pohjolainen (1991) found a negative relationship between stump pain and/or phantom pain and functioning. However, there is no evidence if the level of pain after amputation is a predictor of a worse functional outcome (Schoppen, 2003). Phantom pain seems to decrease mobility and has impact on the psychological and mental state of the individual. But, it was found that the physical health component is more negatively affected from the presence of phantom pain than the mental health component of QoL (Sinha et al., 2011). The reported frequency of phantom pain was high compared to other findings. In a study of Schoppen et al. (2002), only 9% of the individuals reported severe phantom pain. In contrast, 69% individuals with major LLA reported to experience phantom pain in another sample. The pain was worse for individuals with TFA compared with TTA (Gallagher et al. 2001). Individuals in a study of Smith et al. (1999), 63% had experienced phantom limb pain. Pain from other sites of the body has also been described to be present frequently also in other amputee populations (Hagberg, 2006).

6.1.5 Falls and fall-related consequences

Fifteen participants reported to experience at least one fall per year. Six individuals of them experienced major physical consequences as a result a fall. Even one individual reported 6 falls per year. It was conspicuous that an event of falling was an emotionally demanding topic during the

interviews for some amputees. Nevertheless, almost half of the participants reported no fall at all, which was maybe because a lot individuals were interviewed in a rehabilitative setting instead of their home environment were people are more exposed to all day activities. Another explanation might be, that lower limb amputees tend to walk very carefully and concentrate on their walking.

On average the sample scored 41.19 on the FES-I. The total of the FES-I can range from 16, representing “no concerns about falling” to 64 (“severe concerns about falling”). Hence, it was found that elderly amputees tend to have high concerns about falling.

There is no direct assessment of fear of falling with the FES-I. But, it has been found that the fear of social consequences of falling contributes to avoidance of activities (Yardley et al., 2005). Besides, Dite et al. (2007) reported that multiple fallers’ score is lower on the LCI advanced score than for non-multiple fallers. Miller et al. (2001a) also recognized lot activity avoidance after a fall. Findings of trans-tibial amputees have shown a greater difficulty to perform balance and mobility tasks. Moreover, people with s greater balance and mobility impairments were more likely to experience multiple falls (Dite, 2007).

The importance of falls management for individuals with LLA is highlighted in the literature (Pauley et al., 2006).

6.1.6 Health-related quality of life (SF-36 v.2)

The amputation of a limb is a dramatic change in the life situation of the person involved and limb loss is without doubt a chronic condition. Several studies have reported a reduction in general HRQoL for lower limb amputees (Pell et al. 1993; Smith et al. 1995; Legro et al. 1999; Demet et al. 2003).

The physical functioning index and the role-physical index were low especially compared to other dimensions of the SF-36. For those, poorer results have been expected for individuals with LLA. Fortunately, the results for the social functioning index, the role-emotional index and the mental health index where rather good compared to the physical ones. As predictors for perceived QoL among individuals with LLA were described: “depression, prosthetic mobility, social support, number of comorbidities, daily social activity, number of prosthetic problems, and age” (Asano, 2008). The mobility capability was also found to be a good predictor of QoL. With increasing age,

individuals usually experience a “decrease in muscle mass, strength, and flexibility, as well as an increase in medical complications” (Asano, 2008). As a consequence, these changes can result in further deficiencies in their activities and participation. Also in a study of Pell et al. (1993) physical mobility was the only independent factor with significant influence on quality of life in amputees (measured by the Nottingham Health Profile). In consequence, it was most reasonable, that age was found to be a predictor of perceived QoL in a sample of Asano (2008).

Measuring QoL in amputees is challenging, because of the different meaning and consequences a loss of a limb has for the individual amputee. A disadvantage of the SF-36 is that it covers the relevant limitations to quality of life, but the relative importance of these limitations for the respondent is not considered (Lüthi, 2009). It has to be regarded that the process of adjustment to an amputation of the lower limb is a lifelong procedure including physical and psychological changes (Gallagher and MacLachlan 2002). Pell et al. (1993) found that physical mobility was the only independent factor that significantly affected quality of life in amputees as measured by the Nottingham Health Profile. Here, the amputees were compared with their non-disabled counterparts. Moreover, Eiser et al. (2001) found significantly worse scores of quality of life for individuals with LLA compared with population norms (Eiser et al, 2001).

6.2 Strengths and limitations of the study

It can be said that the participants belong to a more difficult to recruit population. Without the cooperation with the institutions a collection of 26 individuals in this framework would have been very difficult. For this reason, attention on the number of participants could not be paid to ensure a better gender distribution or simply some more female participants. Therefore, separate evaluations for male and female amputees took place barely. A larger number of individuals to recruit would have been also useful to separate participants by the time since the prosthetic restoration. In this aspect, the sample showed some major differences. The cooperation with different institutions required different approaches in recruitment, but anyhow it was possible to collect data purely on elderly trans-femoral amputees.

The method used has demonstrated to be very applicable in a population with elder trans-femoral amputees. An amount of time was required when interviewing elderly amputees. Advanced statistics on this population will be of interest. Moreover, non-participation and non-responsiveness were low in the current study due to face-to-face administration. This mode of administration

ensured data completeness and supported an appropriate interpretation of the questions in the survey.

Comparability with existing international study findings is limited and care should be taken in generalizing these results. The sample size was small and it is a sample of convenience (although from 4 independent institutions), represented a very select population including only less mobile elderly trans-femoral amputee fitted with prosthesis. Characteristics of the study populations in different studies should be taken into consideration. The results reported in this thesis are examined only for the sample and the method used in the described setting.

All participants in this sample had to be fitted with prosthesis. Therefore, the results cannot be generalized to elderly trans-femoral amputees, where no prosthesis applied after amputation. Fletcher et al (2001), reported 36% of successfully fitted geriatric vascular amputee patients in an unselected population. A further limitation of the study was that there was no cognitive assessment for the inclusion of participants in the study. All data is based on participants' self-report and was collected at one point in time only. Therefore, subjectivity in reporting cannot be excluded.

7 CONCLUSION AND OUTLOOK

This descriptive study was conducted in order to give a descriptive analysis of amputee characteristics and health indicators related to prosthesis use (HIRP) as well as of health-related quality of life in a population of elderly individuals with unilateral trans-femoral amputation and low mobility.

In general, the functional level of elderly individuals with trans-femoral amputation was low. Individuals reported restricted mobility and problems with activities of daily living. Regarding this, successful prosthetic ambulation was unsurprisingly low. Due to that, it has already been reported that having good mobility skills and an appropriate prosthesis is required to provide individuals with physical freedom and enhances the participation in various activities (Asano, 2008). The study revealed that every participant suffered from at least one type of pain. Especially, phantom pain was a major issue and this type of pain was experienced as worst in elderly lower limb amputees. Even though the rate of falls per year was rather lower than expected in this population, the assessment of the FES-I has shown that elderly amputees tend to have high concerns about falling. QoL of elderly amputees was poor, especially in dimensions with regard to physical components. Here, improved mobility can foster functional independence of people with lower-limb amputation in all activities of personal care and daily living and enhance their quality of life (Franchigoni et al., 2004). Other research has found that successful fitting and usage of prosthesis by persons after lower limb amputation promotes independent walking and mobility in everyday life (Burger et al., 1997). Nevertheless, elderly amputees face limitations of mobility and independency in activities of daily living. It is therefore recommended to find new approaches, which may help elderly amputees to achieve improved mobility with prosthesis and to maintain the highest possible level of independence. Modifications in social support, rehabilitation and prosthetic design (Engstrom and Van de Ven, 1999) may be necessary for elderly individuals with trans-femoral amputation.

This investigation may provides some insights on HIRP and QoL of elderly trans-femoral amputees living with prosthesis and increased the general body of knowledge on this subgroup of individuals with lower limb amputation. The results of this research may be important to identify areas of potential improvement in the management of elderly people with LLA in order to support further population specific research and development. It is suggested that future investigations in amputees covered by this thesis should focus on the investigation of differences in HRQoL and prosthetic function due to gender, grade of mobility as well as due to the type of prosthetic and rehabilitation

treatment. Besides, a qualitative study on the influence of falls in elderly individuals with trans-femoral amputation would be noteworthy, because the experience of a fall in amputees seemed to be a highly emotional topic with some kind of influence on this population.

However, the small sample size and the lack of inferential statistics do not allow generalizing the findings and it should be noted that the comparability of results with other studies is limited. The results are examined for the sample and the method used in the described setting.

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STATUTORY DECLARATION

I hereby confirm that I am the author of the thesis presented. I have written the thesis as applied for previously unassisted by others, using only the sources and references stated in the text.

Date:

Signature:

Jessica Rymland

APPENDICES

Figure 1: The Otto Bock Mobility System

MOBIS®

Quality for Life: The Otto Bock Mobility System

MOBIS® – the new Otto Bock Mobility System.
It's our highest priority to produce quality modular prosthetic components while offering a range broad enough for you to find the best solutions for your patients.

MOBIS® – is the next generation of the Otto Bock Classification System® introduced in 1994. By expanding the weight and mobility categories, it helps you match components to your patient's unique needs.

Four Mobility Grades, instead of the familiar three functional classes, are now the basis for the system, while an additional weight class was also added for people above 125 kg/275 lbs.

With the aid of the MOBIS® Symbol, you can immediately determine the recommended Mobility Grade as well as the weight load for functional parts such as prosthetic feet, knee and hip joints.

For structural parts like tubes and adapters, classification is still based on patient weight.

MOBIS® – starts with four Mobility Grades*:
the Indoor Walker, the Restricted Outdoor Walker, the Unrestricted Outdoor Walker, and the Unrestricted Outdoor Walker with Especially Rigorous Demands.
(*This classification corresponds to the profiling questionnaires of the German Association of Medical Services for the National Health Insurance Companies (MDS).)

MOBIS® – includes four weight categories:
patient weight below 75 kg/165 lbs, below 100 kg/220 lbs, below 125 kg/275 lbs and above 125 kg/275 lbs. We combine all the information you need for selecting prosthetic components in one simple symbol.

MOBIS® – is easy to use.
The MOBIS® symbol for the 3R60 knee is shown above: colored segments in the upper half of the symbol show that the 3R60 knee joint is recommended for patients with Mobility Grades 2 or 3. In the lower half, the segments <75 kg/165 lbs and <100 kg/220 lbs are colored to show that the 3R60 is approved for patients with a weight of up to 100 kg/220 pounds.

Mobility Grades and Therapy Goals*

*Excerpt from: Degree of Mobility and Goal of Therapy according to the Register of Supportive Devices.
The Otto Bock MOBIS® Mobility System is NOT intended to be used in the U.S.A as a guide to obtaining reimbursement for prosthetic components.

Indoor Walker

The patient has the ability or the potential to use the prosthesis for transfer purposes and to move at minimal speed on level floors. The amount of time and the distance that he/she can walk are **seriously** limited due to his/her condition.

Therapy Goals: Restoration of the patient's ability to stand and provide limited mobility indoors.

Restricted Outdoor Walker

The patient has the ability or the potential to move slowly with the prosthesis and can negotiate low environmental obstacles like curbs, single stairs or uneven ground. The amount of time and the distance that he/she can walk are limited due to his/her condition.

Therapy Goals: Restoration of the patient's ability to stand and move both indoors and with limited mobility outdoors.

Unrestricted Outdoor Walker

The patient has the ability or the potential to move with the prosthesis with variable cadence and can simultaneously negotiate most environmental barriers. He/she also has the ability to move about open areas and can undertake occupational, therapeutic and other activities that do not expose the prosthesis to above-average mechanical demands. This also includes those patients who have an increased need for security due to secondary conditions (additional handicaps, special living circumstances) in connection with medium to high mobility activities. In comparison to healthy individuals, the amount of time and the distance that he/she can walk are limited only in non-essential ways.

Therapy Goals: Restoration of the patient's ability to walk and move without any limitations indoors and with only non-essential limitations outdoors.

Unrestricted Outdoor Walker with Especially Rigorous Demands

The patient has the ability to move with the prosthesis in a manner similar to the Unrestricted Outdoor Walker. The amount of time and the distance that he/she can walk are unlimited. Moreover, due to the high functional demands, the prosthesis can sustain a high degree of shock, tension and torsion.

Therapy Goals: Restoration of the patient's ability to stand, walk and move both indoors and outdoors without any limitations.

Figure 2: Procedure of gathering the study population

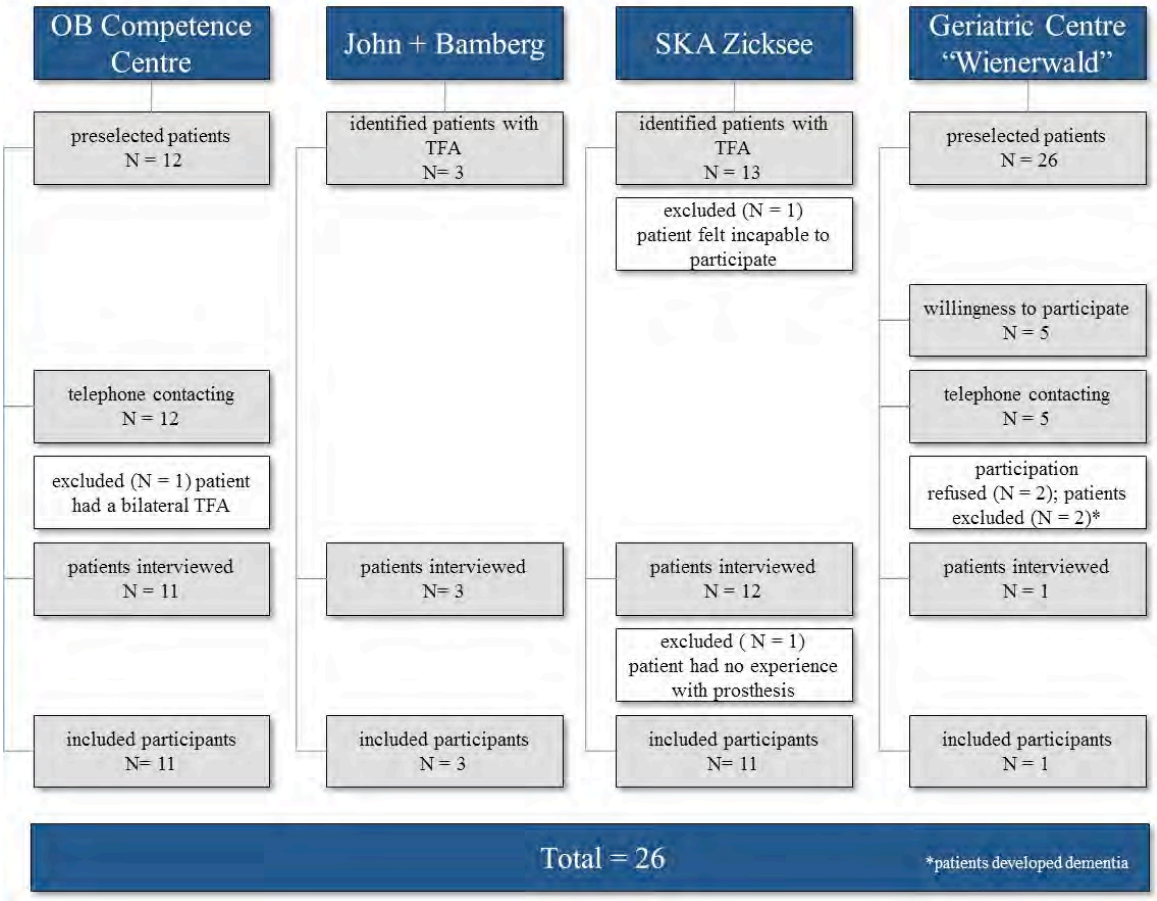

Table 3: Table of the scales of the SF-36 and their content and relationship to physical and mental components of health

Concepts/ Dimensions	No. Of Items	Item Gradations	Content	
Physical Functioning (PF)	10	21	Extent to which the state of health affects physical activities such as self-sufficiency, walking, climbing stairs, bending, lifting, and moderate or strenuous activities	Physical Health
Role Physical (RP)	4	5	Extent to which the state of health disturbs the work or other daily activities, for example create less than usual, limitations in the type of activity or difficulty to perform certain activities	
Bodily Pain (BP)	2	11	Degree of pain and impact of pain on normal work, both inside and outside the house	
General Health (GH)	5	21	Personal health assessment, including current state of health, future expectations and resistance to diseases and the consequences	
Vitality (VT)	4	21	To feel energetic and full of vim versus feeling tired and exhausted	Mental Health
Social Functioning (SF)	2	9	Extent to which physical health or emotional problems affect normal social activities	
Role Emotional (RE)	3	4	Extent to which emotional problems interfere with work or other daily activities, e.g. spend less time on things, work less and less carefull work as usual	
Mental Health (MH)	5	26	General mental health, including depression, anxiety, emotional and behavioral control, general positive mood	
Change in Health	1	5	Assessment of the current state of health compared to last year	

(Adapted from „Der SF-36-Fragebogen zum Gesundheitszustand: Handbuch für die deutschsprachige Fragebogen-version“ by M. Bullinger and I. Kirchberger (1998), Hogrefe-Verlag für Psychologie, Göttingen.)

Table 5: Prevalence of diseases and disabilities in the questionnaire

		N	Percent %
Total		26	100
Additional diseases or disabilities?	Yes	26	100
	No	0	0
Diabetes mellitus	Yes	11	42.3
	No	15	57.7
Neuropathy	Yes	7	26.9
	No	19	73.1
Visual disorder	Yes	5	19.2
	No	21	80.8
Congestive heart failure	Yes	6	23.1
	No	20	76.9
Chronic bronchitis	Yes	2	7.7
	No	24	92.3
Paralysis	Yes	1	3.8
	No	25	96.2
Osteoporosis	Yes	6	23.1
	No	20	76.9
Osteoarthritis	Yes	5	19.2
	No	21	80.8
Total joint replacements	Yes	1	3.8
	No	25	96.2
Hypertension	Yes	20	76.9
	No	6	23.1
Venous insufficiency	Yes	8	30.8
	No	18	69.2
PVD	Yes	17	65.4
	No	9	34.6
Others	Yes	4	15.4
	No	22	84.6

Table 6: Family and environmental factors

	N	Percent %
Total	26	100
Family status		
Single	1	3.8
Partnered	3	11.5
Married	20	73.1
Widowed	3	11.5
Do you live alone?		
Yes	3	11.5
No	23	88.5
Independant housekeeping		
Yes	1	3.8
Partly, with relatives	6	23.1
Partly, with care service	2	7.7
No, relatives	16	61.5
No, care service	1	3.8
Do you have to care for other people?		
Yes	1	3.8
No	25	96.2
Type of housing		
Flat	13	50
House	11	42.3
In-patient nursing care facility	1	3.8
Day care centre	1	3.8
Daily amount of steps		
None	8	30.8
1 to 10	9	34.6
11 to 20	5	19.2
More than 20	4	15.4

Table 7: ADL Activities

		N	Percent %	Median	Min / Max
ADL Activities		26	100		
Dress yourself				2	1 / 4
	1	4	15.4		
	2	13	50		
	3	2	7.7		
	4	7	26.9		
Get in and out of bed				1	1 / 4
	1	15	57.7		
	2	7	26.9		
	3	1	3.8		
	4	3	11.5		
Stand up from sitting in a chair				2	1 / 4
	1	8	30.8		
	2	15	57.7		
	3	2	7.7		
	4	1	3.8		
Wash your face and hands				1	1 / 3
	1	21	80.8		
	2	3	11.5		
	3	2	7.7		
	4	0	0		
Wash and dry your whole body				2	1 / 4
	1	6	23.1		
	2	8	30.8		
	3	1	3.8		
	4	11	42.3		
Get on and off the toilet				2	1 / 4
	1	12	46.2		
	2	9	34.6		
	3	2	7.7		
	4	3	11.5		
Feed yourself				1	1 / 2
	1	25	96.2		
	2	1	3.8		
	3	0	0		
	4	0	0		
Get around in the house				2	1 / 4
	1	7	26.9		
	2	12	46.2		
	3	2	7.7		
	4	5	19.2		
Go up and down the stairs				4	1 / 4
	1	3	11.5		
	2	5	19.2		
	3	4	15.4		
	4	14	53.8		
Walk outdoors				4	1 / 4
	1	3	11.5		
	2	6	23.1		
	3	1	3.8		
	4	16	61.5		
Take care of your feet and toenails				4	1 / 4
	1	3	11.5		
	2	1	3.8		
	3	3	11.5		
	4	19	73.1		

Table 8: IADL Activities

		N	Percent %	Median	Min / Max
IADL Activities		26	100		
Prepare breakfast or lunch				4	1 / 4
	1	4	15.4		
	2	1	3.8		
	3	0	0		
	4	21	80.8		
Prepare dinner				4	1 / 4
	1	4	15.4		
	2	3	11.5		
	3	0	0		
	4	19	73.1		
Do light household activities				4	1 / 4
	1	3	11.5		
	2	2	7.7		
	3	1	3.8		
	4	20	76.9		
Do heavy household activities				4	4 / 4
	1	0	0		
	2	0	0		
	3	0	0		
	4	26	100		
Wash and iron your clothes				4	1 / 4
	1	2	7.7		
	2	2	7.7		
	3	0	0		
	4	22	84.6		
Make the beds				4	1 / 4
	1	2	7.7		
	2	1	3.8		
	3	0	0		
	4	3	88.5		
Do the shopping				4	1 / 4
	1	1	3.8		
	2	3	11.5		
	3	0	0		
	4	22	84,6		

Table 14: The locomotor capabilities index (LCI) item scores for basic activities

		N	Percent %	Median	Min / Max
LCI Basic Activities		26	100		
Get up from chair				3	0 / 4
No	0	2	7.7		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	3	11.5		
Yes alone, with ambulation aids	3	10	38.5		
Yes alone, without ambulation aids	4	10	38.5		
Walk in the house				3	0 / 4
No	0	1	3.8		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	5	19.2		
Yes alone, with ambulation aids	3	17	65.4		
Yes alone, without ambulation aids	4	2	7.7		
Walk outside on even ground				3	0 / 3
No	0	5	19.2		
Yes, if someone helps me	1	3	11.5		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	17	65.4		
Yes alone, without ambulation aids	4	0	0		
Go up the stairs with a handrail				3	0 / 4
No	0	5	19.2		
Yes, if someone helps me	1	0	0		
Yes if someone is near me	2	6	23.1		
Yes alone, with ambulation aids	3	11	42.3		
Yes alone, without ambulation aids	4	4	15.4		
Go down the stairs with a handrail				3	0 / 4
No	0	5	19.2		
Yes, if someone helps me	1	0	0		
Yes if someone is near me	2	6	23.1		
Yes alone, with ambulation aids	3	12	46.2		
Yes alone, without ambulation aids	4	3	11.5		
Step up a sidewalk curb				3	0 / 3
No	0	6	23.1		
Yes, if someone helps me	1	4	15.4		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	15	57.7		
Yes alone, without ambulation aids	4	0	0		
Step down a sidewalk curb				3	0 / 3
No	0	6	23.1		
Yes, if someone helps me	1	2	7.7		
Yes if someone is near me	2	3	11.5		
Yes alone, with ambulation aids	3	15	57.7		
Yes alone, without ambulation aids	4	0	0		

Table 15: The locomotor capabilities index (LCI) item scores for advanced activities

		N	Percent %	Median	Min / Max
LCI Advanced Activities		26	100		
Picking up an object from the floor				1.5	0 / 4
No	0	12	46.2		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	2	7.7		
Yes alone, with ambulation aids	3	9	34.6		
Yes alone, without ambulation aids	4	2	7.7		
Get up from the floor				0.5	0 / 4
No	0	13	50		
Yes, if someone helps me	1	4	15.4		
Yes if someone is near me	2	2	7.7		
Yes alone, with ambulation aids	3	5	19.2		
Yes alone, without ambulation aids	4	2	7.7		
Walk outside on uneven ground				0.5	0 / 3
No	0	13	50		
Yes, if someone helps me	1	3	11.5		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	9	34.6		
Yes alone, without ambulation aids	4	0	0		
Walk outside in inclement wheather				0	0 / 3
No	0	23	88.5		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	1	3.8		
Yes alone, without ambulation aids	4	0	0		
Go up a few steps without handrail				0	0 / 3
No	0	20	76.9		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	4	15.4		
Yes alone, without ambulation aids	4	0	0		
Go down a few steps without handrail				0	0 / 3
No	0	20	76.9		
Yes, if someone helps me	1	2	7.7		
Yes if someone is near me	2	1	3.8		
Yes alone, with ambulation aids	3	3	11.5		
Yes alone, without ambulation aids	4	0	0		
Walk while carring an object				0	0 / 4
No	0	16	61.5		
Yes, if someone helps me	1	1	3.8		
Yes if someone is near me	2	0	0		
Yes alone, with ambulation aids	3	8	30.8		
Yes alone, without ambulation aids	4	1	3.8		

Table 16: The locomotor capabilities index (LCI) total scores

	N	Percent %	Median / Mode	Min / Max
LCI	26	100		
LCI- Total Score			23 / 8	0 / 49
0	1	3.8		
5	1	3.8		
8	3	11.5		
10	1	3.8		
12	1	3.8		
15	1	3.8		
16	1	3.8		
17	1	3.8		
21	1	3.8		
22	2	7.7		
24	2	7.7		
28	3	11.5		
30	1	3.8		
33	2	7.7		
34	1	3.8		
37	1	3.8		
39	1	3.8		
43	1	3.8		
49	1	3.8		

Table 18: Pain

		N	Percent %	Median	Min / Max
Pain		26	100		
Hip pain, side of amputated limb				1	1 / 4
No pain	1	21	80.8		
Mild pain	2	0	0		
Moderate pain	3	4	15.4		
Severe pain	4	1	3.8		
Worst pain	5	0	0		
Hip pain, side of residual limb				1	1 / 3
No pain	1	22	84.6		
Mild pain	2	1	3.8		
Moderate pain	3	3	11.5		
Severe pain	4	0	0		
Worst pain	5	0	0		
Back pain				41395	1 / 5
No pain	1	13	50		
Mild pain	2	2	7.7		
Moderate pain	3	5	19.2		
Severe pain	4	4	15.4		
Worst pain	5	2	7.7		
Joint pain in residual limb				1	1 / 4
No pain	1	16	61.5		
Mild pain	2	4	15.4		
Moderate pain	3	4	15.4		
Severe pain	4	2	7.7		
Worst pain	5	0	0		
Stump pain				1	1 / 5
No pain	1	19	73.1		
Mild pain	2	3	11.5		
Moderate pain	3	2	7.7		
Severe pain	4	1	3.8		
Worst pain	5	1	3.8		
Phantom pain				3.5	1 / 5
No pain	1	3	11.5		
Mild pain	2	3	11.5		
Moderate pain	3	7	26.9		
Severe pain	4	5	19.2		
Worst pain	5	8	30.8		

Table 22: Falls Efficacy Scale – International: Activities

		N	Percent %	Median	Min / Max
FES		26	100		
Cleaning the house				4	1 / 4
Not at all concerned	1	4	15.4		
Somewhat concerned	2	0	0		
Fairly concerned	3	2	7.7		
Very concerned	4	20	76.9		
Getting dressed or undressed				1	1 / 4
Not at all concerned	1	14	53.8		
Somewhat concerned	2	7	26.9		
Fairly concerned	3	2	7.7		
Very concerned	4	3	11.5		
Preparing simple meals				2	1 / 4
Not at all concerned	1	12	46.2		
Somewhat concerned	2	2	7.7		
Fairly concerned	3	1	3.8		
Very concerned	4	11	42.3		
Taking a bath or shower				2	1 / 4
Not at all concerned	1	10	38.5		
Somewhat concerned	2	7	26.9		
Fairly concerned	3	1	3.8		
Very concerned	4	8	30.8		
Going to shop				2.5	1 / 4
Not at all concerned	1	9	34.6		
Somewhat concerned	2	4	15.4		
Fairly concerned	3	2	7.7		
Very concerned	4	11	42.3		
Getting in or out of a chair				1	1 / 4
Not at all concerned	1	19	73.1		
Somewhat concerned	2	2	7.7		
Fairly concerned	3	3	11.5		
Very concerned	4	2	7.7		
Go up or down stairs				2	1 / 4
Not at all concerned	1	7	26.9		
Somewhat concerned	2	8	30.8		
Fairly concerned	3	2	7.7		
Very concerned	4	9	34.6		
Walking arround the neighborhood				2	1 / 4
Not at all concerned	1	9	34.6		
Somewhat concerned	2	6	23.1		
Fairly concerned	3	0	0		
Very concerned	4	11	42.3		
Reaching for sth.				3	1 / 4
Not at all concerned	1	3	11.5		
Somewhat concerned	2	9	34.6		
Fairly concerned	3	8	30.8		
Very concerned	4	6	23.1		

Going to answer the telephone				2	1 / 4
Not at all concerned	1	11	42.3		
Somewhat concerned	2	7	26.9		
Fairly concerned	3	1	3.8		
Very concerned	4	7	26.9		
Walking on a slippery surface				4	2 / 4
Not at all concerned	1	0	0		
Somewhat concerned	2	1	3.8		
Fairly concerned	3	0	0		
Very concerned	4	25	96.2		
Visiting a friend or relative				1	1 / 4
Not at all concerned	1	14	53.8		
Somewhat concerned	2	4	15.4		
Fairly concerned	3	3	11.5		
Very concerned	4	5	19.2		
Walking in a place with crowds				4	1 / 4
Not at all concerned	1	6	23.1		
Somewhat concerned	2	3	11.5		
Fairly concerned	3	1	3.8		
Very concerned	4	16	61.5		
Walking on an uneven surface				4	1 / 4
Not at all concerned	1	4	15.4		
Somewhat concerned	2	3	11.5		
Fairly concerned	3	4	15.4		
Very concerned	4	15	57.7		
Walking up or down a slope				3	1 / 4
Not at all concerned	1	4	15.4		
Somewhat concerned	2	5	19.2		
Fairly concerned	3	9	34.6		
Very concerned	4	8	30.8		
Going out to a social event				2.5	1 / 4
Not at all concerned	1	11	42.3		
Somewhat concerned	2	2	7.7		
Fairly concerned	3	3	11.5		
Very concerned	4	10	38.5		

Fragebogen für den Patienten

zur Beurteilung von gesundheitsrelevanten Parametern und Lebensqualität

Mobilitätsgrad: *□ 1 Innenbereichsgeher*

(Ermittlung nach der Befragung durch den Interviewer) *□ 2 eingeschränkter Außenbereichsgeher*

□ stark □ mittel □ wenig

Angaben zur Person

Geburtsdatum:	_____
Geschlecht:	□ männlich □ weiblich
Körpergewicht (ohne Prothese):	_____kg
Körpergröße:	_____cm
Lokalisation der Amputation:	□ links □ rechts
Amputationsursache:	□ Durchblutungsstörung □ Tumorerkrankung □ Trauma □ Infektion □ andere: _____
Amputiert seit:	____Jahren ____Monaten ____Wochen
Prothesenversorgung seit:	____Jahren ____Monaten ____Wochen
Krankenversicherung:	□ privat □ gesetzlich
Pflegestufe	□ keine □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ beantragt

1. Welche Pflegeleistungen nehmen Sie in Anspruch?

□ keine	□ Geldleistungen □ Sachleistungen □ Kombination aus Sach- und Geldleistungen	
	□ professionell erbracht □ familiär erbracht	

2. Haben Sie weitere Erkrankungen oder Behinderungen? (ankreuzen, wenn zutreffend)

□ Diabetes mellitus	□ Neuropathie	□ Sehstörung
□ Herzinsuffizienz	□ chron. Bronchitis	□ Lähmungen
□ Osteoporose	□ Arthrose	□ Endoprothese
□ Bluthochdruck	□ Venenschwäche	□ pAVK
□ weitere: _____		

Familiäres und häusliches Umfeld

3. Was ist Ihr Familienstand?

□ ledig □ verpartnert □ verheiratet □ geschieden □ verwitwet

4. Leben Sie allein?

□ ja

□ nein Wenn nein, wie viele Personen leben insgesamt in Ihrem Haushalt? _____

5. Führen Sie Ihren kompletten Haushalt selbstständig?

□ ja

□ teilweise Wenn teilweise, helfen □ Angehörige und/oder □ Pflegedienst?

□ nein Wenn nein, helfen □ Angehörige und/oder □ Pflegedienst?

6. Müssen Sie andere Personen mitversorgen?

□ ja Wenn ja, wie viele?_____ Wen?_____

□ nein

7. In welcher Art Unterkunft leben Sie?

□ Wohnung □ stationäre Pflegeeinrichtung □ anderes: _____

□ Haus □ teilstationäre Pflegeeinrichtung

8. Wie viele Stufen täglich haben Sie im Alltag durchschnittlich zu überwinden?

□	□	□	□
keine	1 bis 10	11 bis 20	mehr als 20

Aktivitäten des täglichen Lebens (Groningen Activity Restriction Scale)

9. Wie sind Sie in der Lage die folgenden Tätigkeiten auszuführen?

Punktzahl	Antwort
1 2 3	selbstständig, ohne Schwierigkeiten , leichte Schwierigkeiten , große Schwierigkeiten
4	unselbstständig oder mit umfassender Hilfe

ADL Tätigkeiten	Pkt.	ADL Tätigkeiten	Pkt.
sich anziehen		ins Bett gehen und aufstehen	
vom Stuhl aufstehen		Gesicht und Hände waschen	
essen		auf Toilette gehen	
den Körper waschen und trocknen		Treppen auf- und absteigen	
Fuß- und Nagelpflege		sich innerhalb der Wohnung bewegen (ggf. mit Hilfsmitteln)	
sich außerhalb der Wohnung bewegen (ggf. mit Hilfsmitteln)			

IADL Tätigkeiten	Pkt.	IADL Tätigkeiten	Pkt.
Frühstück/Mittag zubereiten		Abendbrot zubereiten	
leichte Hausarbeit (z.B. Staub wischen, aufräumen)		schwere Hausarbeit (z.B. wischen, Fenster putzen, Staubsaugen)	
Wäsche waschen, bügeln		Bett machen	
einkaufen			

Prothesen- und Hilfsmittelgebrauch (*Houghton Scale)

10. Wie zufrieden sind Sie mit Ihrer aktuellen Prothese?

□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10

extrem unzufrieden — extrem zufrieden

11. Wie oft tragen Sie Ihre Prothese wenn Sie wach sind?*

□ weniger als 25% (1-3 Stunden) □ 25%-50% (4-8 Stunden)

□ > 50% (>8 Stunden) □ den ganzen Tag (12-16 Stunden) *weiter mit Frage 13

12. Was sind Ihre Gründe die Prothese nicht den ganzen Tag zu tragen?

_____

_____

_____

13. Welche Gehstrecke legen Sie täglich mit der Prothese etwa zurück?

im Haus _____m draußen _____m

14. Wo benutzen Sie Ihre Prothese zum Gehen?*

□ nur wenn ich beim Arzt oder Orthopädietechniker bin

□ im Haus, aber nicht draußen

□ im Haus, gelegentlich draußen

□ dauerhaft im Haus und draußen

15. Fühlen Sie sich mit Ihrer Prothese im Außenbereich unsicher wenn Sie auf einer ... *

... flachen Oberfläche gehen? □ ja □ nein

... geneigten Oberfläche gehen? □ ja □ nein

... unebenen Oberfläche gehen? □ ja □ nein

16. Welche Hilfsmittel nutzen Sie im Innenbereich wenn Sie die Prothese tragen?

□ keine	□ Rollator	□ Treppenlift
□ manueller Rollstuhl	□ elektrischer Rollstuhl	
□ einen Gehstock	□ zwei Gehstöcke	□ mit mehreren Fußbeinen
□ eine Unterarmstütze	□ zwei Unterarmstützen	□ mit mehreren Fußbeinen
□ sonstige:		

17. Welche Hilfsmittel nutzen Sie im Außenbereich wenn Sie die Prothese tragen?*

□ keine	□ Rollator	□ Treppenlift
□ manueller Rollstuhl	□ elektrischer Rollstuhl	
□ einen Gehstock	□ zwei Gehstöcke	□ mit mehreren Fußbeinen
□ eine Unterarmstütze	□ zwei Unterarmstützen	□ mit mehreren Fußbeinen
□ sonstige:		

18. Gibt es etwas Aktivitäten die Sie mit der Prothese können möchten, die Sie jetzt noch nicht können?

_____

_____

_____

Mobilität (Locomotor Capabilities Index-5)

19. Unabhängig davon, ob Sie Ihre Prothese gerade tragen, würden Sie sagen, dass Sie die folgenden Aktivitäten mit Ihrer Prothese ausführen können?

Aktivität	Nein	Ja, wenn mir jemand hilft	Ja, wenn jemand in meiner Nähe ist	Ja, alleine, mit weiteren Gehhilfen	Ja, alleine, ohne weitere Gehhilfen
Von einem Stuhl aufstehen	□ 0	□ 1	□ 2	□ 3	□ 4
Gehen im Haus	□ 0	□ 1	□ 2	□ 3	□ 4
Außerhalb des Hauses auf ebenem Untergrund gehen	□ 0	□ 1	□ 2	□ 3	□ 4
Treppauf gehen mit Handlauf	□ 0	□ 1	□ 2	□ 3	□ 4
Treppab gehen mit Handlauf	□ 0	□ 1	□ 2	□ 3	□ 4
Den Bordstein zu einem Bürgersteig hinaufgehen	□ 0	□ 1	□ 2	□ 3	□ 4
Den Bordstein eines Bürgersteigs hinuntergehen	□ 0	□ 1	□ 2	□ 3	□ 4
Punktzahl Grundaktivitäten: _____/ 28					
Aus dem Stand mit angelegter Prothese einen Gegenstand vom Boden aufheben	□ 0	□ 1	□ 2	□ 3	□ 4

Vom Fußboden aufstehen (z.B. wenn Sie gestürzt sind)	□ 0	□ 1	□ 2	□ 3	□ 4
Draußen auf unebenem Untergrund gehen	□ 0	□ 1	□ 2	□ 3	□ 4
Draußen bei schlechtem Wetter gehen (z.B. Regen, Schnee, Glatteis)	□ 0	□ 1	□ 2	□ 3	□ 4
Einige Stufen einer Treppe ohne Handlauf hinaufgehen	□ 0	□ 1	□ 2	□ 3	□ 4
Einige Stufen einer Treppe ohne Handlauf hinuntergehen	□ 0	□ 1	□ 2	□ 3	□ 4
Während des Gehens einen Gegenstand tragen	□ 0	□ 1	□ 2	□ 3	□ 4
Punktzahl erweiterte Aktivitäten: _____/ 28					
Gesamtpunktzahl: _____/ 56					

Schmerz

20. Hatten Sie in der letzten Woche Schmerzen in den folgenden Bereichen Ihres Körpers und wenn ja, wie ausgeprägt war der Schmerz?

Schmerz	kein Schmerz	milder Schmerz	mäßiger Schmerz	ernster/starker Schmerz	schlimmstmöglicher Schmerz
Hüftschmerz amputierte Seite	□	□	□	□	□
Hüftschmerz nicht-amputierte Seite	□	□	□	□	□
Rückenschmerz	□	□	□	□	□
Gelenkschmerz im erhaltenem Bein	□	□	□	□	□
Stumpfschmerz	□	□	□	□	□
Phantomschmerz	□	□	□	□	□

Sturz und sturzbedingte Konsequenzen

21. Wie häufig stürzen Sie beim Gehen mit Ihrer Prothese?

□ nie (*weiter mit Frage 23)

□ _____mal □ pro Tag □ pro Woche □ pro Monat □ pro Jahr

22. Wenn Sie stürzen, haben Sie sich jemals dabei verletzt?

□ nein □ ja Wenn ja, was waren die Folgen?

□ Arztbesuche _____ □ Krankenhausaufenthalt: _____ Tage

□ andere: _____

23. Ich würde Ihnen gern einige Fragen darüber stellen, welche Bedenken Sie haben hinzufallen, wenn Sie bestimmte Tätigkeiten ausführen.
Bitte denken Sie noch mal darüber nach wie Sie die Tätigkeiten normalerweise ausführen. Wenn Sie die Aktivität z.Zt. nicht ausführen (z.B. wenn jemand ihren Einkauf erledigt), geben Sie bitte (trotzdem) eine Antwort, um anzuzeigen, ob Sie bedenken hätten zu stürzen, wenn Sie die Aktivität ausführen würden.
Machen Sie bitte die Angabe, die am ehesten ihrem eigenem Empfinden entspricht.

Aktivitäten (FES-I)	keinerlei Bedenken	einige Bedenken	ziemliche Bedenken	sehr große Bedenken	seltenere Ausführung	Vermeidung
Den Hausputz machen	□ 1	□ 2	□ 3	□ 4	□	□
Sich an- oder ausziehen	□ 1	□ 2	□ 3	□ 4	□	□
Einfache Mahlzeiten zubereiten	□ 1	□ 2	□ 3	□ 4	□	□
Ein Bad nehmen oder duschen	□ 1	□ 2	□ 3	□ 4	□	□
In einem Laden einkaufen	□ 1	□ 2	□ 3	□ 4	□	□
Von einem Stuhl aufstehen oder sich hinsetzen	□ 1	□ 2	□ 3	□ 4	□	□
Eine Treppe hinauf- oder hinuntergehen	□ 1	□ 2	□ 3	□ 4	□	□
In der Nähe der Wohnung draußen umhergehen	□ 1	□ 2	□ 3	□ 4	□	□
Etwas erreichen, was sich oberhalb des Kopfes oder auf dem Boden befindet	□ 1	□ 2	□ 3	□ 4	□	□
Das Telefon erreichen bevor es aufhört zu klingeln	□ 1	□ 2	□ 3	□ 4	□	□
Auf einer rutschigen Oberfläche gehen	□ 1	□ 2	□ 3	□ 4	□	□
Einen Freund oder Verwandte besuchen	□ 1	□ 2	□ 3	□ 4	□	□
In einer Menschenmenge umhergehen	□ 1	□ 2	□ 3	□ 4	□	□
Auf unebenem Boden gehen	□ 1	□ 2	□ 3	□ 4	□	□
Eine Steigung hinauf- oder hinunter gehen	□ 1	□ 2	□ 3	□ 4	□	□
Eine Veranstaltung besuchen (z.B. Familientreffen, Gottesdienst, etc.)	□ 1	□ 2	□ 3	□ 4	□	□

<u>Gesundheitsbezogene Lebensqualität</u> (SF-36)

24. Wie würden Sie Ihren Gesundheitszustand im Allgemeinen beschreiben ?

□ 1	□ 2	□ 3	□ 4	□ 5
ausgezeichnet	sehr gut	gut	weniger gut	schlecht

25. Im Vergleich zum vergangenen Jahr, wie würden Sie Ihren derzeitigen Gesundheitszustand beschreiben?

□ 1	□ 2	□ 3	□ 4	□ 5
derzeit viel besser	derzeit etwas besser	etwa wie vor einem Jahr	derzeit etwas schlechter	derzeit viel schlechter

26. Im folgenden sind einige Tätigkeiten beschrieben, die Sie vielleicht an einem normalen Tag ausüben.

Sind Sie durch Ihren derzeitigen Gesundheitszustand bei diesen Tätigkeiten eingeschränkt? Wenn ja, wie stark?

Tätigkeiten	Ja, stark eingeschränkt	Ja, etwas eingeschränkt	Nein, überhaupt nicht eingeschränkt
anstrengende Tätigkeiten, z.B. schnell laufen, schwere Gegenstände heben, anstrengenden Sport treiben	□ 1	□ 2	□ 3
mittelschwere Tätigkeiten, z.B. einen Tisch verschieben, staubsaugen, kegeln, Golf spielen	□ 1	□ 2	□ 3
Einkaufstaschen heben oder tragen	□ 1	□ 2	□ 3
mehrere Treppenabsätze steigen	□ 1	□ 2	□ 3
einen Treppenabsatz steigen	□ 1	□ 2	□ 3
sich beugen, knien, bücken	□ 1	□ 2	□ 3
mehr als 1 Kilometer zu Fuß gehen	□ 1	□ 2	□ 3
mehrere Straßenkreuzungen weit zu Fuß gehen	□ 1	□ 2	□ 3
eine Straßenkreuzung weit zu Fuß gehen	□ 1	□ 2	□ 3
sich baden oder anziehen	□ 1	□ 2	□ 3

27. Hatten Sie in den vergangenen 4 Wochen aufgrund Ihrer *körperlichen* Gesundheit irgendwelche

Schwierigkeiten bei der Arbeit oder anderen alltäglichen Tätigkeiten im Beruf bzw. zu Hause?

Schwierigkeiten	Ja	Nein
Ich konnte nicht so lange wie üblich tätig sein	□ 1	□ 2
Ich habe weniger geschafft als ich wollte	□ 1	□ 2
Ich konnte nur bestimmte Dinge tun	□ 1	□ 2
Ich hatte Schwierigkeiten bei der Ausführung	□ 1	□ 2

28. Hatten Sie in den vergangenen 4 Wochen aufgrund *seelischer* Probleme irgendwelche Schwierigkeiten bei der Arbeit oder anderen alltäglichen Tätigkeiten im Beruf bzw. zu Hause (z.B. weil Sie sich niedergeschlagen oder ängstlich fühlten)?

Schwierigkeiten	Ja	Nein
Ich konnte nicht so lange wie üblich tätig sein	□ 1	□ 2

Ich habe weniger geschafft als ich wollte	□ 1	□ 2
Ich konnte nicht so sorgfältig wie üblich arbeiten	□ 1	□ 2

29. Wie sehr haben Ihre körperliche Gesundheit oder seelischen Probleme in den vergangenen 4 Wochen Ihre normalen Kontakte zu Familienangehörigen, Freunden, Nachbarn oder zum Bekanntenkreis beeinträchtigt?

□ 1	□ 2	□ 3	□ 4	□ 5
überhaupt nicht	etwas	mäßig	ziemlich	schlecht

30. Wie stark waren Ihre Schmerzen in den vergangenen 4 Wochen?

□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
ich hatte keine Schmerzen	sehr leicht	leicht	mäßig	stark	sehr stark

31. Inwieweit haben die Schmerzen Sie in den vergangenen 4 Wochen bei der Ausübung Ihrer Alltagstätigkeiten zu Hause und im Beruf behindert ?

□ 1	□ 2	□ 3	□ 4	□ 5
überhaupt nicht	ein bisschen	mäßig	ziemlich	schlecht

32. In diesen Fragen geht es darum, wie Sie sich fühlen und wie es Ihnen in den vergangenen 4 Wochen gegangen ist. (Bitte kreuzen Sie in jeder Zeile die Zahl an, die Ihrem Befinden am ehesten entspricht).

Wie oft waren Sie in den vergangenen 4 Wochen...

Befinden	immer	meistens	ziemlich oft	manchmal	selten	nie
...voller Schwung?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...sehr nervös?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...so niedergeschlagen, dass Sie nichts aufheitern konnte?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...ruhig und gelassen?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...voller Energie?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...entmutigt und traurig?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...erschöpft?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...glücklich?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6
...müde?	□ 1	□ 2	□ 3	□ 4	□ 5	□ 6

33. Wie häufig haben Ihre körperliche Gesundheit oder seelischen Probleme in den vergangenen 4 Wochen Ihre Kontakte zu anderen Menschen (Besuche bei Freunden, Verwandten usw.) beeinträchtigt?

□ 1	□ 2	□ 3	□ 4	□ 5
immer	meistens	manchmal	selten	nie

34. Inwieweit trifft jede der folgenden Aussagen auf Sie zu?

Aussagen	trifft ganz zu	trifft weitgehend zu	weiß nicht	trifft weitgehend nicht zu	trifft überhaupt nicht zu
Ich scheine etwas leichter als andere krank zu werden	□ 1	□ 2	□ 3	□ 4	□ 5
Ich bin genauso gesund, wie alle anderen, die ich kenne	□ 1	□ 2	□ 3	□ 4	□ 5
Ich erwarte, dass meine Gesundheit nachlässt	□ 1	□ 2	□ 3	□ 4	□ 5
Ich erfreue mich ausgezeichneter Gesundheit	□ 1	□ 2	□ 3	□ 4	□ 5