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Factors Influencing Functional Outcomes and Return-to-Work After Amputation: A review of the literature

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Abstract

PURPOSE—Amputation is a life changing event that can significantly impact an individual's physical and mental well-being. Our objective was to review literature exploring the impact of amputation upon a person's functioning and inclusion in the workplace.

METHODS—Medline, CINAHL, and PsycINFO were searched using keywords related to amputation, employment and community reintegration. Eligible studies were published since 2000 and one of the following study designs: randomized controlled trial, non-randomized controlled trial, retrospective study, prospective study, concurrent cohort study, or cross sectional study. Studies for civilians with amputation as well as service members and Veterans with amputation were considered for inclusion.

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RESULTS—The search identified 995 articles, 25 of which met inclusion/exclusion criteria and were included in the review. While strong evidence for correlations and predictors of outcomes after amputation were limited, multiple factors were identified as contributing to physical functioning and employment after amputation.

CONCLUSIONS—Outcomes after amputation can vary widely with many potentially inter-related factors contributing. The factors identified may also serve to inform the development of interventions aiming to improve functional performance and reintegration after amputation. Furthermore, the review highlights the need for more high quality prospective studies.

Keywords

Amputee; rehabilitation; disability; return-to-work

INTRODUCTION

The experience of an amputation typically has a profound and lasting impact upon an individual's functioning and inclusion. In the United States approximately 2 million individuals have some level of limb amputation [1], with most major amputations performed in the lower extremity (LE) below the knee (transtibial) or above knee (transfemoral), and only 3% involving the upper extremity (UE) [2]. Within a civilian population, amputation is most often necessitated by complications arising from peripheral vascular disease and/or diabetes, but also occurs due to extremity trauma, and in small numbers from cancer or other etiologies [1, 2]. Additionally, approximately 1,700 military service members have experienced trauma related amputation since 2002 due to combat related injuries in Afghanistan and Iraq [3]. The majority of these amputations involve the LE, but may also include UE and/or multiple limb amputations at rates higher than among civilians [4].

Outcomes of Rehabilitation After Amputation

Rehabilitation is generally provided in pre-prosthetic and prosthetic training phases following an amputation. The pre-prosthetic rehabilitation seeks to address limb wound healing, limb strength and range of motion (joint flexibility), and basic mobility without the use of a prosthetic device. Once the residual limb is appropriately healed the individual receives a prosthetic limb and can begin physical rehabilitation to restore function, including as appropriate, an emphasis on walking [5]. In the US, civilians may receive rehabilitation in the inpatient or outpatient setting lasting several weeks to several months after an amputation. For service members with amputation, the rehabilitation process is designed to be holistic, and intensive [6]. Rehabilitation may last a year or longer in order to enable a high level of function at the discontinuation of therapy, supports and services.

Previous research suggests most patients with extremity amputation use a prosthetic device and are able to regain a basic level of physical function [7–9]. Yet disablement over the long term is also a serious concern for persons with an amputation. A study by Mackenzie [10] suggested most patients reported physical and psychosocial functioning deteriorated during 7 years after an amputation to the point that half rated themselves as severely disabled. In addition, persons with an amputation are more likely to develop multiple health

complications over the long term, such as obesity, cardiovascular disease, osteoarthritis, residual limb pain and low back pain [7, 11–16].

Multiple factors likely contribute to an individual's functional status and future decline. Systematic reviews previously suggested a diminished physical capacity and walking ability is more likely in older individuals, those with bilateral amputation(s), more proximal amputation(s), and/or non-traumatic etiologies for the amputation(s) [7, 17]. Additionally, while satisfaction with prosthetic devices utility is relatively high [18, 19], a third to over half may be dissatisfied with the prosthetic limb comfort [18, 20] or report an issue with residual limb skin health [21, 22], and almost all report some type of amputation related pain [15]. These complications can limit use of a prosthetic device for extended period of time and also contribute to a diminished functional status.

A potential consequence of a diminished physical functioning after amputation is a lower rate of return to work (RTW). Previous literature reviews vary on the RTW rate following an amputation, with estimates ranging from 43% – 70% [23, 24]. Whereas among military service members, little more than 10% returned to duty [25]. Unfortunately, the characteristics enabling or inhibiting a RTW are poorly understood.

Exploring factors of functioning, and employment may provide insights to the rehabilitation and community integration of individuals with an amputation. The purpose of this article was to conduct a selective review of literature to explore the impact of amputation and amputation-related factors upon an individual's functioning and inclusion in the workforce. Factors evaluated related to physical functioning, and employment after limb amputation.

METHODS

Articles relevant to employment of adults with major limb loss (an amputation of at least a whole foot or hand) were identified through literature searches of Medline, CINAHL, and PsycINFO databases. The search terms included: amputation, limb loss, employment, return to work, vocation, community reintegration, and others (Table 1). Additional articles were also identified from the works cited in articles obtained during the database searches and review articles on related topics.

The initial group of potential articles was screened based on pre-determined inclusion and exclusion criteria. Studies reporting results for civilians with amputation as well as those focused on service members and Veterans with amputation were eligible for inclusion if the study design was a randomized controlled trial, non-randomized controlled trial, retrospective study, prospective study, concurrent cohort study, or cross sectional study. Literature reviews, qualitative studies, case reports, editorials, dissertations, book chapters and conferences abstracts/proceeding were excluded from the review. Articles were also excluded if published before 2000 or written in language other than English.

The remaining study titles and abstracts were then reviewed by 3 authors (BD, AA, CH) to identify articles reporting correlational or predictive results relating to physical functioning, and employment after amputation. The full-text of the remaining articles were then reviewed and jointly discussed for final inclusion.

RESULTS

A total of 995 articles were identified through the database searches. Of the initial set, 490 were duplicates, or removed due to the publication date or non-English language. Further screening based on inclusion and exclusion criteria netted 95 articles for a full-text review, of which 25 were selected for inclusion in the final review. Articles were grouped for further analysis and discussion according to the following two themes: physical functioning, and employment. The review process is summarized in Figure 1.

Among the articles selected for the review (Table 2), 12 were a retrospective design [25–36], 12 a cross-sectional design [9, 37–47], and 1 a prospective design [10]. Most studies were open to all persons with an amputation, regardless of amputation etiology or level of amputation [27, 36–38, 43–47]. However, some studies did target specific cohorts, such as individuals who experienced a traumatic amputation related to combat operations [25, 26, 28–30, 33, 35, 41] or individuals with upper extremity amputation [9, 31, 34, 40], because of the potential impact of the characteristic on outcomes of interest. Overall, the majority of studies involved samples that were almost exclusively all male and under the age of 40 years.

DISCUSSION

Impact on physical functioning

Consistent with the broader literature, the participants in the studies exhibited functional limitations after the amputation. Device use and complications involving the residual limb were among the factors commonly described for their impact on physical functioning after amputation.

Mobility and Function—Walking distance (i.e., 500 m) can be used as an assessment of overall mobility and an important determinant of health related quality of life[48]. According to a previous literature review, approximately 75% of individuals with a traumatic transtibial (below knee) and 55% with transfemoral (above knee) amputation could walk at least 500 m[24]. However, the current studies revealed only 20–65% could walk 500 m, though the percentage who could was higher among those who returned to employment compared to those who did not[42, 44]. Furthermore, the quality of the walking was impaired as about half used an assistive device (i.e., cane, crutches) to walk[27, 45, 47].

Several studies specifically examined the outcomes of services members with combat related amputation. Among this group, the perception of overall health was good to excellent[41]. Yet, this perception of good health belies conflicting evidence on functional outcomes for service members and Veterans with amputation. Results from the Short Form-36 (SF-36) self-report questionnaire suggest service members were near or within 1-standard deviation of normative ranges for nonamputees after rehabilitation[28] and upwards of 50% partaking in recreation/leisure activities[25, 41]. Others report lower function relative to norms for non-amputees[25, 26], and in individuals with longstanding amputations compared to those with a more recent amputation[41].

Device Use and Satisfaction—The majority of study participants used a prosthetic device in some capacity[9, 26, 27, 34, 36, 41, 44]. Satisfaction with the device fit and/or function was generally high (84%)[37, 41], although <5% of persons with an upper extremity amputation could perform complicated tasks/hold lift objects and 12% found a limb provided no functional benefit[34]. On average the daily use of a device exceeded 8 hours per day[9, 26, 27, 34, 36, 44]. However, using a device for greater than 8 hours occurred less frequently among individuals with an upper extremity amputation than those with lower extremity amputation[9]. Overall comparisons of use and satisfaction based on level of amputation were limited, but evidence suggests those with upper extremity amputation may be less satisfied with the device than those with lower extremity amputation[34].

Potential Complications Impacting Device Use—Pain, residual limb skin health, and socket comfort were several interrelated factors frequently assessed that contribute to the device use. Responses indicated pain occurred occasionally in almost half of the individuals, and constantly in about a quarter of all individuals[34]. Specific types and locations of pain were examined with results indicating 18% to 75% of the individuals experience some degree of phantom and or residual limb pain[27, 30, 38, 41, 43, 45–47] that rated on average as almost 5/10 on a numeric pain rating scale[9]. In addition, pain was not limited to the residual limb, as many as half reported pain in some other bodily location (e.g., low back) [30, 41]. Overall, persons with amputation have more bodily pain than in non-amputees[26] and this pain is significant enough to interfere with the ability to complete daily activities in about 15% of persons with amputation[25].

The occurrence of complications linked to skin health of the residual limb varied widely across studies[27, 36, 41, 44, 45, 47]. The percent reporting a problem ranged from a low of about 18% [45, 47] to as high as 75%[44]. The most prevalent problem assessed was sweating inside the socket, with 67% of Vietnam and 62% of Operation Iraqi Freedom/ Operation Enduring Freedom (OIF/OEF) participants identifying sweating as a problem[41]. In addition, ulceration of the skin, a complication that likely requires the user to forgo wearing a device until the skin heals, was found to have occurred in about a third of individuals with amputation[27].

Problems with socket comfort occurred less frequently among the studies included in the review. Overall, comfort was rated as about a 7/10 (higher number reflects greater comfort) [27, 37] with only about 10% have difficulty wearing a prosthetic device due to poor fit[41, 43]. However, identifying a cause for the difference in socket comfort between studies in the review and other available literature is difficult given the wide variation across studies and the interrelated nature of multiple factors affecting the perception of comfort.

Impact on Employment

Civilian employment rates following an amputation vary significantly within these studies from a low of 48%[30] to a high of 89%[26] post amputation. Among service members, amputation resulted in only 11–13% continuing on activity duty[29, 33], though a study reported 63% of the 52 British soldiers injured in Afghanistan and Iraq remained in military

service 2 years post injury[28]. Various factors were assessed for their relationship with RTW after amputation, including demographic characteristics, physical functioning, and pre-injury vocational history.

Demographics—The relationship between the type and severity of the amputation and employment was inconsistent. For instance, amputation level was shown to be an important indicator of RTW[31, 32, 35, 36, 44], with higher levels of amputation having poorer outcomes[37]. Whereas, Jang et al.[34], compared RTW by occupation and found no statistically significant difference in terms of level of amputation; however there was a greater tendency for return to original occupation when it was at a distal versus proximal site. Furthermore, having a comorbid condition negatively influences RTW[40, 43, 44], as does the number of surgical procedures related to the amputation[32].

The age of the amputee also impacts employment. Being of a younger age at the time of the amputation has a positive relationship to RTW[10, 27, 32, 40, 44]. Whereas, the possibility of returning to employment decreases with age. For older amputees, aging may have a negative impact on their physical limitations. Additionally, recovery time from an amputation can take longer in older individuals, lessening the chances for RTW[44].

Education level is associated with RTW[27, 40, 44]. Higher educational levels are correlated with occupation type and income. Dajpratham et al.,[27] found that amputees with a higher educational level had more job opportunities and had more flexibility in their work schedule. MacKenzie et al.[10], hypothesized education level may also predict an individual's expectations for recovery and their ability to adapt to change.

Psychosocial adjustment to the amputation is related to employment. Individuals with greater adjustment were more likely to be employed[46]. MacKenzie et al.[10], found that work self-efficacy, the belief that an individual will be able to RTW, was one of the most important predictors of RTW. The authors believed individuals with low self-efficacy may disengage from pursuing RTW options as failure is expected. Furthermore, individuals are more like to RTW if psychologically invested and motivated to be involved in the job[10].

Physical Functioning—Assessments of physical functioning and pain at 3 months post-injury are significant predictors of later RTW[10]. Furthermore, reporting a good general health status is a positive predictor of work participation[40]. However, Schoppen et al.[42] found individuals with an amputation perceived their general health as worse than the general population (RAND-3); though those who were working perceived a better health status than those who were not [42]. But, it is not known if poorer health is the consequence or cause of the individuals' being unemployed. Furthermore, despite their poorer health, participants with an amputation had greater job satisfaction than controls (70% vs. 54%) [43].

The relationship between RTW and pain is more complex. MacKenzie et al.[10] found individuals who experienced greater pain early in their recovery were less likely to RTW. Other research did not find a relationship between pain and RTW[27, 38]. Additionally,

Whyte et al.[36] found no direct relationship between employment status and pain, however those who used a prosthesis more had less pain and were more likely to be employed.

Greater prosthetic use is correlated with employment[27, 31, 36, 40, 44]. Although for some, the increased usage of a prosthetic may be more a function of cosmesis at the work site rather than the prosthetic increasing work productivity[40].

Vocational history and workplace accommodation—For those individuals who do RTW it is rarely to their same position. Those who do successfully return to a previous occupation were more likely to have worked at the job longer pre-injury[10] and be office workers, versus more physical jobs such as skilled and manual work[34]. Most often, the individual instead returns to less physically demanding work or requires job modifications[32, 34, 36, 42].

Schoppen et al.[44], reported that among those who were in jobs with a high physical workload, moving to positions with decreased workloads post amputation led to a 100% success rate in maintaining their employment, whereas only 58% of those who returned to their previous positions maintained their employment. A shift toward sedentary clerical assignments was a primary alteration in the job duties reported[36, 40].

The impact of the physical demands of the job and a need for job modification was also apparent among service members with amputation. Approximately 85% of service members with amputation who continued on activity duty returned with a job modification to a less physically demanding role[33]. However, other factors also appear to have a significant role in determining if an individual is found fit for duty. Belisle et al.[29] reported members of the Special Forces, for whom the physical demands can be assumed to be high, were more likely to return to duty, despite no difference in injury severity. Trying to account for these variations, the authors questioned the influence of motivation, resources, or opportunities for special force personnel, relative to other occupations in the military. Krueger et al.[35], studying all service members who obtained an amputation between 2001 and 2011 found that 5% of military personnel were redeployed following an amputation. Those with a higher military rank, an older age at the time of amputation, and a transtibial amputation were more likely to deploy. The authors speculate that more senior personnel may be better able to control their work environment and roles during deployment[35]. Again, members of the Special Forces had a much higher rate of deployment (47%).

Maintaining long-term employment may also be a challenge without workplace intervention[10, 36, 44]. Sinha et al.[47], found 80% of those with amputation who were unemployed attributed their unemployment directly to their amputation. Schoppen et al.[44], found that 34% of individuals who had dropped out of the workforce stated they would have worked longer if workplace accommodations had been made, while 30% of individuals currently working desired additional workplace modifications. Furthermore, the majority of amputees believe they have limitations performing their job[10], making ongoing workplace accommodation evaluations necessary for job tenure[42]. Not surprisingly there is also a relationship between insufficient job modifications and reduced job satisfaction[43]. Unfortunately, these workplace difficulties for persons with amputation also appear to

impact upward career mobility. MacKenzie et al.[10], report that 31% of respondents working with an amputation viewed their opportunity for promotion to be less than their coworkers.

Overall, such uncertainty with work can have adverse socio-economic consequences. For instance, Whyte et al.[36], found significant differences in employment status and occupational classification from pre to post-amputation, with the majority of respondents moving from skilled, to semi or unskilled occupations. The finding led the authors to speculate the job changes also results in reductions in pay and social status. Furthermore, working was shown to positively correlate with health-related quality of life[39].

IMPLICATIONS

A review was conducted of the existing literature on the physical health and vocational experience of individuals following a traumatic amputation. While there is some consistency in findings, results also show much variability across studies in the functioning and outcomes of individuals following an amputation.

Factors related to physical functioning were varied and highly interrelated. Nevertheless, in general the evidence strongly indicated that individuals with an amputation will experience a loss of function and an increase in pain. However, the degree of function loss and severity of pain varied among studies and participants. Additionally, the occurrence of other complications such as excessive sweating within the socket, and ulcers on the residual limb differed widely. Prosthesis use also ranged between studies as a function of amputation level and employment. For instance, individuals with a LE amputation tend to use their prosthetic more than those with an UE amputation, while employed individuals have greater prosthetic use than those who are unemployed. Thus, better physical functioning can be facilitated by regularly assessing the utility of the device, an individual's comfort with their prosthesis, the health of residual limb, their level of chronic pain, and the incorporation of pain management techniques.

The employment experience of people with amputations also differed among studies. While the majority of individuals with an amputation will not return to their pre-injury employment, overall RTW rates fluctuated across studies as well as populations (e.g., civilian vs. military populations). The age of the amputee, their level of education, their degree of pain and amputation related complications all impacted RTW.

To better facilitate RTW following an amputation vocational supports may be necessary, and should include a bio-psychosocial holistic appraisal of an individual's circumstances. These services can include RTW models offering access to new employment opportunities, including retraining, education, vocational rehabilitation, and a focus upon less physically demanding occupations. Following an amputation many individuals will have challenges with returning to work. Some will have to modify their job duties or change their jobs entirely. Workplace accommodations and modifications may also be required to increase returning to work and job maintenance/retention. Accommodations should also address any physical issues that may arise post-injury.

There are several limitations that may influence the results of this study. The findings include conclusions based upon cross-sectional studies utilizing individuals of different ages and etiologies. Studies vary in sample size and lack a consistency of measures across concepts making them difficult to compare. Additionally, the research originates from various nations with differing benefit and policy structures that may impact the generalizability of the findings. Thus, the influence of systemic versus individual differences on the findings is unknown, as is the influence of advancements in prosthetic device technology over the review period.

CONCLUSIONS

In summary, physical rehabilitation following a traumatic amputation is a long and complex process. Rehabilitation professionals can play an integral role in recovery after amputation and long-term health management incorporating a bio-psychosocial model is essential toward facilitating the individual's functioning. Furthermore, a need exists for additional research to understand more clearly the experiences of persons with amputation. In particular, research on systems issues such as access to quality healthcare and employment supports; potential disincentives to RTW to include benefits and an uncertain health trajectory should be explored further.

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Figure 1.
Flow diagram for selection of articles included in the review

Table 1

Database search terms

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1. (Amput* OR Limb loss) AND Employment
 2. (Amput* OR Limb loss) AND (Community Reintegration OR Community Adjustment)
 3. (Amput* OR Limb loss) AND (Return to work OR Vocation* OR Job)
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Table 2

Summary of articles included in review

Reference	Study Design (n)	Etiology	Relevant Findings
Belisle, 2013	Retrospective (n=1,221)	Upper and lower limb trauma (Combat)	<ul style="list-style-type: none"> 11% of US service members return to duty (RTD) Special Forces personnel were more likely to RTD despite similar injury severity
Dajpratham, 2008	Retrospective (n=309)	Lower limb trauma, dysvascular disease, and congenital deficiency	<ul style="list-style-type: none"> Higher RTW associated with blast injury and congenital deficiency, higher education level, younger age at time of amputation, and at least satisfactory comfort while wearing a prosthesis
Dharm-Datta, 2011	Retrospective (n=52)	Upper and lower limb trauma (combat)	<ul style="list-style-type: none"> 63% of UK service members RTW Physical health perceived as improved with rehabilitation
Dougherty, 2003	Retrospective (n=46)	Lower limb trauma (combat)	<ul style="list-style-type: none"> 89% were/had been employed since the amputation 87% wore a prosthesis on average of 13.5h/day Greater overall health disability perceived
Doukas, 2013	Retrospective (n= 113 with amputation)	Lower limb trauma (combat)	<ul style="list-style-type: none"> 43% of US service members with unilateral amputation RTW/RTD but contralateral limb amputation or injury decreased the RTW/RTD Overall function rated lower than population norms but higher than those with limb reconstruction
Ebrahmimzadeh, 2007	Retrospective (n=27)	Lower limb trauma (combat)	<ul style="list-style-type: none"> 48% of the Iranians RTW 33–44% reported pain in the residual limb, back and the contralateral knee 40% had phantom sensations
Fernandez, 2000	Retrospective (n=43)	Upper limb trauma	<ul style="list-style-type: none"> 51% of the patients RTW RTW higher among those retaining the elbow and in those using a prostheses Healthcare policy can impact the percent who RTW
Fisher, 2003	Cross-sectional (n=100)	Lower limb trauma, dysvascular disease, and tumor	<ul style="list-style-type: none"> 66% of the patients RTW 68% perceived no change in work productivity Greater mobility, longer time since amputation, and less disability were associated with better work status Age, socket comfort, level/etiology of amputation, work history, and presence of comorbidity were not associated with work status

Reference	Study Design (n)	Etiology	Relevant Findings
Hebert, 2006	Retrospective (n=88)	Lower limb trauma	<ul style="list-style-type: none"> 58% of the sample RTW Amputation level, total costs to Workers Compensation Board, and days of Total Disability (TD) were related with RTW Rehabilitation costs, vocational rehabilitation, work assessment, age, number of surgical procedures, length of acute care, and amputation level related to days of TD Amputation level and gross annual income predicted RTW Age, number of surgical procedures, hospital length of stay, and amputation levels predicted days of TD
Hurley, 2015	Retrospective (n=1,221)	Upper and lower limb trauma (combat)	<ul style="list-style-type: none"> 13% of US service members RTD Virtually all who RTD required a job modification. 56% were determined to be fully disabled
Ide, 2002	Cross-sectional (n=101)	Upper and lower limb trauma, dysvascular disease, and other conditions	<ul style="list-style-type: none"> No association between type of pain or pain severity and RTW High pain severity associated with lower work satisfaction
Jang, 2011	Retrospective n=307	Upper limb amputation cause not specified	<ul style="list-style-type: none"> 69% either changed jobs or became unemployed 80% of respondents used prosthetic for cosmetic purposes Only 30% were "very" or "somewhat satisfied" with their prosthesis and many had difficulties in complex tasks Clerical workers were the most likely to RTW
Johansen, 2016	Cross-sectional (n=77)	Upper limb congenital deficiency	<ul style="list-style-type: none"> Reduced HRQoL on most SF-36 subscales as compared to the general public, including physical functioning, bodily pain, and general health Employment status, comorbidity, and chronic pain negatively impact health related Quality of life (HRQoL)
Krueger, 2014	Retrospective (n=953)	Upper and lower limb trauma (combat)	<ul style="list-style-type: none"> Only 5% of US service members redeployed Transtibial amputation, senior rank/age, and being a member of Special Forces predicted redeployment
MacKenzie, 2006	Prospective (n=124 with amputation)	Lower limb trauma	<ul style="list-style-type: none"> Younger age, Caucasian, higher education, nonsmoker, high self-efficacy, preinjury job tenure, higher job involvement, no litigation were associated with RTW Pain and physical functioning at 3 months predicted RTW

Reference	Study Design (n)	Etiology	Relevant Findings
Postema, 2016	Cross-sectional (n=207)	Upper limb trauma, limb deficiency, and other conditions	<ul style="list-style-type: none"> 57–74% were employed No difference in work productivity among those with amputation and a reference group without amputation Male sex, younger age, medium/high education level, prosthesis use, and good health predicted work participation Work productivity inversely related to musculoskeletal pain
Raichle, 2008	Cross-sectional (n= 752)	Upper and lower limb trauma, dysvascular disease, tumor, infection congenital deficiency, and other conditions	<ul style="list-style-type: none"> Participants with LE amputation more likely to use prosthetic than those with UE amputation Younger age, employment, marriage, distal amputation level, traumatic amputation, and absence of phantom limb pain associated with prosthetic use were associated with greater daily use
Reiber, 2010	Cross-sectional (n=581)	Upper and lower trauma (combat)	<ul style="list-style-type: none"> 71% of Vietnam Veterans and 86% of OEF/OIF Veterans rate health status as good or better 78% of Vietnam Veterans and 91% of OEF/OIF Veterans use a prosthetic device
Schoppen, 2002	Cross-sectional (n=144)	Lower limb trauma, dysvascular disease, tumor, and other conditions	<ul style="list-style-type: none"> A desire for job modifications and the presence of comorbidities were associated with job dissatisfaction Those with amputation reported worse physical health than the reference group Nevertheless, individuals with amputations had greater job satisfaction than a reference group without amputation
Schoppen, 2001	Cross-sectional (n=322)	Lower limb trauma, dysvascular disease, tumor, and other conditions	<ul style="list-style-type: none"> 79% of participants RTW Age at time of amputation, comfort of prosthesis, and higher education level predicted RTW Those in physically demanding jobs who changed jobs were more successful in RTW than those who tried to stay in the same job
Schoppen, 2001	Cross-sectional (n=652)	Lower limb trauma, dysvascular disease, tumor, and other conditions	<ul style="list-style-type: none"> 64% of the participants RTW Those with amputation shifted to less demanding work On average 2.3 years passed between amputation and a RTW Participants had concerns about lack of promotions and accommodations Those who quit working reported worse health than those who worked
Sinha, 2011	Cross-sectional (n=605)	Lower limb trauma, dysvascular disease, and other conditions	<ul style="list-style-type: none"> HRQoL was lower compared to the general population

Reference	Study Design (n)	Etiology	Relevant Findings
			<ul style="list-style-type: none"> • Employment status, assistive device use, prosthetic use, comorbidities, phantom and residual stump pain predicted HRQoL
Sinha, 2014	Cross-sectional (n=368)	Lower limb trauma, dysvascular disease, tumor, and other conditions	<ul style="list-style-type: none"> • Participants were generally satisfied with their prosthetic and not limited with functional or social activities, except athletics • Not using an assistive device or having phantom limb pain, and greater daily use of a prosthesis were associated with greater satisfaction • Younger age, RTW, higher daily use, and absence of assistive device use were most strongly associated with better adjustment to the amputation and prosthesis
Sinha, 2014	Cross-sectional (n=368)	Lower limb trauma, dysvascular disease, tumor, and other conditions	<ul style="list-style-type: none"> • Absence of comorbidity and residual stump pain, being employed, younger age, less functional restriction, greater adjustment, increased social support and less restriction in athletic activity were associated with higher physical function scores • Absence of comorbidity and phantom limb pain, nonuse of assistive device, greater adjustment, increased social support and less functional restrictions were associated with higher mental function scores
Whyte, 2002	Retrospective (n=315)	Upper and lower limb trauma, dysvascular disease, illness, and tumor	<ul style="list-style-type: none"> • Few participants make use of available services and when used few were reported as helpful • 75% of the participants were employed prior to amputation but only 43% RTW after the amputation • Changes in work occupation occurred frequently; most often from manual to non-manual type work • Higher phantom pain intensity and daily prosthetic limb use were associated with employment status