Original Article

Affective Distress and Amputation-Related Pain Among Older Men with Long-Term, Traumatic Limb Amputations

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Abstract
*Psychological distress and postamputation pain were investigated in a sample of 582 males
with long-term limb amputations (mean time since amputation 639.3 months, standard
deviation 166.1; range 240–784 months). Prevalence of significant depressive symptoms
(Hospital Anxiety and Depression Scale [HADS]-D score ≥ 8) was 32.0%, and 34.0% of
respondents met the screening criterion for clinical anxiety (HADS-A score ≥ 8). Nearly one
quarter (24.6%) of respondents reported significant post-traumatic psychological stress
symptoms (Impact of Event Scale scores ≥ 35). In total, 87.8% experienced either phantom
or residual limb pain. Affective distress scores differed according to the respondents' type of
pain experience. Respondents who experienced residual limb pain reported significantly
higher affective distress scores than those with no phantom or residual limb pain. Many older
individuals with long-term traumatic limb amputations could benefit from interventions to
ameliorate affective distress and appropriate residual limb pain treatment.   J Pain
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Key Words
Affective distress, amputation, phantom limb pain, residual limb pain, veteran

Introduction

Adaptation to limb amputation involves a variety of evolving physical and psychosocial challenges, such as impairments in physical functioning, prosthesis use, pain, changes in employment status or occupation, and alterations in body image and self-concept.[1,2] Such stressors can challenge the individuals' ability to maintain emotional well-being and may stimulate maladaptive reactions leading to poor

psychosocial adjustment.[3] There is little consensus, however, regarding the prevalence of clinically significant emotional distress following limb amputation, either in the short or longer term. While some studies report elevated prevalences of clinically significant affective disorders among individuals with amputations compared with the general population,[4,5] others do not.[6–8] The issue is complicated by the diversity of methods, instruments, and cut-off criteria used to measure various aspects of affective distress and the varied timing of such assessments.[1,2]

Affective distress among individuals with long-term amputations (>10 years) has rarely been investigated.[2] Rather, the adjustment literature has primarily concentrated on lower extremity amputation for peripheral vascular disease, which is characteristically associated with poor prognosis[9] and thus relatively short follow-up times. Those who sustain traumatic amputations are typically athletically fit and otherwise healthy individuals who have long survival. The circumstances surrounding disease-related amputation clearly differ from those surrounding traumatic amputation, thus limiting the applicability of findings from the analyses of vascular cases to cases of traumatic amputation.[9] Relatively sparse research attention has been directed at the incidence and outcomes of amputation related to trauma; hence little is known about long-term outcomes.[10–12]

Many individuals with amputations experience significant amputation-related pain, which has the potential to negatively affect mobility and quality of life. Pain has been highlighted as a significant risk factor in affective distress in a variety of clinical populations.[13,14] However, the relationship between chronic postamputation pain and affective distress remains unclear. Investigations to date[6,15] have largely focused on associations between phantom pain, i.e., pain in the missing portion of the amputated limb, and emotional distress. For example, Katz and Melazck[15] report that individuals with phantom pain, painless phantom sensations, or no phantom sensations cannot be distinguished in terms of their scores on depression or anxiety inventories. Similarly, Fisher and Hanspal[6] found no association between phantom pain experience and emotional distress. This exclusive emphasis on phantom pain is problematic in light of observed interrelatedness of phantom and residual limb pain experiences (i.e., pain emanating from the residual or remaining portion of the limb). Significant positive relationships between the occurrence, frequency, intensity, and bothersomeness of residual limb pain and phantom limb pain have been identified.[16–18] Thus, failure to consider the influence of residual limb pain in investigations of the associations between postamputation pain and affective distress limits the meaningfulness and interpretability of findings.

To elucidate these issues we investigated the prevalence of psychological distress, phantom, and residual limb pain experiences, and their associations in a sample comprising individuals who had sustained traumatic amputations at least 10 years previously.

Methods

We conducted a cross-sectional survey of members of the British Limbless Ex-Service Men's Association (BLESMA). BLESMA is a national charity dedicated to promotion of the welfare of those who have lost a limb or limbs, one or both eyes, or the use of a limb in any branch of Her Majesty's Forces or Auxiliary Forces. Almost three quarters of BLESMA's 2500 members have acquired amputations. BLESMA published an article outlining the aims of the study in their quarterly magazine, the BLESMAG. Questionnaire packs including cover letters, a copy of the questionnaire, and a stamped, addressed reply envelope were subsequently distributed by post to eligible members. A "reminder" to return completed questionnaires to the BLESMA head office in Essex, was published in the BLESMAG approximately 6 weeks after initial questionnaire distribution. Personalized reminders were not issued to nonresponders due to financial constraints and respondents were not offered incentives for participation. The Ethics Committee of the authors' institution approved the study protocol.

Outcomes Measures

Affective distress was assessed using the Hospital Anxiety and Depression Scale (HADS[19]) and the Impact of Event Scale (IES[20]) (administered as part of a broader study investigating psychosocial adjustment to amputation). The HADS is a 14-item scale designed as a brief assessment of both anxiety and depression in

nonpsychiatric populations.[21] The major advantage of the HADS relates to the exclusion of somatic symptoms of anxiety and depression (such as dizziness, headaches, and insomnia) because of their potential endorsement due to physical rather than psychological states. Items are answered on a 4-point Likert scale (range 0–3). The anxiety and depression subscales each comprise seven items that are summed to give subscale scores ranging from 0 to 21, with higher scores indicating greater levels of anxiety and depression. Zigmond and Snaith[19] recommend that, for the anxiety and depression subscales alike, raw scores of between 8 and 10 identify "mild" cases, 11–14 "moderate" cases, and 15 or greater "severe" cases. The IES is an assessment of post-traumatic psychological distress, which has high sensitivity and specificity in identifying cases of post-traumatic stress disorder.[22,23] The assessment includes 15 items, which form two subscales reflecting two of the core phenomena of traumatic stress: intrusion (B criteria in the Diagnostic and Statistical Manual of Mental Disorders-IV, post-traumatic stress disorder or PTSD diagnosis) and avoidance (C criteria).[24] Total IES scores of 35 are used to identify PTSD caseness.[23,25] Participants were also asked whether or not they experience phantom limb pain and/or residual limb pain.[26]

Participants

Of the questionnaires distributed ($n = 2500$), 22 were returned because the intended recipient was deceased. A total of 1222 questionnaires were returned representing a response rate of 49%, of which 1072 contained sufficient data for analysis. Inclusion criteria for the current analyses include upper and/or lower unilateral or bilateral amputation sustained 10 or more years previously and related to traumatic injury. Of the respondents ($n = 1072$), 366 were excluded because they sustained injuries other than amputation ($n = 120$), had sustained their amputations within the past 10 years ($n = 215$), or had disease-related amputations ($n = 31$).

Of the remaining 706 participants, respondents who did not answer both of the questions requiring them to confirm or deny the experience of phantom and residual limb pain, respectively, were excluded ($n = 106$), as were those for whom information on gender was not provided ($n = 2$). As this sample included just 16 females they were also excluded and analysis was thus limited to a sample of 582 males.

The characteristics of the sample are detailed in Table 1. As indicated, the majority of participants had lower-limb amputations (81.6% [475/582]). The mean age of the sample was 76.7 years (standard deviation [SD] 8.96) and the average time elapsed since amputation was 53.3 years (or 639.30 months, SD 116.13), with a median value of 57 years.

Statistical Analyses

Data were initially analyzed by descriptive statistics. Continuous variables are presented in terms of mean value, SD, and range. Respondents were divided according to their pain experience (i.e., no phantom or residual limb pain, phantom pain alone, residual limb pain alone, or both phantom and residual limb pain). Differences in the demographic and clinical characteristics of the groups were assessed using nonparametric tests (Chi-square test in the case of categorical variables; otherwise, the Kruskal-Wallace test was implemented). Differences in affective distress scores were investigated using univariate analysis of variance (ANOVA). Post hoc comparisons were made using Dunnett's t tests to determine whether each of the pain groups could be distinguished from the no (phantom or residual limb) pain group in terms of the affective distress measures. A $P < 0.05$ level was chosen for statistical significance.

Results

Average scores on the anxiety and depression scales were 5.98 (SD 4.35) and 5.78 (SD 3.82),

Table 1
Sample Characteristics

Characteristic	n	%	Mean (SD)	Range
Cause of amputation				
Active combat	438	75.3		
Training accident	45	7.7		
Other accident	78	13.4		
Other	21	3.6		
Amputation level				
Upper limb	96	16.5		
Lower limb	475	81.6		
Both upper and lower	11	1.9		
Age (years)			76.7 (8.96)	37–92
Time since amputation (years)			53.3 (9.68)	10–65
Prosthesis users	568	92.1		

respectively. Scores ranged from 0 to 20 on both the anxiety and depression subscales. Average scores on the intrusion and avoidance subscales were 11.04 (SD 10.14) and 10.34 (SD 10.20), respectively. Scores ranged from 0 to 38 on the avoidance subscale and from 0 to 35 on the intrusion subscale. Using the authors'[12] suggested cut-off points, almost one-third of respondents (32.0% [186/582]) met the criterion for possible clinical depression, and 34.0% (198/582) met the criterion for possible clinical anxiety. Of these, 20.3% (118/582) reached caseness for "mild" symptoms of depression and 10.0% (58/852) and 1.7% (10/582) were in the ranges representing "moderate" and "severe" symptoms, respectively. For anxiety, 18.4% (107/582) of respondents scored within the mild range, 11.2% (65/582) reported moderate levels of anxiety, and 4.5% (26/582) indicated severe anxiety levels. Overall, 24.6% (143/582) of respondents reported significant post-traumatic psychological stress (i.e., total IES scores ≥ 35).

Seventy-one respondents (12.2%) experienced neither phantom nor residual limb pain. Sixty-one people (10.5%) experienced phantom pain only, whereas 106 people (18.2%) experienced residual limb pain only and 344 people (59.1%) experienced both phantom and residual limb pain. The four pain groups did not differ with respect to age, time since amputation, level of amputation, or current prosthesis use (Table 2).

ANOVA showed that the pain groups differed significantly in depression [$F (3,568) = 7.033, P < 0.001$], anxiety [$F (3,557) = 11.473, P < 0.001$], avoidance [$F (3, 493) = 8.333, P < 0.001$], intrusion [$F (3,479) = 11.320, P < 0.001$], and total IES scores [$F (3,491) = 10.553, P < 0.001$]. Simple contrasts revealed that the residual limb pain only, and the combined phantom and residual limb pain groups could be distinguished from the "no pain" group with respect to intrusion. Only those who experienced both phantom and residual limb pain reported avoidance scores significantly higher than those who experienced no pain. Respondents who reported both phantom and residual limb pain had significantly higher total IES than those with no pain. Each of the pain groups could be distinguished from the no pain group with respect to symptoms of anxiety. There was no significant

difference between the phantom pain only group and the no pain group in terms of average depression scores ($P = 0.211$). However, significant differences emerged between the residual limb pain groups and the no pain group (i.e., residual limb pain only and combined residual and phantom pain). Average scores on each of these measures according to pain category are illustrated in Table 3.

Discussion

This is the first study to provide prevalence data on symptoms of depression, anxiety, and post-traumatic stress disorder and their associations with postamputation pain in a sample comprised exclusively of individuals with long-term traumatic amputations. Consistent with findings based on samples with heterogeneous amputation etiologies and average post-amputation periods of at least 10 years,[27,28] the prevalence of depressive symptomatology in the current sample was elevated compared to the general population. Almost three times as many respondents met the criterion for possible depression when compared to a nonclinical sample broadly representative of UK adults.[29] The proportion of respondents meeting the criterion for anxiety in this sample was similar to that reported by Crawford et al.[29] This is also consistent with previous literature on amputation populations.[6,30] It is clearly of concern that an appreciable proportion of this sample with long-term amputations scored in the range indicative of clinically significant levels of depression and anxiety, as well as significant levels of distressing intrusive and avoidant experiences consistent with a diagnosis of post-traumatic stress disorder. Despite the potential for expression of post-traumatic stress disorder symptoms following amputation and the documented comorbidity between chronic pain and post-traumatic stress disorder,[31,32] the burgeoning literature on post-traumatic stress disorder has not yet extended to amputation specifically.[1] Systematic, long-term prospective studies investigating the risk/protective factors and patterns of expression of such symptoms amongst individuals with amputations are warranted.

In contrast with previous studies,[6,15] the current findings reveal associations between postamputation pain and affective distress.

Table 2
**Demographic and Amputation-Related Characteristics of Respondents with Phantom Limb Pain
Only, Residual Limb Pain Only, Combined Phantom and Residual Limb Pain,
and No Phantom or Residual Limb Pain**

Characteristic	No PLP or RLP ($n = 71$)	Both PLP & RLP ($n = 342$)	PLP only ($n = 61$)	RLP Only ($n = 106$)	Kruskal-Wallace H	χ^2	P-Value
Mean age (SD) years	76.82 (7.36)	76.84 (8.69)	75.59 (8.45)	76.76 (10.92)	7.076		0.070
Mean time since amputation (SD) months	650.09 (99.38)	640.11 (114.49)	633.70 (113.66)	632.13 (132.95)	1.252		0.741
Amputation level							
Upper limb	19 (19.8)	57 (59.4)	11 (11.5)	9 (9.4)			
Lower limb	52 (11.0)	279 (58.7)	49 (10.3)	95 (20.0)			
Both upper and lower	0	8 (72.7)	1 (9.1)	2 (18.2)		11.961	0.064
Prosthesis user							
Yes	67 (12.5)	316 (59.0)	54 (10.1)	99 (18.5)			
No	4 (8.7)	28 (60.8)	7 (15.2)	7 (15.2)		1.844	0.065

Values are n (%) unless otherwise indicated.
PLP = phantom limb pain; RLP = residual limb pain.

Phantom, residual limb pain, and the combination of these pain experiences were differentially associated with emotional distress indicators. Anxiety was higher among all pain groups when compared to those who did not experience either phantom or residual limb pain. It should be noted, however, that the average anxiety score for each of the pain groups was within the normal range. In contrast, only those who experienced both phantom and residual limb pain reported higher avoidance scores and total IES scores than those who had no pain. In addition, both of the residual limb pain groups (but not the phantom pain only group) could be distinguished from the no pain group with respect to intrusion and depressive symptomatology. Reasons for the differential associations between phantom and residual limb pain, and residual limb pain alone, and symptoms of avoidance and total IES scores, respectively, are not clear. It may be that the cognitive, affective, and behavioral components of the combination of these pain conditions place a unique constellation of demands on the individual, serving to maintain and exacerbate post-traumatic stress symptoms. It also may be the case that the combination of these chronic postamputation pain experiences serve as a persistent reminder of the traumatic event triggering an arousal response and, in turn, an avoidance of the cause of the pain.[33]

The association between residual limb pain and affective distress evident here is in keeping with recent analyses suggesting that residual limb pain is a more influential determinant of health-related quality of life and accounts for a greater proportion of pain-related impairment than phantom pain.[34,35] Discrepancies between the current findings and those reported elsewhere[6,15] may relate to differences in sample size and in the distribution of amputation etiologies, and disparities in the incidence of phantom pain. Furthermore, the incidence of residual limb pain in previous studies[6,15] is unknown. Therefore, the possibility that participants did not experience residual

Table 3
Results of ANOVAs for All Groups on Symptoms of Depression, Anxiety, Intrusion, and Avoidance

Measure	F	df	P	No PLP or RLP Mean (SD)	Both PLP & RLP Mean (SD)	RLP Alone Mean (SD)	PLP Alone Mean (SD)
						Group	
HADS anxiety	11.473	3,557	<0.001	3.58 (3.67)	6.72 (4.41)[a]	5.37 (3.99)[a]	5.72 (4.19)[a]
HADS depression	7.033	3,568	<0.001	4.17 (3.58)	6.29 (3.78)[a]	5.63 (3.79)[a]	5.07 (3.76)
IES intrusion	11.320	3,479	<0.001	5.34 (7.31)	12.75 (10.17)[a]	10.37 (10.74)[a]	8.61 (8.91)
IES avoidance	8.333	3,493	<0.001	6.70 (8.82)	12.27 (10.52)[a]	8.43 (9.14)	8.32 (9.70)
IES total score	10.553	3,491	<0.001	12.38 (15.37)	25.10 (19.40)[a]	18.53 (18.54)	17.27 (17.93)

Mean and SD on the anxiety, depression, intrusion, and avoidance scales according to pain group.
PLP = phantom limb pain; RLP = residual limb pain.
[a]Significant post hoc comparisons (the "no pain" group is the reference category).

limb pain cannot be excluded. Residual limb pain has been associated with reductions in prosthesis use and increases in activity restriction,[7] which in turn lead to negative affect.[36] In contrast, a number of researchers suggest that phantom pain has little impact on prosthetic usage[16,37,38] and in the majority of cases is not perceived as significantly disabling.[17,38]

Although not every individual who sustains traumatic amputation will experience clinically significant negative psychological reactions, immediately or in the longer term, those who do may benefit from a comprehensive follow-up service providing specialist physical and psychological support. The key to appropriate delivery of such services lies in recognition of, and action upon, the individual needs of people with amputations. The findings of the present study attest to the fact that adjustment to amputation is complex and long term, highlighting the importance of encompassing the psychosocial components of injury across the continuum of care rather than exclusively in the immediate postamputation period.

The present study provides longer-term data, involving individuals with amputations of similar etiologies and a larger sample size than has hitherto being reported. Nonetheless, some caution is warranted in interpretation of the study findings. First, although a substantial number of respondents met the criteria for clinically significant anxiety, depression, and/or symptoms of post-traumatic psychological distress, the instruments used to measure these constructs are not intended as substantiation of diagnosis, rather they serve as screening measures. Second, the cross-sectional nature of the study precludes any inferences about the temporal relationship between postamputation pain and affective distress. Third, the survey response rate and self-report nature of the design may be a source of bias. Furthermore, the generalizability of the results is limited by the sample: most respondents were Second World War veterans with lower extremity combat-related amputations and all were members of BLESMA. Membership of this support group may be a potential source of bias. Further research is necessary to determine whether these findings generalize to other people with amputations. Finally, we did not obtain data regarding extent and patterns of use of psychosocial services; this is likely to be an important covariate in long-term distress.

In conclusion, this study provides evidence from a relatively large sample of individuals with long-term traumatic amputations. Trauma is an important cause of amputation in young, otherwise healthy adults. In light of the significant disability often associated with amputation, it is important to develop a clearer understanding of the long-term outcomes for these individuals.

Acknowledgments

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