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Depression and Anxiety Symptoms Among Lebanese Lower Limb Traumatic Amputees: Association with Education, Employment, Adjustment to Amputation and Prosthesis Satisfaction

Nour El Hoda Saleh, Fatima Hamiye, Marwa Summaka, Hiba Zein, Rami El Mazbouh, and Ibrahim Naim

Objective: To examine and compare the association between the presence of depression and anxiety symptoms and different sociodemographic and clinical factors including the adjustment to amputation and prosthesis satisfaction among Lebanese individuals with lower limb amputation (LLA). *Method:* This cross-sectional study was conducted between December 2022 and May 2023 among 72 participants with LLA. Participants completed a questionnaire that included

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sociodemographic and clinical variables, the revised Trinity Amputation and Prosthesis Experience Scale (TAPES-R), and the Hopkins Symptom Checklist (HSCL-25). *Result:* Using the HSCL depression and anxiety cut-off, 25% of participants were categorized as having depression symptoms, with unemployment being significantly associated (p-value < .05) with depression. Similarly, 25% were classified as having anxiety symptoms, with both lower education and unemployment (p-value < .05) significantly linked to anxiety. TAPES-R subscales scores exhibited significant differences between non-depressed and depressed, as well as non-anxious and anxious participants (p-value < .05). Correlation analysis demonstrated significant relationship between HSCL scales and TAPES-R subscales; lower scores in adjustment to amputation and prosthesis satisfaction were moderately associated with increased rates of depression (r ranging between –0.331 and –0.500, p-values < .005) and increased rates of anxiety symptoms (r ranging between –0.362 and –0.441, p-values < .002). In addition, higher scores in activity limitation were moderately correlated to increased rates of depression and anxiety ($r = 0.438$ for anxiety and 0.490 for depression; $p < .001$). *Conclusion:* Mental health symptoms are associated with educational level, employment status, and adjustment to amputation and prosthesis satisfaction in Lebanese individuals with LLA. These findings should be considered to achieve optimal prosthetic rehabilitation.

Traumatic amputation is the second most common cause of amputation (Jorge, 2020). It is the result of an accident or an injury leading to the separation of a limb at the level of one or more of the extremities (Jorge, 2020). It can occur as a result of a motor vehicle or farming accident, or the use of power tools or firearms (Jorge, 2020; Talbot et al., 2017). In Lebanon, amputation represents around one-tenth of impairments, and 87% of limb amputations were lower limb amputations with a rate of 1.40 per 10,000 (Yaghi et al., 2012). Lower limb amputation (LLA) affects the functional capacity of the affected limb (Lin et al., 2014) and leads to long-term disability with a major impact on daily life activities (De-Rosende Celeiro et al., 2017; Xu et al., 2011). Individuals with LLA experience restrictions in mobility and community participation, due to appearance, limited social engagement, perceived isolation, and dependency (De-Rosende Celeiro et al., 2017; Raya et al., 2010; Young et al., 2019). Thus, the said trauma decreases the quality of life and increases the risk of depression and anxiety (Madsen et al., 2019; McKechnie & John, 2014; Srivastava & Chaudhury, 2014; Young et al., 2019).

The prevalence of depression and anxiety after traumatic amputation has been presented as 20–63% and 25–57% respectively (McKechnie & John, 2014). Depression has been shown to have a span of many years after amputation (Singh et al., 2009), and it negatively impacts the person's ability to adjust to their amputation (Bragaru et al., 2013; Durmus et al., 2015). Similarly, anxiety symptoms present negative predictors of healing following limb loss (Pedras et al., 2020). The high prevalence of depression and anxiety symptoms was found to be associated with different factors including female gender, young age, low educational level, unemployment, traumatic cause of amputation, and low perceived social support (Hawamdeh et al., 2008; Iqbal et al., 2019). Thus, screening for mental health symptoms and related patient characteristics (i.e. sociodemographic and clinical variables) is valuable for health and rehabilitation professionals to guide prosthetic rehabilitation (Roşca et al., 2021).

Prosthetic fitting and rehabilitation following LLA are essential to regain functionality (De-Rosende Celeiro et al., 2017), thus facilitating the adaptation to the amputation process (Madsen et al., 2019). Successful prosthesis fitting and use is one of the main goals of rehabilitation to attain functional mobility (Webster et al., 2012) and to improve physical performance and independence in daily activities (Nunes et al., 2014; Penn-Barwell, 2011; Silva et al., 2021). Therefore, the selection of an appropriate prosthesis is necessary and usually guided by both cosmetic and functional features (Bekrater-Bodmann, 2020). As such, adjustment and satisfaction with both aspects are considered essential outcomes of prosthetic rehabilitation (Webster et al., 2012). Adjustment to amputation is mainly considered an intricate process entailing physical and psychosocial aspects (Gallagher & Maclachlan, 2004; Murray & Forshaw, 2013), as well as prosthetic satisfaction (Gallagher & Maclachlan, 2004). Higher adjustment and prosthesis satisfaction are regularly interrelated with the amputation itself including the amputation level, residual limb health, frequency of prosthetic use, and prosthesis characteristics (Baars et al., 2018; Bekrater-Bodmann, 2020). On the other hand, the application of a prosthesis earlier after amputation may reduce the resulting mental health symptoms (Roșca et al., 2021), which are also associated with lower physical and psychosocial adjustment to amputation (Webster et al., 2012) and reduced prosthesis satisfaction (Durmus et al., 2015). Consequently, in addition to the necessity of evaluating the adjustment and prosthesis satisfaction in LLA using various questionnaires such as the Trinity Amputation and Prosthesis Experience Scales (TAPES) and the Prosthesis Evaluation Questionnaire (PEQ) (Baars et al., 2018), it is also recommended to screen mental health status (Eskridge et al., 2022), including the levels of depression and anxiety within this population (McKechnie & John, 2014; Pedras et al., 2020) to monitor a successful integration of any prosthesis (Batbaatar et al., 2017; Bekrater-Bodmann, 2020).

Several studies have shown that depression and anxiety are highly prevalent after unsuccessful prosthetic fitting (Luza et al., 2020; Webster et al., 2012). However, no studies have been reported in the Arab world regarding the screening of anxiety and depression among individuals with LLA, its associated factors as well and the relationship between adjustment to amputation and prosthesis satisfaction. Thus, the present study aims to examine and compare the association between the presence of depression and anxiety symptoms and different sociodemographic and clinical factors including psychosocial adjustment to amputation, activity restriction, and prosthesis satisfaction among Lebanese participants with lower limb amputation (LLA).

MATERIALS AND METHODS

Study Design and Participants

This cross-sectional study was conducted between December 2022 and May 2023 at the Health, Rehabilitation, Integration, and Research Center (HRIR). The center is a multidisciplinary rehabilitation center that treats people with disabilities and is composed of three branches located in different regions across Lebanon.

This study was approved by the institutional review board of the Health, Rehabilitation, Integration, and Research Center of Beirut-Lebanon. All procedures were performed following relevant ethical regulations and guidelines reported in the Declaration of Helsinki (Williams, 2008). No remuneration was awarded to the participants for their involvement in the study.

Participants with traumatic unilateral LLA were recruited using convenience sampling from the medical records of the Department of Prosthetics and Orthotics at the center. Inclusion criteria were age 18 years and

older, had undergone prosthesis fitting more than one year ago, and had no comorbidities. Participants with bilateral LLA or with documented cognitive disorders were excluded from the study.

Procedure

A total of 180 eligible participants were informed about the project and its procedure and were invited to participate in the study through telephone interviews. However, only 72 agreed to participate in the study. The participants were requested to complete an electronic informed consent form for their voluntary participation in the study. Once a patient had provided informed consent, he was asked to complete a questionnaire using a web link to the study (Google Forms software), shared via email and WhatsApp. Data collected through the online platform were anonymized and handled confidentially.

Measures

An anonymous online self-administered questionnaire, using "Google Forms" software, was developed. The questionnaire was associated with a cover letter on the purpose of the study, its procedure, and the expected duration to complete the survey. The questionnaire included sociodemographic information (age, marital status, educational level, and employment status), injury and prosthesis characteristics (time since amputation, level of amputation, time with current prosthesis, and prosthesis use), the Arabic version of the revised Trinity Amputation and Prosthesis Experience Scale (TAPES-R), and Hopkins Symptom Checklist Arabic (HSCL-25).

The Arabic Version of the Revised Trinity Amputation and Prosthesis Experience Scale (TAPES-R)

The TAPES-R is a self-administered multidimensional questionnaire evaluating prosthesis satisfaction and psychosocial adjustment to LLA (Gallagher et al., 2010). It consists of three dimensions: psychological adjustment, activity restriction, and prosthesis satisfaction. General adjustment (GA), social adjustment (SA), and adjustment to limitation (AL) are the three subscales that make up the psychosocial adjustment scale Higher scores indicate greater adjustment. Ten items on the activity restriction scale (AR) are scored on a 3-point scale (limited a lot, limited a little, not limited at all) (Gallagher & Maclachlan, 2004). Higher restrictions were linked to higher scores. Aesthetic satisfaction (AS) (three items) and functional satisfaction (FS) (five items) subscales were included in the prosthesis satisfaction subscale. Higher scores were associated with greater prosthesis satisfaction.

TAPES-R has been commonly used for clinical and research purposes and has been translated into different languages with a demonstration of good psychometric properties (Gallagher et al., 2010; Luthi et al., 2020; Topuz et al., 2011). It was translated into Arabic and was demonstrated as a reliable and valid tool to measure the multidimensional adjustment to amputation in LLA; factor analysis showed the same three dimensions of the original TAPES-R, with high Cronbach's α 0.892, 0.894, and 0.873 for the three subscales (Massarweh & Sobuh, 2019).

The Hopkins Symptom Checklist Arabic (HSCL-25)

The HSCL-25 is a brief screening tool for anxiety and depression symptoms. It was originally developed in 1948 (Wider, 1948). It consists of 25 self-reported questions, with four response options ranging from (1"not at all" to 4 "extremely"). The total score was calculated by averaging the 25 items' scores. Therefore, the anxiety symptoms subscale score can be obtained through the first 10 items, and the depression symptoms subscale score over the last 15 items. The HSCL-25

has been translated and validated in different languages and populations (Nabbe et al., 2021). The Arabic version was developed and validated in the Lebanese population (Fares et al., 2021; Mahfoud et al., 2013), and has demonstrated a cutoff of 2.1 for the depression subscale and 2 for the anxiety subscale (Fares et al., 2021).

Statistical Analysis

Data from "Google Forms" were extracted using an Excel spreadsheet and exported to IBM SPSS version 26 for analysis. First, descriptive statistics were calculated for all variables. Means and standard deviations were presented for continuous variables, whereas frequencies were used for categorical variables. To represent the different sociodemographic, amputation, and prosthesis-related characteristics and scores of the TAPES-R subscales in terms of anxiety and depression, the sample was divided into anxiety and non-anxiety groups, and depression and non-depression groups, based on the cut-off value of the HSCL-25 subscales. Chi-square tests and odds ratios were calculated to assess the association between the given variables. Pearson's correlation was used to assess the association between the TAPES-R subscale scores and the HSCL depression and HSCL anxiety scores. Statistical significance was set at $p < .05$.

RESULTS

Participant's Characteristics

A total of seventy-two males with LLA agreed to participate in the study and provided their informed consent, and they were included in this study. The mean age was 39.361 ± 12.136 years (range 22–68 years). 87% of the participants were married, 54.166% were employed, and 79.166% reported having a low educational level (<12 years of education). The time since amputation varied from two to 39 years, with a mean duration of 13.819 years ± 11.099. Of these participants, 70.833% had a below-knee amputation.

Regarding the HSCL-25, the study population had a mean score of 3.680 ± 1.665, with 1.630 ± 0.643 for HSCL-25 anxiety and 1.688 ± 0.617 for HSCL-25 depression respectively. Finally, concerning the participants' scores on the TAPES-R subscales, they scored 3.288 ± 0.612 out of 4 on the GA subscale, 3.361 ± 0.740 out of 4 on the SA subscale, and 2.425 ± 0.829 out of 4 on the AL subscale. For the AR score, the mean score was 0.951 ± 0.571 out of 2. Regarding satisfaction, the mean AS scores were 6.430 ± 1.758 out of 9 and 10.694 ± 2.635 out of 15 for the FS.

Associations Between the Baseline Characteristics of Participants with Lower Limb Amputation and Depression

Table 1 presents the baseline characteristics of participants and depression. Participants were divided into two groups according to depression status defined by the cut-off value of the HSCL depression. 75% ($n = 54$) of the participants were classified in the non-depression group, while 25% ($n = 18$) were classified in the depression group. Chi-square results showed a significant association between employment status and depression (x2 = 4.352, p-value = .037). Noting that unemployed participants were 3.400 times (95% CI 1.039–11.124) more likely to experience depression compared to employed participants.

As for the results of the TAPES-R scale, the scores of the 6 subscales were significantly different across the depressed and non-depressed groups (p-values < .05 for all). Participants in the non-depressed group demonstrated higher levels of positive adjustment, lower levels of activity restriction, and greater satisfaction with the current prosthesis.

TABLE 1. The Baseline Characteristics of Individuals with Lower Limb Amputation in Terms of Depression Status ($N = 72$)

Factors	Depression status		Chi-square test		
	Non-depression group ($n = 54$)	Depression group ($n = 18$)	X^2	p-value	OR[i] (95% confidence Interval)
Age (years)					
18–35	27	7	0.697	.404	
≥36	29	9			
Educational level					
<college	42	15	2.653	.103	
≥college	14	1			
Marital status					
Married	48	15	0.735	.391	
Unmarried	8	1			
Employment status					
Employed	34	5	**4.352**	**.037***	**Reference**
Unemployed	22	11			**3.400 (1.039–11.124)**
Time since amputation					
≤5	15	5	0.950	.622	
6–10	16	6			
≥11	25	5			
Time with current prosthesis					
≤5	46	15	1.295	.255	
6–10	10	1			
Amputation level					
Above knee	13	2	6.136	.189	
Knee level	2	1			
Below knee	40	11			
Ankle level	1	2			
TAPES-R[a]	Mean ± SD[h]			p-value[j]	
GA subscale[b]	3.404 ± 0.556	2.888 ± 0.641		**.002***	
SA subscale[c]	3.479 ± 0.627	2.950 ± 0.959		**.011***	
AL subscale[d]	2.938 ± 0.802	2.279 ± 0.783		**.004***	
AR subscale[e]	0.843 ± 0.547	1.331 ± 0.503		**.002***	
AS subscale[f]	6.732 ± 1.742	5.375 ± 1.408		**.006***	
FS subscale[g]	11.143 ± 2.693	9.125 ± 1.708		**.001***	

[a]Trinity Amputation and Prosthesis Experience Scales—Revised; [b]General Adjustment; [c]Social Adjustment; [d]Adjustment to Limitation; [e]Activity Restriction; [f]Aesthetic Satisfaction; [g]Functional Satisfaction; [h]Standard deviation; [i]Odds Ratio; [j]independent samples test; * p-value < .05 is considered significant.

Associations Between the Baseline Characteristics of Participants with Lower Limb Amputation and Anxiety

Table 2 depicts the baseline characteristics of participants and anxiety. Based on the cut-off value of the HSCL anxiety, 75% ($n = 54$) of the participants were in the non-anxiety group, whereas, 25% ($n = 18$) were in the anxiety group. The results of the chi-square tests showed significant associations between anxiety and educational level, as well as, employment status. Participants with less than 12 years of education demonstrated higher levels of anxiety as compared to the other group (x2 = 3.396,

TABLE 2. The Baseline Characteristics of Individuals with Lower Limb Amputation in Terms of Anxiety Status ($N = 72$)

	Anxiety status		Chi-square test		
Factors	**Non-anxiety group ($n = 54$)**	**anxiety group ($n = 18$)**	**X^2**	***p*-value**	**OR[i] (95% confidence Interval)**
Age (years)					
18–35	26	8	0.074	.785	
≥36	28	10			
Educational level					
<college	40	17	3.396	**.045***	**5.950 (0.724–8.911)**
≥college	14	1			**Reference**
Marital status					
Married	47	16	0.042	.837	
Unmarried	7	2			
Employment status					
Employed	34	5	6.732	**.009***	**Reference**
Unemployed	20	13			**4.420 (1.372–14.241)**
Time since amputation					
≤5	15	5	0.105	.949	
6–10	16	6			
≥11	23	7			
Time with current prosthesis					
≤5	44	17	1.753	.186	
6–10	10	1			
Amputation level					
Above knee	11	4	4.734	.316	
Knee level	1	2			
Below knee	39	12			
Ankle level	3	0			
TAPES-R[a]	Mean±SD [h]			*p*-value [j]	
GA subscale[b]	3.385 ± 0.590	3 ± 0.602		**.020***	
SA subscale[c]	3.433 ± 0.667	3.144 ± 0.915		.153	
AL subscale[d]	2.722 ± 0.777	2.326 ± 0.829		.079	
AR subscale[e]	0.869 ± 0.566	1.200 ± 0.529		**032***	
AS subscale[f]	6.722 ± 1.720	5.556 ± 1.617		**.014***	
FS subscale[g]	11.185 ± 2.556	9.222 ± 2.365		**.005***	

[a]Trinity Amputation and Prosthesis Experience Scales—Revised; [b]General Adjustment; [c]Social Adjustment; [d]Adjustment to Limitation; [e]Activity Restriction; [f]Aesthetic Satisfaction; [g]Functional Satisfaction; [h]Standard deviation; [i]Odds Ratio; [j]independent samples test; * *p*-value < .05 is considered significant.

p-value = .045), with 5.950 times more risk of anxiety (95% CI 0.724–8.911) than those who attended college. Moreover, the risk of anxiety among the unemployed participants was 4.420 times (95% CI 1.372–14.241) higher than in the employed group. Regarding the subscales of the TAPES-R, the participants' scores differed significantly on the GA, AR, AS, and FS subscales (*p*-values < .05).

Correlation Analysis

To assess the correlation between the HSCL-25 and the TAPES-R subscales, a Pearson correlation was calculated. The

TABLE 3. The Correlation Between HSCL-25 and TAPES-R Subscales

	HSCL-25 test [h]	
TAPES-R [a]	HSCL-depression	HSCL-anxiety
GA subscale[b]	r = −0.498, $p < .001$*	r = −0.441, $p < .001$*
SA subscale[c]	r = −0.395, $p = .001$*	r = −0.331, $p < .005$*
AL subscale[d]	r = −0.459, $p < .001$*	r = −0.362, $p < .002$*
AR subscale[e]	r = 0.490, $p < .001$*	r = 0.438, $p < .001$*
AS subscale[f]	r = −0.500, $p < .001$*	r = −0.393, $p < .001$*
FS subscale[g]	r = −0.497, $p < .001$*	r = −0.415, $p < .001$*

[a]Trinity Amputation and Prosthesis Experience Scales—Revised; [b]General Adjustment; [c]Social Adjustment; [d]Adjustment to Limitation; [e]Activity Restriction; [f]Aesthetic Satisfaction; [g]Functional Satisfaction; [h]Hopkins Symptom Checklist-25.
Pearson Correlation; * p-value < .05 is considered significant.

results are shown in Table 3. Statistically significant results were obtained between all the TAPES-R subscales and the HSCL-depression and -anxiety scales (p-values < .005). Negative linear associations were shown between the HSCL scales and the GA, SA, AL, AS, and FS subscales of the TAPES-R (r ranging between −0.331 and −0.500, p-values < .005). On the other hand, positive associations were obtained between the HSCL scales and the AR subscale ($r = 0.438$ for anxiety and 0.490 for depression, p-values < .001).

DISCUSSION

To the best of our knowledge, this study is the first initiative to assess depression and anxiety in a sample of Lebanese participants with LLA. The present study aimed to examine and compare the association between the presence of depression and anxiety symptoms and different sociodemographic and clinical factors including the psychosocial adjustment to amputation, activity restriction, and prosthesis satisfaction among Lebanese participants with lower limb amputation (LLA). Among the study participants with LLA 25% presented depression and anxiety symptoms similarly to several prior studies reporting comparable rates of anxiety and depression after amputation (Atherton & Robertson, 2006; Hawamdeh et al., 2008; McKechnie & John, 2014). Concerning the adjustment to amputation, participants in this study showed very good psychosocial adjustment levels (GA:3.288 ± 0.612 out of 4; SA:3.361 ± 0.740 out of 4; AL:2.425 ± 0.829 out of 4), moderate levels of AR (0.951 ± 0.571 out of 2), and good levels of prosthesis satisfaction (AS:6.430 ± 1.758 out of 9 and FS:10.694 ± 2.635 out of 15), similar to those reported in an earlier study of the French population with LLA (Luthi et al., 2020).

Our findings showed no differences between participants with depression and anxiety in terms of sociodemographic and amputation-related variables; only an association between employment status and depression was demonstrated, as well as between anxiety, educational level, and employment status. Unemployed participants showed greater levels of anxiety and depression, whereas participants with a level of education <12 years presented higher levels of anxiety. In terms of employment, our results are consistent with earlier studies confirming that unemployed amputees reacted with more anxiety and depression (Hawamdeh et al., 2008). For educational level, numerous studies have found that adults with low educational attainment have a

higher prevalence of anxiety and depression (Chazelle et al., 2011; Melkevik et al., 2016).

Regarding time since injury, the findings confirmed the previous results establishing no relationship between time since amputation and psychiatric symptoms (Horgan & MacLachlan, 2004) and contradicted the element that a long time since amputation is associated with a lower prevalence of anxiety and depression (Hawamdeh et al., 2008). Furthermore, the level of amputation also showed no association with the levels of HSCL-25; these results are distinguished from those demonstrating that below-knee amputees had higher levels of depression than above-knee amputees (Hawamdeh et al., 2008), and similar to studies finding no association between above-knee amputation and increased levels of depression (Rybarczyk, 2002) or psychiatric symptoms (Shukla et al., 1982).

In terms of adjustment and satisfaction, participants with depression presented lower psychosocial adjustment (GA:2.888 < 3.404, $p = .002$; SA:2.950 < 3.479, $p = .001$; AL:2.279 < 2.938, $p = .004$), higher AR (1.331 > 0.843, $p = .002$), and lower prosthesis satisfaction (AS:5.375 < 6.732, $p = .006$; FS:9.125 < 11.143, $p = .001$) than the non-depressed group. Similarly, participants with anxiety symptoms presented lower GA (3 < 3.385, $p = .02$), higher AR (1.2 > 0.8, $p = .032$), and lower prosthesis satisfaction (AS:5.556 < 6.722, $p = .014$; FS:9.22 < 11.18, $p = .005$) compared to those with no anxiety symptoms. These findings support prior results confirming the association between depressive symptoms and psychological adaptation (Jo et al., 2021), and those demonstrating the importance of psychological variables in predicting positive adjustment (Unwin et al., 2009). AR results confirm previous studies suggesting that the relationship between disability and depression is influenced by the degree of limitation in performing activities of daily living (Coffey et al., 2009), as well as the proven importance of considering the impact of the psychological aspect of prosthetic use on daily activities (Möller et al., 2018). In addition, a prior study demonstrated that significant improvements in depressive symptoms are associated with improvements in locomotor capabilities (Şen et al., 2020). Prosthesis satisfaction results from earlier studies showed that high prosthesis satisfaction is negatively correlated with psychiatric symptoms (Durmus et al., 2015) and that mental health status is considered one of the factors impacting prosthesis satisfaction (Baars et al., 2018). Altogether, our results support previous studies showing that increased adjustment to limitation and lower activity restriction are correlated with high mental component scores of quality of life (Sinha et al., 2014), and adjustment with prosthesis satisfaction is associated with mental and cognitive performance (Gozaydinoglu et al., 2019).

The study findings showed a significant moderate correlation between all TAPES-R subscales and the HSCL-25, representing a negative correlation between anxiety and depression symptoms and psychosocial adjustment and prosthesis satisfaction and a positive correlation with activity restriction. These findings are consistent with the aforementioned studies (Baars et al., 2018; Durmus et al., 2015; Sinha et al., 2014), and with previously reported studies demonstrating a significant correlation between GA, AR, and global prosthesis satisfaction with depression and SA with anxiety (Luthi et al., 2020).

To date, no studies have been published on depression and anxiety among LLAs in Lebanon. However, the limitations of this study require further investigation. First, considering the lack of population-based records and registries on people with disabilities in Lebanon (Summaka et al., 2021), as well as the lack of studies targeting Lebanese people with amputation; the small sample size and the cross-sectional design restricts the confirmation of various factors that could affect the adjustment process and prosthesis satisfaction and limits the establishment of possible differences that may be elicited due to sociodemographic variables, level of amputation, or time since amputation. Second, a notable limitation is the relatively low

participation rate, with 72 out of 180 eligible participants agreeing to take part in the study; this may be justified by the unique characteristics of the target population and the online data collection method used during the study. In addition, this limitation may be due to the fact that discussing mental health is considered culturally taboo in Lebanon (Abi Hana et al., 2022). In addition, the variation in age and duration since amputation between the participants might have influenced our findings. Hence, since the inclusion criteria addressed traumatic amputees, it is reasonable that all of the participants were male, therefore, this characteristic may be considered a limitation, but it may reflect a homogeneous group of individuals in the study. Finally, self-reported data collected through an online survey suggested the probability that responses may be prejudiced by participants' personal and social characteristics.

For instance, the present study confirms the existing literature and provides evidence for the necessity of incorporating mental health screening and intervention during prosthetic rehabilitation to support better adjustment and satisfaction. This study will, therefore, prompt mental health professionals to normalize people with LLA emotional responses to amputation to improve their psychosocial adjustment and satisfaction. It expands on the notable information concerning the mental health status of Lebanese individuals with LLA and its association with adjustment and prosthesis satisfaction. In addition, the findings of this study emphasize the necessity of implementing educational programs and vocational rehabilitation for individuals with LLA to promote their mental health and their adjustment to amputation. This can be conceived as a preliminary exploratory resource for future studies that target this population. Future studies should be carried out with a larger sample of amputees, including a detailed emphasis on the type and use of the prosthesis, and a homogeneous sample of sociodemographic and amputation-related variables.

As a conclusion, the present study contributes to a greater understanding of the impact of mental health status on psychosocial adjustment to amputation as well as prosthesis satisfaction. These findings highlight the importance of promoting mental health assessments and interventions for people with lower limb amputations undergoing prosthetic rehabilitation. Educational programs and employment of people with LLA must be integrated into rehabilitation goals to ensure improved mental and physical health.

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The associated data could be available at a reasonable request from scientists by sending an email to the corresponding author nourelhoda.saleh.1@ul.edu.lb.

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REFERENCES

Abi Hana, R., Arnous, M., Heim, E., Aesch limann, A., Koschorke, M., Hamadeh, R. S., Thornicroft, G., Kohrt, B. A., Sijbrandij, M., Cuijpers, P., & El-Chammay, R. (2022). Mental health stigma at primary health care centres in Lebanon: Qualitative study. *International Journal of Mental Health Systems*, *16*(1), 23. https://doi.org/10.1186/s13033-022-00533-y

Atherton, R., & Robertson, N. (2006). Psychological adjustment to lower limb amputation amongst prosthesis users. *Disability & Rehabilitation*, *28*(19), 1201–1209. https://doi.org/10.1080/09638280600551674

Baars, E. C., Schrier, E., Dijkstra, P. U., & Geertzen, J. H. B. (2018). Prosthesis satisfaction in lower limb amputees: A systematic review of associated factors and questionnaires. *Medicine (Baltimore)*, *97*(39), e12296. https://doi.org/10.1097/md.0000000000012296

Batbaatar, E., Dorjdagva, J., Luvsannyam, A., Savino, M. M., & Amenta, P. (2017). Determinants of patient satisfaction: A systematic review. *Perspectives in Public Health*, *137*(2), 89–101. https://doi.org/10.1177/1757913916634136

Bekrater-Bodmann, R. (2020). Factors associated with prosthesis embodiment and its importance for prosthetic satisfaction in lower limb amputees. *Frontiers in Neurorobotics*, *14*. https://doi.org/10.3389/fnbot.2020.604376

Bragaru, M., van Wilgen, C. P., Geertzen, J. H., Ruijs, S. G., Dijkstra, P. U., Dekker, R., & DiRusso, F. (2013). Barriers and facilitators of participation in sports: A qualitative study on Dutch individuals with lower limb amputation. *PLoS One*, *8*(3), e59881. https://doi.org/10.1371/journal.pone.0059881

Chazelle, E., Lemogne, C., Morgan, K., Kelle her, C. C., Chastang, J. F., & Niedhammer, I. (2011). Explanations of educational differences in major depression and generalised anxiety disorder in the Irish population. *Journal of Affective Disorders*, *134*(1–3), 304–314. https://doi.org/10.1016/j.jad.2011.05.049

Coffey, L., Gallagher, P., Horgan, O., Desmond, D., & MacLachlan, M. (2009). Psychosocial adjustment to diabetes-related lower limb amputation. *Diabetic Medicine*, *26*(10), 1063–1067. https://doi.org/10.1111/j.1464-5491.2009.02802.x

De Rosende Celeiro, I., Simón Sanjuán, L., & Santos-Del-Riego, S. (2017). Activities of daily living in people with lower limb amputation: Outcomes of an intervention to reduce dependence in pre-prosthetic phase. *Disability and Rehabilitation*, *39*(18), 1799–1806. https://doi.org/10.1080/09638288.2016.1211757

Durmus, D., Safaz, I., Adıgüzel, E., Uran, A., Sarısoy, G., Goktepe, A. S., & Tan, A. K. (2015). The relationship between prosthesis use, phantom pain and psychiatric symptoms in male traumatic limb amputees. *Comprehensive Psychiatry*, *59*, 45–53. https://doi.org/10.1016/j.comppsych.2014.10.018

Eskridge, S. L., Watrous, J. R., McCabe, C. T., Clouser, M. C., & Galarneau, M. R. (2022). The relationship between self-reported physical functioning, mental health, and quality of life in service members after combat-related lower extremity amputation. *Disability & Rehabilitation*, *44*(13), 3189–3195. https://doi.org/10.1080/09638288.2020.1863481

Fares, S., Dirani, J., & Darwish, H. (2021). Arabic validation of the hopkins symptom checklist-25 (HSCL) in a Lebanese sample of adults and older adults. *Current Psychology*, *40*(6), 2980–2987. https://doi.org/10.1007/s12144-019-00240-x

Gallagher, P., Franchignoni, F., Giordano, A., & MacLachlan, M. (2010). Trinity amputation and prosthesis experience scales: A psychometric assessment using classical test theory and rasch analysis. *American Journal of Physical Medicine & Rehabilitation*, *89*(6), 487–496. https://doi.org/10.1097/PHM.0b013e3181dd8cf1

Gallagher, P., & Maclachlan, M. (2004). The trinity amputation and prosthesis experience scales and quality of life in people with lower-limb amputation. *Archives of Physical Medicine & Rehabilitation*, *85*(5), 730–736. https://doi.org/10.1016/j.apmr.2003.07.009

Gozaydinoglu, S., Hosbay, Z., & Durmaz, H. (2019). Body image perception, compliance with a prosthesis and cognitive performance in

transfemoral amputees. *Acta orthopaedica et traumatologica turcica*, *53*(3), 221–225. https://doi.org/10.1016/j.aott.2019.03.014

Hawamdeh, Z. M., Othman, Y. S., & Ibrahim, A. I. (2008). Assessment of anxiety and depression after lower limb amputation in Jordanian patients. *Neuropsychiatric Disease and Treatment*, *4*(3), 627–633. https://doi.org/10.2147/ndt.s2541

Horgan, O., & MacLachlan, M. (2004). Psychosocial adjustment to lower-limb amputation: a review. *Disability & Rehabilitation*, *26*(14–15), 837–850. https://doi.org/10.1080/09638280410001708869

Iqbal, M., Mohamed, S., & Mohamad, M. (2019). Depression and its associated factors among lower limb amputees at hospital Kuala Lumpur and hospital Sultanah Bahiyah: A cross sectional study. *Journal of Depression and Anxiety*, *8*, 1–9.

Jo, S. H., Kang, S. H., Seo, W. S., Koo, B. H., Kim, H. G., & Yun, S. H. (2021). Psychiatric understanding and treatment of patients with amputations. *Yeungnam University Journal of Medicine*, *38*(3), 194–201. https://doi.org/10.12701/yujm.2021.00990

Jorge, M. (2020). 17 - Etiology of Amputation**The author extends appreciation to Caroline C. Nielsen, whose work in prior editions provided the foundation for this chapter. In K. K. Chui, M. M. Jorge, S.-C. Yen, & M. M. Lusardi (Eds.), *Orthotics and prosthetics in rehabilitation* (4th ed., pp. 432–445). Elsevier. https://doi.org/10.1016/B978-0-323-60913-5.00017-9

Lin, S.-J., Winston, K. D., Mitchell, J., Girlinghouse, J., & Crochet, K. (2014). Physical activity, functional capacity, and step variability during walking in people with lower-limb amputation. *Gait & Posture*, *40*(1), 140–144. https://doi.org/10.1016/j.gaitpost.2014.03.012

Luthi, F., Praz, C., Léger, B., Vouilloz, A., Favre, C., Loiret, I., Paysant, J., Martinet, N., Lacraz, A., Suva, D., Lambert, J., Borens, O., Karatzios, C., & Vuistiner, P. (2020). Cross-cultural adaptation and measurement properties of the French version of the trinity amputation and prosthesis experience scales-revised (TAPES-R). *PLoS One*, *15*(2), e0229084. https://doi.org/10.1371/journal.pone.0229084

Luza, L. P., Ferreira, E. G., Minsky, R. C., Pires, G. K. W., & da Silva, R. (2020). Psychosocial and physical adjustments and prosthesis satisfaction in amputees: A systematic review of observational studies. *Disability and Rehabilitation: Assistive Technology*, *15*(5), 582–589. https://doi.org/10.1080/17483107.2019.1602853

Madsen, U. R., Baath, C., Berthelsen, C. B., & Hommel, A. (2019). Age and health-related quality of life, general self-efficacy, and functional level 12 months following dysvascular major lower limb amputation: A prospective longitudinal study. *Disability and Rehabilitation*, *41*(24), 2900–2909. https://doi.org/10.1080/09638288.2018.1480668

Mahfoud, Z., Kobeissi, L., Peters, T. J., Araya, R., Ghantous, Z., & Khoury, B. (2013). The Arabic validation of the Hopkins symptoms checklist-25 against MINI in a disadvantaged suburb of Beirut, Lebanon. *International Journal Educational Psychological Assessment*, *13*, 17–33.

Massarweh, R., & Sobuh, M. M. (2019). The Arabic version of trinity amputation and prosthetic experience scale-revised (TAPES-R) for lower limb amputees: Reliability and validity. *Disability, CBR & Inclusive Development*, *30*(1), 44–56. https://doi.org/10.5463/dcid.v30i1.718

McKechnie, P. S., & John, A. (2014). Anxiety and depression following traumatic limb amputation: A systematic review. *Injury*, *45*(12), 1859–1866. https://doi.org/10.1016/j.injury.2014.09.015

Melkevik, O., Hauge, L. J., Bendtsen, P., Reneflot, A., Mykletun, A., & Aarø, L. E. (2016). Associations between delayed completion of high school and educational attainment and symptom levels of anxiety and depression in adulthood. *BMC Psychiatry*, *16*(1), 64. https://doi.org/10.1186/s12888-016-0765-1

Möller, S., Hagberg, K., Samulesson, K., & Ramstrand, N. (2018). Perceived self-efficacy and specific self-reported outcomes in persons with lower-limb amputation using a non-microprocessor-controlled versus a microprocessor-controlled prosthetic knee. *Disability and Rehabilitation Assistive Technology*, *13*(3), 220–225. https://doi.org/10.1080/17483107.2017.1306590

Murray, C. D., & Forshaw, M. J. (2013). The experience of amputation and prosthesis use for adults: A metasynthesis. *Disability & Rehabilitation*, *35*(14), 1133–1142. https://doi.org/10.3109/09638288.2012.723790

Nabbe, P., Le Reste, J. Y., Guillou-Landreat, M., Assenova, R., Kasuba Lazic, D., Czachowski, S., Stojanović-Špehar, S., Hasanagic, M., Ling ner, H., Clavería, A., Rodríguez-Barragán, M., Sowinska, A., Argyriadou, S., Lygidakis, C., Le Floch, B., Montier, T., Van Marwijk, H., & Van Royen, P. (2021). Nine forward-backward translations of the Hopkins symptom checklist-25 with cultural checks. *Frontiers in Psychiatry*, *12*, 688154. https://doi.org/10.3389/fpsyt.2021.688154

Nunes, M., Campos-Neto, I., Ferraz, L., Lima, C., Rocha, T., & Rocha, T. (2014). Adaptation to prostheses among patients with major lower-limb amputations and its association with sociodemographic and clinical data. *Sao Paulo Medical Journal*, *132*(2), 80–84. https://doi.org/10.1590/1516-3180.2014.1322572

Pedras, S., Meira-Machado, L., Couto de Carvalho, A., Carvalho, R., & Pereira, M. G. (2020). Anxiety and/or depression: Which symptoms contribute to adverse clinical outcomes after amputation? *Journal of Mental Health*, *31*(6), 1–9. https://doi.org/10.1080/09638237.2020.1836554

Penn-Barwell, J. G. (2011). Outcomes in lower limb amputation following trauma: A systematic review and meta-analysis. *Injury*, *42*(12), 1474–1479. https://doi.org/10.1016/j.injury.2011.07.005

Raya, M. A., Gailey, R. S., Fiebert, I. M., & Roach, K. E. (2010). Impairment variables predicting activity limitation in individuals with lower limb amputation. *Prosthetics and Orthotics International*, *34*(1), 73–84. https://doi.org/10.3109/03093640903585008

Roșca, A. C., Baciu, C. C., Burtăverde, V., & Mateizer, A. (2021). Psychological consequences in patients with amputation of a limb. An interpretative-phenomenological analysis [original research]. *Frontiers in Psychology*, *12*, 12. https://doi.org/10.3389/fpsyg.2021.537493

Rybarczyk, B. (2002). The role of perceived vulnerability in adjustment to lower extremity amputation: A preliminary investigation. *Rehabilitation Psychology*, *47*, 92–105. https://doi.org/10.1037/0090-5550.47.1.92

Şen, E., Aydın, T., Buğdaycı, D., & Kesiktaş, F. N. (2020). Effects of microprocessor-controlled prosthetic knees on self-reported mobility, quality of life, and psychological states in patients with transfemoral amputations. *Acta orthopaedica et traumatologica turcica*, *54*(5), 502–506. https://doi.org/10.5152/j.aott.2020.19269

Shukla, G. D., Sahu, S. C., Tripathi, R. P., & Gupta, D. K. (1982). A psychiatric study of amputees. *The British Journal of Psychiatry*, *141*(1), 50–53. https://doi.org/10.1192/bjp.141.1.50

Silva, A. D. M., Furtado, G., dos Santos, I. P., da Silva, C. B., Caldas, L. R., Bernardes, K. O., & Ferraz, D. D. (2021). Functional capacity of elderly with lower-limb amputation after prosthesis rehabilitation: A longitudinal study. *Disability and Rehabilitation: Assistive Technology*, *16*(5), 556–560. https://doi.org/10.1080/17483107.2019.1684581

Singh, R., Ripley, D., Pentland, B., Todd, I., Hunter, J., Hutton, L., & Philip, A. (2009). Depression and anxiety symptoms after lower limb amputation: The rise and fall. *Clinical Rehabilitation*, *23*(3), 281–286. https://doi.org/10.1177/0269215508094710

Sinha, R., van den Heuvel, W. J., Arokiasamy, P., & van Dijk, J. P. (2014). Influence of adjustments to amputation and artificial limb on quality of life in patients following lower limb amputation. *International Journal of Rehabilitation Research*, *37*(1), 74–79. https://doi.org/10.1097/mrr.0000000000000038

Srivastava, K., & Chaudhury, S. (2014). Rehabilitation after amputation: Psychotherapeutic intervention module in Indian scenario. *Scientific World Journal*, *2014*, 469385. https://doi.org/10.1155/2014/469385

Summaka, M., Zein, H., Naim, I., & Fneish, S. (2021). Assessing the psychological impact of COVID-19 outbreak and its related factors on Lebanese individuals with physical disabilities. *Disability and Health Journal*, *14*(3), 101073. https://doi.org/10.1016/j.dhjo.2021.101073

Talbot, L. A., Brede, E., & Metter, E. J. (2017). Psychological and physical health in military amputees during rehabilitation: Secondary analysis

of a randomized controlled trial. *Military Medicine*, *182*(5), e1619–e1624. https://doi.org/10.7205/milmed-d-16-00328

Topuz, S., Ülger, Ö., Yakut, Y., & Gül Şener, F. (2011). Reliability and construct validity of the Turkish version of the trinity amputation and prosthetic experience scales (TAPES) in lower limb amputees. *Prosthetics and Orthotics International*, *35*(2), 201–206. https://doi.org/10.1177/0309364611407678

Unwin, J., Kacperek, L., & Clarke, C. (2009). A prospective study of positive adjustment to lower limb amputation. *Clinical Rehabilitation*, *23*(11), 1044–1050. https://doi.org/10.1177/0269215509339001

Webster, J. B., Hakimi, K. N., Williams, R. M., Turner, A. P., Norvell, D. C., & Czerniecki, J. M. (2012). Prosthetic fitting, use, and satisfaction following lower-limb amputation: A prospective study. *Journal of Rehabilitation Research and Development*, *49*(10), 1453–1504. https://doi.org/10.1682/JRRD.2012.01.0001

Wider, A. (1948). *Cornell index and manual*. Psychological Corporation.

Williams, J. R. (2008). The declaration of Helsinki and public health. *Bulletin of the World Health Organization*, *86*(8), 650–652. https://doi.org/10.2471/blt.08.050955

Xu, J., Kohler, F., & Dickson, H. (2011). Systematic review of concepts measured in individuals with lower limb amputation using the international classification of functioning, disability and health as a reference. *Prosthetics and Orthotics International*, *35*(3), 262–268. https://doi.org/10.1177/0309364611412821

Yaghi, K., Yaghi, Y., McDonald, A. A., Yadegarfar, G., Cecil, E., Seidl, J., Dubois, E., Rawaf, S., & Majeed, A. (2012). Diabetes or war? Incidence of and indications for limb amputation in Lebanon, 2007. *Eastern Mediterranean Health Journal*, *18*(12), 1178–1186. https://doi.org/10.26719/2012.18.12.1178

Young, M., McKay, C., Williams, S., Rouse, P., & Bilzon, J. L. (2019). Time-related changes in quality of life in persons with lower limb amputation or spinal cord injury: Protocol for a systematic review. *Systematic Reviews*, *8*(1), 1–6. https://doi.org/10.1186/s13643-019-1108-3