Personality traits and psychosocial adjustment in patients with limb amputation

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Abstract

Purpose: The aim of this cross-sectional study was to examine the relationship between psychosocial adjustment and personality traits since research regarding psychosocial adjustment and variables that influence adjustment in patients with limb amputation is relatively scarce.

Methods: There were 63 (81% male) participants in this study. The sample consisted of 51 men and 12 women between the ages of 27 and 86 ($M = 56.63$, $SD = 13.35$). The Next Big Five Inventory was used to assess personality traits and The Trinity Amputation and Prosthesis Experience Scales – Revised was used to measure psychosocial adjustment (general adjustment, social adjustment and adjustment to limitation).

Results: Extraversion was positively and negative emotionality negatively associated with general adjustment. No significant associations were found between social adjustment and personality traits. Extraversion, agreeableness and open-mindedness correlated positively with adjustment to limitation. Similar pattern of associations was found between personality facets and general adjustment and adjustment to limitation. Results of the regression analyses indicate negative emotionality facet depression as a negative predictor of general adjustment, and agreeableness facet trust as a positive predictor of adjustment to limitations.

Conclusions: Results indicate that personality traits are associated with psychosocial adjustment in patients with limb amputation. Since this finding can be useful for adaptation to amputation, further research in larger samples is needed.

Key words: psychosocial adjustment, limb loss, coping, amputation, personality traits

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1. Introduction

Limb loss brings a number of physical and psychosocial challenges to an individual, including changes in body image and self-perception, difficulties in physical functioning, use of prosthesis and various types of pain (Desmond & MacLachlan, 2006). In addition, some economic changes (loss of employment, change of profession) and changes in lifestyle are possible. Many individuals function well, but some individuals who have undergone amputation experience clinically significant psychological and social problems, such as anxiety and traumatic stress symptoms (Pedras et al., 2018), depression and post-traumatic stress disorder (Sahu et al., 2016). The term amputation indicates partial or complete surgical removal of a part of the body, most often done in order to save the patient's life. In most cases, amputations are done on the upper or lower extremities. After rehabilitation, when patients regain strength and develop security as far as the physical aspect of amputation is concerned, their focus shifts to dealing with limb loss emotionally and mentally (Gallagher & MacLachlan, 2000). The causes of amputation are most often divided into three groups. Amputations are in most cases the result of vascular problems and chronic diseases (diabetes, peripheral vascular disease and cancer) and mostly affect the elderly. The second, smaller group mostly includes the younger, active population for whom amputation is a consequence of an accident or a trauma. The last group, whose incidence is the lowest of all three groups, includes people who had an amputation due to congenital anomalies (Kovač et al., 2015). Horgan and MacLachlan (2004) classified the factors influencing psychosocial adjustment into three groups. The first relates to factors closely related to amputation such as the level and cause of amputation, the time elapsed since amputation, prosthesis satisfaction, and residual and phantom pain. The second group includes some sociodemographic factors such as gender, age, marital status, economic situation and social support. Studies have found that age and gender were mostly unrelated to the psychosocial adjustment to amputation and life with the prosthesis (Behel et al., 2002; Rybarczyk et al., 1992; Shukla et al., 1982). The third group includes coping strategies and personality traits. Among the aforementioned factors, the time elapsed since amputation, the level of amputation, social support, prosthesis satisfaction and problem-focused coping strategies have been shown as important for predicting a more successful adaptation to amputation and life with the prosthesis. In addition, determination, perseverance, positive thinking, downward social comparison, perceiving amputation as a challenge, and valuable character-building experience were also found to be associated with better adjustment (Gallagher et al., 2008). Personality traits affect many aspects of a person's life. They affect how people behave, how they experience the world around them, and how they react to the circumstances they face. In line with that, meta-analyses have shown that personality traits are associated with resilience (Oshio et al., 2018) and coping (Connor-Smith & Flachsbart, 2007). In addition, it has been shown that personality traits, especially neuroticism, are associated with psychosocial adjustment for post burn injury patients (Klinge et al., 2009). Personality traits that were mainly examined in amputees were perceived control, optimism, depression, and anxiety (Srivastava et al., 2010), and when personality traits were examined, it was done without using a five-factor personality framework (Soto & John, 2017). To our knowledge, there is little to no research dealing with the characteristics of the Big Five in predicting or examining the association with adjustment in amputees. Considering the relevance of this topic and the lack of research, the aim of this study was to examine how personality traits are associated with psychosocial adjustment of people who have experienced amputation. Our first hypothesis was that people with higher scores on extraversion, agreeableness, conscientiousness and open mindedness will have better psychosocial adjustment and people with higher scores on negative emotionality will have worse psychosocial adjustment. We examined the associations with personality facets as well, since the pattern of associations with psychosocial adjustment might be different for different specific personality traits that describe a broad personality factor. In addition, examining the associations with specific personality traits can give more information about which individual differences in personality are more important for psychosocial adjustment of amputees.

This part of our study was exploratory so we did not have any specific hypotheses about which personality facets will be associated with psychosocial adjustment.

2. Methods

2.1. Measures

Psychosocial adjustment. Psychosocial adjustment was measured with three subscales from *The Trinity Amputation and Prosthesis Experience Scales – Revised* (TAPES-R; Gallagher & MacLachlan, 2000). The scale was translated to Croatian for the purpose of this study using the double translation method. TAPES-R is a multidimensional questionnaire that examines psychosocial processes in adaptation to amputation and life with prosthesis. The questionnaire includes a set of demographic questions (age, gender) and questions about amputation: time elapsed since the amputation, first time using the prosthesis, using the current prosthesis, level of amputation (below/above the knee, below/above the elbow), cause of amputation (accident, illness...). There are four parts of the questionnaire: psychosocial adjustment, activity restriction, prosthesis satisfaction (aesthetic and functional satisfaction), phantom pain examination, residual pain and other health problems unrelated to amputation. General adjustment (GA) is the first subscale of the psychosocial adjustment and it refers to successful adjustment to and acceptance of the artificial limb, social adjustment (SA) is the second subscale which refers to the infiltration of the artificial limb into social situations, while the third subscale, adjustment to limitation (AL), refers to the restriction as a result of having an artificial limb. Each subscale has 5 items and the participant has to rate each item on a 5-point scale ranging from 1 (*strongly agree*) to 5 (*strongly disagree*). Cronbach's alpha reliabilities were .82, .92 and .83 for GA, SA and AL, respectively.

Personality. To assess personality traits, we used *The Next Big Five Inventory* (BFI-2; Soto & John, 2017). The Croatian version has been used in previous studies (e.g. Pavlić et al., 2021). The questionnaire consists of 60 items grouped into 15 facets and five dimensions. The dimensions are extraversion, agreeableness, conscientiousness, negative emotionality and open mindedness. Facets are sociability, assertiveness and energy level for extraversion, compassion, respectfulness and trust for agreeableness, organization, productiveness and responsibility for conscientiousness, anxiety, depression and emotional volatility for negative emotionality, and intellectual curiosity, aesthetic sensitivity, and creative imagination for open mindedness. The participant's task is to assess the extent to which each statement refers to them and enter the number on a scale from 1 (*do not agree at all*) to 5 (*completely agree*) regarding how much they agree or disagree with the statement. Cronbach's alpha reliabilities were .74, .64, .71, .64 and .71 for extraversion, agreeableness, conscientiousness, negative emotionality and open mindedness, respectively.

2.2. Participants and procedure

People with upper and/or lower limb amputation from Croatia participated in the study. The only condition for participating in the research, apart from the experienced amputation, was the regular use of prostheses. Participants were approached through companies producing and distributing prostheses and other medical devices, a hospital specialised in medical rehabilitation, and through institutions and associations that bring amputees together and help them with employment and inclusion in everyday life. We wanted to assure this way that all eligible participants were informed about the study. The study has been performed in accordance with the principles stated in the Declaration of Helsinki. Once amputees agreed to participate and gave their informed consent, they filled in the questionnaires. Data collection lasted from March to June 2019. Final sample included 63 (81% male) participants, with ages ranging from 27 to 86 years ($M = 56.63$, $SD = 13.35$). Sample size was similar to those in other studies with amputees (Horgan & MacLachlan, 2004), and large enough, with power value set at 0.80 and alpha level value set at $p < 0.05$, to determine as significant expected correlations around .30. Most participants had the amputation below the knee ($n = 35$), then over the knee ($n = 25$), while only 3 participants had the amputation below the elbow. Almost half of the participants had the amputation due to the accident ($n = 28$), followed by diabetes ($n = 17$), peripheral vascular disease ($n = 14$) and cancer ($n = 2$). Information about the cause of amputation was missing for 2 participants. Time elapsed since the amputation ranged between 2 months and 42 years, first time using the prosthesis ranged between 1 month and 41 years, while time using the current prosthesis ranged between 1 month and 11 years. There was no missing data.

2.3. Statistical analyses

All statistical analyses were done in SPSS 26.0. First, we examined the reliability and normality of distributions, and then we calculated descriptive statistics and correlations. Statistical significance was set at $p < 0.05$.

3. Results

Before processing the data, normality of all distributions was checked using Kolmogorov-Smirnov (K-S) test and measures of skewness and kurtosis. Since significant deviations from normality were found for psychosocial adjustment scales (all K-S tests were significant at $p < .05$, with skewness and kurtosis values $> \pm 2$), non-parametric statistics were used for further data analysis. Medians, median absolute deviations and Spearman correlations are presented in Table 1.

As can be seen from medians for GA and SA scales, the majority of participants rated their adjustment to and acceptance of the artificial limb, as well as infiltration of the artificial limb into social situations as successful. Larger individual differences were found

in the rated restrictions as a result of having an artificial limb, as shown by the median and median absolute deviation of AL scale.

As for correlational analysis, significant associations with personality traits were not found for SA scale. For GA scale significant positive correlation with extraversion ($rs = .29$, $p = .020$) and negative with negative emotionality ($rs = -.26$, $p = .038$) was found.

AL scale had significant positive associations with extraversion ($rs = .39$, $p = .002$), agreeableness ($rs = .25$, $p = .047$) and open mindedness ($rs = .33$, $p = .008$). In other words, amputees with higher extraversion and lower negative emotionality reported better GA, while those higher in extraversion, agreeableness and open mindedness reported better AL.

Table 1. Descriptive results and intercorrelations between psychosocial adjustment scales and personality traits ($N = 63$).

	Mdn	*MAD*	1.	2.	3.	4.	5.	6.	7.
1.GA	24	1							
2.SA	24	1	.37**						
3.AL	12	3	.35**	.10					
4.E	42	4	.29*	.08	.39**				
5.A	48	4	.00	.13	.25*	.17			
6.C	48	4	.23	-.03	.21	.47**	.30*		
7.NE	32	4	-.26*	-.09	-.19	-.38**	-.27*	-.24	
8.O	41	4	.21	-.05	.33**	.50**	.21	.31*	-.23

Note. * p < .05; ** p < .01, Mdn = median, MAD = median absolute deviation, GA = general adjustment, SA = social adjustment, AL = adjustment to limitation, E= extraversion, A = agreeableness, C = conscientiousness, NE = negative emotionality, O = open mindedness.

We also examined correlations of psychosocial adjustment scales with personality facets and they are presented in Table 2. Significant associations were found for GA and AL scales. GA was associated with extraversion facet assertiveness ($rs = .32$, $p = .011$), conscientiousness facet productiveness ($rs = .26$, $p = .041$), negative emotionality facet depression ($rs = -.48$, $p < .001$), and open mindedness facets aesthetic sensitivity ($rs = .29$, $p = .023$) and creative

imagination ($rs = .28$, $p = .024$). AL was associated with extraversion facets assertiveness ($rs = .29$, $p = .022$) and energy level ($rs = .31$, $p = .015$), agreeableness facet trust ($rs = .29$, $p = .021$), conscientiousness facet productiveness ($rs = .34$, $p = .006$), negative emotionality facet depression ($rs = -.46$, $p < .001$), and open mindedness facet creative imagination ($rs = .31$, $p = .012$).

Table 2. Spearman's correlations of personality facets with psychosocial adjustment scales ($N = 63$).

Personality facet	GA	SA	AL
Sociability (E1)	.21	.17	.24
Assertiveness (E2)	.32*	.04	.29*
Energy level (E3)	.07	-.06	.31*
Compassion (A1)	.14	.18	.19
Respectfulness (A2)	-.11	-.13	.03
Trust (A3)	.02	.20	.29*
Organization (C1)	.18	-.09	.07
Productiveness (C2)	.26*	-.04	.34**
Responsibility (C3)	.03	-.05	.07
Anxiety (NE1)	-.04	-.16	-.11
Depression (NE2)	-.48**	-.10	-.46**
Emotional volatility (NE3)	-.02	-.02	.10
Intellectual curiosity (O1)	.00	-.19	.18
Aesthetic sensitivity (O2)	.29*	.20	.23
Creative imagination (O3)	.28*	-.08	.31*

Note. * p < .05; ** p < .01, GA = general adjustment, SA = social adjustment, AL = adjustment to limitation, E = extraversion, A = agreeableness, C = conscientiousness, NE = negative emotionality, O = open mindedness.

Table 3. Results of the regression analyses for GA and AL with personality facets as predictors.

Predictors GA	β	Predictors AL	β
Time elapsed since amputation	.07	Age	-.35**
Assertiveness (E2)	.04	Assertiveness (E2)	.08
Productiveness (C2)	.14	Energy level (E3)	.05
Depression (NE2)	-.32*	Trust (A3)	.27*
Aesthetic sensitivity (O2)	.09	Productiveness (C2)	.11
Creative imagination (O3)	-.04	Depression (NE2)	-.25
		Creative imagination (O3)	-.10
$F(6,56) = 2.21, p = .055$, Adj. $R^2 = .105$		$F(7,55) = 4.19, p = .001$, Adj. $R^2 = .265$	

Note. * p < .05; ** p < .01, GA = general adjustment, AL = adjustment to limitation, E = extraversion, A = agreeableness, C = conscientiousness, NE = negative emotionality, O = open mindedness

To further examine if personality facets explain the variance in psychosocial adjustment the regression analyses were run for GA and AL scales. For GA as criteria, we included personality facets assertiveness, productiveness, depression, aesthetic sensitivity and creative imagination which had significant correlations on a bivariate level, as well as time elapsed from the amputation which was also significantly

associated with GA on a bivariate level ($rs = .25$, $p = .045$). For AL as criteria, we included personality facets assertiveness, energy level, trust, productiveness, depression and creative imagination, as well as age which was also significantly associated with AL on a bivariate level ($rs = -.37$, $p = .003$). Results are presented in Table 3. For GA, the model was marginally significant with $p = .055$, explaining 10.5% of variance with depression facet as a significant negative predictor of general adjustment. For AL, the model was significant at $p = .001$, explaining 26.5% of variance with age being a negative predictor and personality facet trust a positive predictor of adjustment to limitations.

4. Discussion

The aim of this study was to examine how personality traits are associated with psychosocial adjustment of people who have experienced amputation. Five personality traits have been shown to be related to resilience (Oshio et al., 2018) and coping (Connor-Smith & Flachsbart, 2007), so we expected that these traits would also be associated with psychosocial adjustment of amputees. In line with this expectation, we found significant correlations between personality traits from the Big Five model and psychosocial functioning in individuals with experienced amputation, but not with all subscales. No significant associations with personality were found for social adjustment, but it is important to mention that 48% of our sample had the maximum score on this subscale. For general adjustment we found a positive correlation with extraversion and a negative correlation with negative emotionality. This pattern of correlations is similar to the pattern obtained in the large-scale meta-analysis for life satisfaction (Anglim et al., 2020). Participants in our sample differed the most in their adjustment to limitation and these individual differences were associated positively with individual differences in extraversion, open mindedness and agreeableness. Therefore, our first hypothesis was confirmed for extraversion, agreeableness, open mindedness and negative emotionality, but not for conscientiousness.

We further examined the associations of psychosocial adjustment of amputees with personality facets. This part of our study was exploratory and we did not have any specific hypotheses. A recent study has shown that specific personality facets can provide incremental predictive power over and above global personality domains in educational attainment, income, health, and life satisfaction (Danner et al., 2021). Significant associations with personality facets were found for general adjustment and adjustment to limitation scales, while like in the previous analysis on personality factors, no significant associations were found for social adjustment. For general adjustment and adjustment to limitation scales highest correlations were obtained with depression facet indicating that people who are not dealing well after experiencing a setback and who tend to feel sad also have the lowest psychosocial adjustment after amputation. For general adjustment similar sized positive associations were found for assertiveness, productiveness, aesthetic sensitivity and creative imagination. This finding indicates that people who take charge, get things done, have interest in art, music and literature and are creative and imaginative have better adjustment to amputation. For adjustment to limitation similar sized positive associations were found for assertiveness, energy level, trust, productiveness, and creative imagination. This indicates that people who take charge and are active, who have forgiving nature and get things done, and are creative and imaginative tend to have better adjustment to limitations. Regression analyses with personality facets as predictors and time elapsed from amputation for general adjustment further indicated that individual differences in depression personality facet can explain variance in general adjustment. For adjustment to limitations age was the strongest predictor with older participants having worse adjustment to limitations, but also individual differences in personality facet trust explained variance in adjustment to limitations.

This is a very interesting result because it indicates that psychosocial adaptation in people with amputation, especially adjustment to limitation, is associated with personality traits. The finding that some people, due to their personality, adjust to amputation more successfully can be of interest to the health care system. This way psychological help can be offered and targeted for specific groups of people with amputation (for example, people who tend to feel sad, insecure, unproductive and with low energy levels). In addition, these results indicate that people with specific personality traits might be at greater risk of worse adjustment after the amputation and might need more support after the amputation. It would be interesting to examine in further research if there are

any differences in adjustment depending on how a limb was lost, whether it was due to accident, illness or a suicide attempt. Furthermore, especially if the amputation is caused by an accident, amputees might suffer from post-traumatic stress disorder which can hinder their adjustment. Future studies should also estimate the prevalence of post-traumatic stress disorder in amputees. By raising awareness of the importance of psychological and social aspects of adaptation to traumatic life events, positive changes can be made in the healthcare system and more attention given to these aspects in order to achieve a more successful transition of individuals to a new lifestyle.

This study also has some limitations. Although the population is specific and it is not easy to find participants, our sample size is small which limits our conclusions. Future studies should examine if the results obtained in this study would be replicated in a larger sample, especially from the regression analyses. In addition, results on two psychosocial adjustment scales (GA and SA) indicate that it is possible that people who were more motivated to participate in the research were the ones who successfully overcame this trauma in their lives. Therefore, in future studies it would be good to also include amputees with lower scores on psychosocial adjustment scales. The results of this study offer a basis for future studies and indicate that when examining the association of personality with psychosocial adjustment in amputees, it is important to measure not only personality factors but also personality facets. This is in line with suggestions by personality researchers that associations with personality traits should be examined at different lower levels of personality hierarchy, such as personality facets (Anglim & O'Connor, 2019), or at an even lower level of personality nuances (Mõttus et al., 2020).

5. Conclusions

In this study we examined the relationship between personality traits and the psychosocial adjustment in individuals with limb amputation. Results indicate that higher extraversion, agreeableness, and open mindedness are associated with better psychosocial adjustment, while higher negative emotionality is associated with poorer psychosocial adjustment in individuals with limb amputation. On a lower level of personality hierarchy, bivariate correlations indicate that higher negative emotionality facet depres-

sion is the specific personality trait associated the most with poor psychosocial adjustment in individuals with limb amputation. Results of the regression analyses indicate negative emotionality facet depression as a negative predictor of general adjustment, and agreeableness facet trust as a positive predictor of adjustment to limitations. These results show that individual differences in personality are associated with differences in adjustment after amputation and could be helpful to healthcare professionals dealing with individuals with limb amputation.

Conflicts of interests

The authors have no relevant financial or non-financial interests to disclose.

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