

# The predictive value of self-compassion for psychological adjustment in left ventricular assist device patients: an observational study

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## Abstract

**Aims** Implantation of a left ventricular assist device (LVAD) is an established treatment option for patients with advanced heart failure. However, apart from its challenging medical management, it comes with serious psychological implications. Empirical evidence suggests that self-compassion, a self-regulation strategy for countering negative self-directed emotions, might be a promising approach in facilitating psychological adjustment also in LVAD patients. The aims of the present study were to investigate self-compassion as a protective factor for anxiety and depressive symptoms, to test whether taking a decentred perspective mediates these effects, and to explore whether self-compassion predicts the clinically rated functional health status.

**Method and results** A sample of  $N = 45$  patients (36 male) with a mean age of 60.5 years ( $SD = 10.8$ ) from the outpatient department for terminal heart failure at the University Medical Center in Kiel, Germany, participated in the study. Patients completed self-report measures for psychological adjustment (HADS), self-compassion (SCS), and decentring (EQ). Functional health status was determined by the NYHA classification. The more patients were self-compassionate, the less they reported anxiety ( $r = -0.28$ ) and depressive symptoms ( $r = -0.34$ ). Decentring mediated both effects. Moreover, self-compassion predicted the functional health status, even when controlling for anxiety (odds ratio [OR] = 0.09) and depressive symptoms (OR = 0.11).

**Conclusions** This study provides the first evidence for a significant interrelation between self-compassion and common adverse psychological conditions in LVAD patients. Longitudinal data and the evaluation of interventions to strengthen self-compassion are needed to further validate the beneficial effects of self-compassion in LVAD patients in the future.

**Keywords** Heart failure; LVAD; Anxiety; Depression; Self-compassion; Functional health status

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## Introduction

Implantation of a left ventricular assist device (LVAD) that supports the function of the left ventricle of the heart is an effective treatment option for patients suffering from advanced heart failure to prolong survival and improve health-related quality of life (HRQOL).<sup>1–3</sup> LVADs can be implanted as a bridge to heart transplantation or destination therapy. In a systematic review,<sup>4</sup> LVAD patients experienced an improvement in functional health status and HRQOL

irrespective of the treatment goal (bridge to heart transplantation or destination therapy) or type of device (pulsative vs. continuous flow). Surprisingly, few studies have measured anxiety and depressive symptoms, which are highly prevalent in patients with heart failure.<sup>5,6</sup> About a third of patients report elevated depressive symptoms on self-report measures, and 19% meet the criteria for a depressive disorder (predominantly major depressive disorder, MDD). About 30% of patients report an elevated level of anxiety, and 13% meet the criteria for an anxiety disorder (typically generalized anxiety

disorder). Moreover, empirical evidence suggests that depression is especially associated with the development and progression of heart failure.<sup>5,7</sup> Given the increased prevalence of depressive symptoms and anxiety in patients with heart failure and their impact on medical and functional outcomes,<sup>5,8</sup> identifying and strengthening protective factors is of high importance.

Self-compassion is a self-regulation strategy, which has recently gained interest in research on mental health. High self-compassionate people treat themselves with kindness, care, and concern when facing negative life experiences. 'Self-compassion involves being open to and moved by one's own suffering, experiencing feelings of caring and kindness toward oneself, taking an understanding, non-judgmental attitude toward one's inadequacies and failures, and recognizing that one's own experience is part of the common human experience' (p. 224).<sup>9</sup> Self-compassion is rooted in the Buddhist tradition of compassion. Thus, it is different from being self-centred or exhibiting self-pity. Instead, self-compassion is closely related to mindfulness because it involves a balanced awareness of negative feelings and thoughts.<sup>10</sup> The beneficial effects of mindfulness-based interventions on mental health have already been demonstrated in numerous clinical and non-clinical populations.<sup>11–13</sup> A growing number of studies suggests that dispositional self-compassion, as well as compassion-based interventions, can yield comparable effects on mental health. A meta-analytic review<sup>14</sup> revealed large effects of habitual self-compassion on depressive symptoms, anxiety, and stress in non-clinical populations. In a mood-induction experiment, instructing self-compassion was as effective as the strategies of reappraising and acceptance in decreasing depressed mood in MDD patients.<sup>15</sup> In a similar experiment,<sup>16</sup> self-compassion was more effective in regulating depressed mood than acceptance or a waiting-list condition in three groups of participants: recovered depressed patients, currently depressed patients, and healthy controls. Moreover, self-compassion was more effective than reappraising in recovered depressed patients and healthy controls and equally effective in depressed participants. The efficacy of mindfulness-based cognitive therapy (MBCT<sup>17</sup>) and compassion-focused therapy<sup>18</sup> in decreasing depressive symptoms, rumination, anxiety, and stress compared with a waiting-list control group was demonstrated in an inpatient rehabilitation setting.<sup>19</sup> Interestingly, MBCT and compassion-focused therapy together stimulated self-compassion and mindfulness in participants, thus emphasizing the interdependence of both constructs. A first meta-analytic review of RCTs on compassion-based interventions reported increased compassion, self-compassion, mindfulness, and decreased depressive symptoms, anxiety, and psychological distress.<sup>20</sup> A systematic review of self-compassion related interventions showed significant effects also for individuals with chronic physical health conditions.<sup>21</sup>

Although only a few studies have investigated mindfulness in patients with heart failure, these studies suggest that their beneficial effects would likely extend to this clinical population. In a systematic review involving  $N = 467$  patients, mindfulness-based interventions significantly reduced depressive symptoms and anxiety.<sup>22</sup> Inconsistent effects resulted for self-reported physical symptoms such as breathlessness or tiredness, and no effect resulted for functional health status, which was measured in only one study.<sup>23</sup> Dispositional mindfulness was associated with lower anxiety and greater HRQOL in patients with heart failure in an observational study.<sup>24</sup>

As empirical evidence accumulates showing that mindfulness and self-compassion alleviate conditions of impaired mental health across various populations, investigating mechanisms for these salutary effects has become a prominent direction for research.<sup>25</sup> One hypothesis, which was adopted in the present study, attributes the beneficial effects to a shift in the perspective towards one's inner experience. This shift has been referred to as *decentring*.<sup>26,27</sup> Decentring builds on metacognitive awareness, which enables a disidentification from the content of one's thoughts and feelings and increases the scope and flexibility of potential reactions. In an observational study, decentring mediated the effect of dispositional mindfulness on depressive symptoms in a non-clinical sample.<sup>28</sup> A mediating function of decentring was also observed for the effects of mindfulness-based stress reduction training<sup>29</sup> and to a lesser extent for compassion-cultivation training<sup>30</sup> on stress, depressive symptoms, and well-being.<sup>31</sup>

In conclusion, the outlined research suggests that self-compassion might function as a protective factor in LVAD patients against experiencing depressive symptoms and anxiety. To the best of our knowledge, no study to date has investigated the significance of self-compassion for psychological adjustment in this specific population. The objectives of the current study were (i) to test whether individual differences in self-compassion predicted patient's anxiety and depressive symptoms and (ii) to investigate whether decentring mediated the effects of self-compassion. Additionally, we investigated whether self-compassion predicted the functional health status as an important determinant of HRQOL controlling for psychological adjustment.

## Method

### Participants and procedure

Participants were recruited at the outpatient department for terminal heart failure at the University Medical Center Schleswig-Holstein (UKSH), Campus Kiel, Germany. Only patients having an LVAD were included in the study. Patients who regularly visited the outpatient department for terminal heart failure at UKSH for medical monitoring were surveyed

during one of their appointments. Patients gave written informed consent to participate in the study. All questionnaires were administered in paper-pencil mode. A male undergraduate psychology student was present to assist the participants if they had difficulties completing the questionnaires. The survey started with sociodemographic questions, followed by instruments for psychological adjustment, self-compassion, and decentring. The survey contained additional instruments, which were not included in the analyses of the present study. Further clinical information was retrieved from the medical records with permission by the patients. The study was approved by the local ethics committee at UKSH (reference: D412/18) and managed in accordance with the principles of the Declaration of Helsinki.

## Instruments

### *Anxiety and depression*

The prevalence of anxiety and depressive symptoms was assessed with the German version of the Hospital Anxiety and Depression Scale.<sup>32,33</sup> The instrument consists of 7 items that assess anxiety and 7 that assess depression, presented with a 4-point Likert scale (0–3). Each total score range is from 0 to 21. Scores between 8 and 10 suggest elevated sub-clinical symptoms, whereas scores above 10 indicate clinically relevant symptoms. Cronbach's alpha was determined for all self-report measures and can be retrieved from *Table 2*.

### *Self-compassion*

Individual differences in self-compassion were measured with the German version of the Self-Compassion Scale.<sup>9,34</sup> The instrument consists of 26 items with a 5-point Likert scale assessing the three components self-kindness, common humanity, and mindfulness. The total mean score ranging from 1 to 5 represents an overall measure for self-compassion. A sample item is: 'I try to be loving towards myself when I'm feeling emotional pain'.

### *Decentring*

The capability to take a decentred perspective was assessed with the German version of the Experience Questionnaire.<sup>35</sup> The instrument consists of 20 items, but only 4 items each measure the two components used in the current study: Taking a self-distanced perspective (e.g. 'I can observe unpleasant feelings without being drawn into them') and adopting an accepting self-perception (e.g. 'I can treat myself kindly'). All items were presented with a 5-point Likert scale. The sum scores can vary from 0 to 16.

### *Functional health status*

The New York Heart Association Classification is a clinical rating system for the functional health status of patients with diseases of the heart and blood vessels.<sup>36</sup> The patient is assigned to one of four categories based on the presenting

symptoms. NYHA class I indicates no symptoms and no limitation in ordinary physical activity. Class II marks mild symptoms (e.g. mild shortness of breath or angina) and few limitations during ordinary activity, but the patient is comfortable at rest. Class III indicates a marked limitation of activity due to symptoms, even during less-than-ordinary activity, for example, walking short distances. The patient is comfortable only at rest. Class IV indicates severe limitations. The patient experiences symptoms even while at rest. The ratings were performed by the senior consulting cardiologist who was unaware of the psychological measures (blinded assessment).

## Statistical analyses

Statistical analyses started with checking the internal consistencies of all psychological measures by computing Cronbach's alpha and estimating bivariate correlations of all study variables, using either Bravais–Pearson  $r$  or Kendall  $\tau_b$ , depending on the metric of the measures.

To investigate the predictive value of self-compassion more thoroughly, two multiple mediation analyses were conducted using SPSS (v. 25) and PROCESS<sup>37</sup> (v. 3.5) with accepting self-perception and distanced perspective as two parallel mediators. Following the recommendation of Hayes,<sup>37</sup> all indirect effects were tested for significance by applying  $N = 5000$  bootstrap samples. Although no severe heteroscedasticity was detected, standard errors were corrected in the parametric tests. The hypothesized models were compared with inverted mediation models with anxiety and depressive symptoms as predictors and self-compassion as the dependent variable.

Finally, binary logistic regression models were computed to test whether patients self-reported self-compassion predicted their clinically rated functional health status, using a dichotomized version of the NYHA scores with 0 (= no impairment = Class I) vs. 1 (= impairment = Classes II and III) as the criterion variable. The dichotomization was performed to compensate for the unequal distribution of scores. The focus of the study was to analyse the direct effect of self-compassion. Thus, we controlled for anxiety and depressive symptoms, applying separate models to reduce model complexity.

## Results

### **Descriptive statistics of sociodemographic and clinical information and study variables**

A total of 45 LVAD patients were recruited at the outpatient department for terminal heart failure at the University Medical Center Schleswig-Holstein (UKSH), Campus Kiel, Germany. Of these, 36 patients (80%) were male, and 9 were female. The mean age was 60.5 years ( $SD = 10.8$ ). The youngest

patient was 28 years old, and the oldest was 77 years. Twenty-two participants (48.9%) achieved a basic level in secondary education, 13 achieved medium level (28.9%), and 10 (22.2%) achieved university entrance qualification. Most participants were retired (35; 77.8%), only 3 participants (6.7%) were employed, 4 patients (8.9%) were unable to work, 1 participant was unemployed, and another participant was enrolled at a university. Twenty-six participants were married (57.8%), 5 patients (11.1%) were divorced, 2 patients (4.4%) were widowed, and 12 patients (26.7%) were single.

Most patients (30; 66.7%) had an LVAD implanted as destination therapy, whereas for 15 patients (33.3%), the implantation served as a bridge to transplantation (refer to *Table 1* for an overview). The mean age at implantation was 58.6 years ( $SD = 10.8$ ). The mean period since implantation was 2.1 years ( $SD = 1.7$ ). For 24 patients (53.6%), no adverse events were documented in the medical record. Coronary heart disease and dilated cardiomyopathy were the dominating aetiologies with 22 (48.9%) for each. The average number of prescribed drugs was 14 ( $SD = 3.6$ ), but only 8 participants had a psychotropic medication. Thirty patients had a BMI  $\geq 25$ , and 8 patients had a BMI  $\geq 30$ . Clinical ratings of functional health status revealed for most patients (33; 73.3%) mild symptoms indicative of NYHA class II.

Nearly half of the patients (20, 44.4%) reported elevated anxiety (HADS  $\geq 8$ ). Of these 20 patients, 12 (26.7% of the total sample) had borderline-level symptoms ( $8 \leq$  HADS

$\leq 10$ ), and 8 (17.8%) scored above the cut-off point of 10, which indicated clinically relevant symptoms. Over half of the patients (23, 51.1%) reported an elevated level of depressive symptoms (HADS  $\geq 8$ ), 16 (35.6%) had borderline-level symptoms ( $8 \leq$  HADS  $\leq 10$ ), and 7 patients (15.6%) scored above the cut-off point of 10. Reporting anxiety covaried with reporting depressive symptoms ( $r = 0.63$ ,  $P < 0.001$ , cf. *Table 2*). For patients with elevated levels of anxiety or depressive symptoms (HADS  $\geq 8$ ), LVAD implantation more often served as a bridge-to-transplantation treatment rationale with less time passed since implantation. Not surprisingly, psychotropic medication was more common among these patients.

The mean score for self-compassion ( $M = 3.39$ ,  $SD = 0.50$ ) can be considered moderate. We found no gender difference or association with age, but patients tended to be more self-compassionate with increasing temporal distance from implantation ( $r = 0.27$ ,  $P = 0.081$ ). The mean scores for decentring were moderate, a finding which is not different from healthy samples.<sup>28</sup>

### Covariation of self-compassion and decentring with anxiety and depressive symptoms

A significant moderate negative correlation was found between self-compassion and depressive symptoms ( $r = -0.34$ ,  $P = 0.024$ ) and a negative correlation with anxiety ( $r = -0.28$ ,

**Table 1** Descriptive statistics of clinical information

Characteristic	Total sample	HADS-A $\geq 8$	HADS-D $\geq 8$
	n (%) or mean (SD)		
Treatment rationale			
Destination therapy	30 (66.7)	9 (45)	10 (43.5)
Bridge to transplantation	15 (33.3)	11 (55)	13 (56.5)
Age at LVAD implantation (years)	58.6 (10.8)	56.4 (10.8)	57.7 (12.3)
Period since LVAD implantation (years)	2.1 (1.7)	1.3 (1.5)	1.6 (1.8)
Adverse events <sup>a</sup>			
None	24 (53.6)	10 (50)	11 (47.8)
Reoperation	7 (15.6)	3 (15)	3 (13)
Gastrointestinal bleeding	6 (13.3)	1 (5)	3 (13)
Infection	3 (6.7)	2 (10)	2 (8.7)
Other events	7 (15.6)	4 (20)	4 (17.4)
Heart failure aetiology			
Coronary heart disease	22 (48.9)	10 (50)	12 (52.8)
Dilated cardiomyopathy	22 (48.9)	10 (50)	11 (47.2)
Other aetiologies	1 (2.2)	0	0
Severe comorbidity	3 (6.7)	0	0
Number of drugs	14 (3.6)	13.9 (3.3)	14 (3.1)
Psychotropic medication (yes)	8 (17.8)	6 (30)	6 (26.1)
NYHA classification			
Class I	10 (22.2)	3 (15)	3 (13)
Class II	33 (73.3)	15 (75)	18 (78.3)
Class III	2 (4.4)	2 (10)	2 (8.7)
Class IV	0	0	0
Body mass index (BMI)	27.2 (4.9)	27.1 (3.9)	25.8 (3.9)

Total sample  $N = 45$ ; HADS-A  $\geq 8$ :  $N = 20$ ; HADS-D  $\geq 8$ :  $N = 23$ .

<sup>a</sup>Multiple entries possible.

**Table 2** Descriptive statistics of study variables

Measure	<i>M</i>	<i>(SD)</i>	$\alpha$	1	2	3	4	5
1. Anxiety (HADS)	6.18	3.92	0.75					
2. Depression (HADS)	6.60	3.82	0.71	0.63**				
3. Self-compassion (SCS)	3.39	0.50	0.84	-0.28	-0.34*			
4. Distanced perspective (EQ)	9.20	3.77	0.83	-0.52**	-0.34*	0.48**		
5. Accepting self-perception (EQ)	11.60	2.52	0.54	-0.27	-0.43**	0.51**	0.50**	
6. NYHA class ( $n_{\text{cl}} = 10, n_{\text{cII}} = 33, n_{\text{cIII}} = 2$ )				0.24	0.27*	-0.38**	-0.33**	-0.40**

$\alpha$  = Cronbach's alpha; correlations with NYHA class are Kendall's  $\tau_b$ ; and all other correlations are Bravais-Pearson  $r$ .

\* $P < 0.05$ ,

\*\* $P < 0.01$  two-tailed.

$P = 0.064$ ). The regression analysis showed that scoring one point higher on the SCS scale decreased the HADS score by  $b = -2.15$  points for anxiety and  $b = -2.62$  points for depression. Both components of decentring were related to psychological adjustment as well. Adopting a distanced perspective was significantly associated with anxiety ( $r = -0.52, P < 0.001$ ) and depressive symptoms ( $r = -0.34, P = 0.022$ ). Developing an accepting self-perception covaried significantly with depressive symptoms ( $r = -0.43, P = 0.003$ ) but less strongly with anxiety ( $r = -0.27, P = 0.071$ ). All correlations were in the predicted direction. That is, the higher the self-compassion and the higher the capability to take a decentred perspective towards oneself, the less anxiety and depressive symptoms were experienced.

Moreover, self-reported self-compassion and decentring also covaried with the clinically rated functional health status. The higher patients scored on self-compassion and the two components of decentring, the less impairment was observed (Kendall's  $\tau_b$  ranging between  $= -0.33, P = 0.010$  and  $-0.40, P = 0.001$ ).

### Mediating effect of decentring

Figure 1A and 1B and Tables 3 and 4 present the results of both analyses. A significant total indirect effect for anxiety ( $-2.00$  with 95% CI  $[-3.82; -0.37]$ ) and for depressive symptoms ( $-1.70$  with 95% CI  $[-3.44; -0.10]$ ) was observed, indicating that the capability to take a decentred perspective mediated the covariation between self-compassion and both aspects of impaired psychological adjustment. The analyses revealed unequal specific indirect effects for both components of decentring depending on the outcomes. Nearly the complete total indirect effect of self-compassion on anxiety could be attributed to taking a distanced perspective ( $-1.92$ ; 95% CI  $[-3.36; -0.76]$ ) and led to a significant contrast comparing both specific indirect effects. The analysis for depressive symptoms revealed a different pattern. Adopting a self-accepting perception ( $-1.21$ , 95% CI  $[-3.09; 0.04]$ ) had a larger effect compared with taking a distanced perspective ( $-0.49$ , 95% CI  $[-1.46; 0.78]$ ). Although the total indirect effect was significant, the specific indirect effects failed to reach significance.

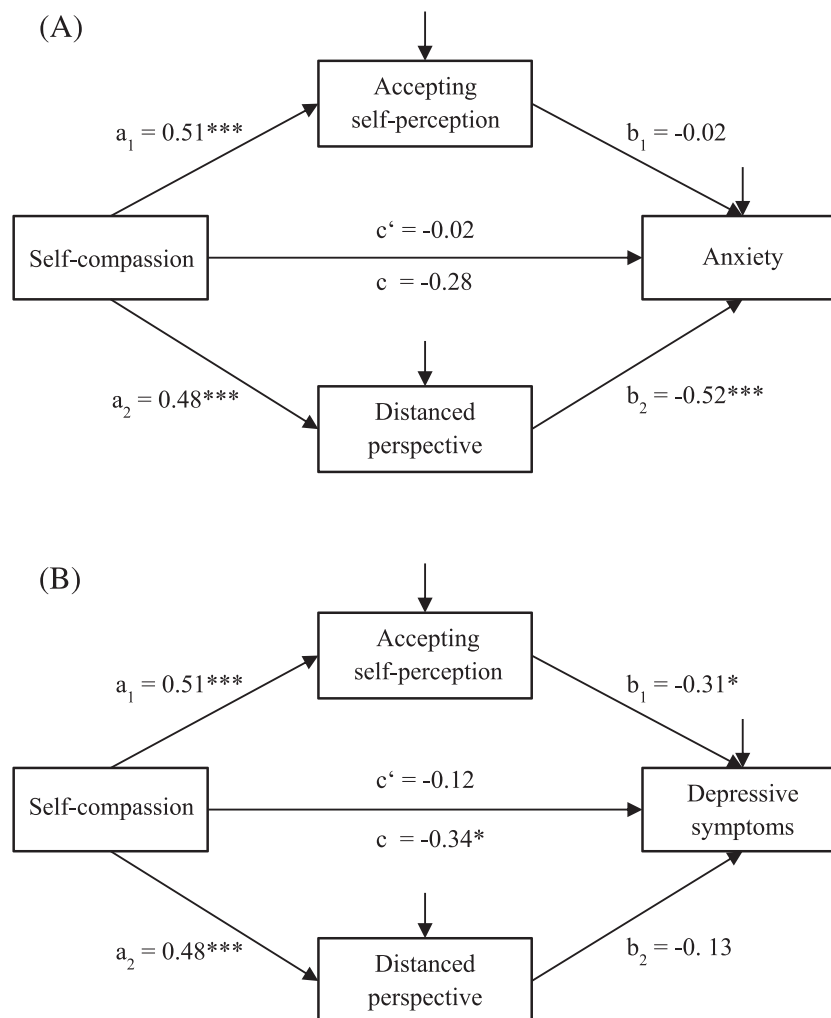
The inverted models with anxiety and depressive symptoms as predictors for self-compassion mediated by the two components of decentring fit the data equally well for the indirect effects. Some differences emerged for single regression coefficients. In the inverted model, anxiety was a stronger predictor for accepting self-perception ( $b = -0.29, P = 0.067$ ) compared with the reversed path in the hypothesized model ( $b = -0.02, P = 0.881$ , cf. Table 3, Figure 1A). Depressive symptoms was a stronger predictor for taking a distanced perspective ( $b = -0.34, P = 0.010$ ) compared with the reversed path in the hypothesized model ( $b = -0.13, P = 0.282$ , cf. Table 4, Figure 1B). Self-compassion was a stronger predictor for both components of decentring as stated in the hypothesized model than the reversed paths in the inverted model.

### Self-compassion as a predictor for functional health status

Finally, we were interested in whether self-compassion could predict the patients' clinically rated functional health status (NYHA classification). For this purpose, we conducted two binary logistic regression models, using a dichotomized NYHA classification (Class I vs. all other classes), and anxiety and depressive symptoms as controls in separate models (refer to Table 5). Both models showed an increased model fit compared with the intercept-only model (Model A:  $\chi^2_{(2)} = 8.29, P = 0.016$ ; Model B:  $\chi^2_{(2)} = 9.55, P = 0.008$ ). The Hosmer-Lemeshow test indicated an adequate model fit (Model A:  $\chi^2_{(8)} = 6.58, P = 0.582$ ; Model B:  $\chi^2_{(8)} = 7.13, P = 0.523$ ).

The results of the logistic regression models revealed that self-compassion significantly predicted the clinically rated functional health status, controlling for anxiety (Model A: odds ratio [OR] = 0.091; 95% CI [0.010; 0.858]), and depressive symptoms (Model B: OR = 0.112; 95% CI [0.014; 0.898]). The more self-compassionate a patient was, the lower the probability of belonging to a NYHA class that indicates impaired functional health. Residuals showed only one outlier in both models. Because no error could be detected, the outlier was not excluded from the analyses. The exclusion would have led to even stronger effects for self-compassion on functional health.

**Figure 1** Multiple parallel mediation models for anxiety (A) and depressive symptoms (B); lowercase letters with subscripts indicate standardized path coefficients; \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .  $c$  = total effect,  $c'$  = direct effect.



## Discussion

Psychological adjustment for patients with advanced heart failure is generally a challenging task, but the adjustment is particularly challenging for patients with LVAD therapy. The present study confirmed the elevated prevalence of clinically relevant levels of anxiety and depressive symptoms previously reported for patients with advanced heart failure,<sup>5</sup> with 17.8% of the participants who scored above the cut-off point that indicates clinically relevant anxiety and 15.6% who scored above the cut-off point for clinically relevant depressive symptoms.

The objective of the present study was to investigate whether self-compassion in LVAD patients is associated with lower levels of anxiety and depressive symptoms, indicating an advantage in psychological adjustment, and to investigate

the mediating effect of taking a decentred perspective. Additionally, we explored whether self-compassion predicts the clinically rated functional health status.

First, self-compassion was fairly moderately and negatively related with depressive symptoms and anxiety, although the relationship with anxiety was slightly weaker.

Second, mediation analyses revealed that the association of self-compassion with anxiety and depressive symptoms could be explained by the patients' ability to take a decentred perspective, which confirms the results of previous studies.<sup>25,28,31</sup> Both total indirect effects reached statistical significance. However, the findings for anxiety were somewhat surprising because the total effect of self-compassion on anxiety failed to reach significance in parametric testing. But as Hayes<sup>37</sup> argued, the statistical procedure does not require a significant total effect as a prerequisite for a significant indirect effect. Furthermore, both effects were tested

**Table 3** Multiple parallel mediation model for anxiety

Effect	Coefficient	SE	t-value	95% CI [LB; UB]	Standardized coefficient
<b>Direct effects</b>					
c' (SC → ANX)	-0.15	1.12 <sup>1</sup>	-0.14	[-2.41; 2.11]	-0.02
a <sub>1</sub> (SC → ASP)	2.59***	0.64 <sup>1</sup>	4.03	[1.29; 3.89]	0.51
a <sub>2</sub> (SC → DP)	3.69***	0.95 <sup>1</sup>	3.88	[1.77; 5.60]	0.48
b <sub>1</sub> (ASP → ANX)	-0.03	0.21 <sup>1</sup>	-0.15	[-0.45; 0.39]	-0.02
b <sub>2</sub> (DP → ANX)	-0.52***	0.11 <sup>1</sup>	-4.57	[-0.75; -0.29]	-0.52
<b>Total indirect effect</b>					
a <sub>1</sub> × b <sub>1</sub> + a <sub>2</sub> × b <sub>2</sub> (SC → ASP → ANX + SC → DP → ANX)	-2.00*	0.86 <sup>2</sup>		[-3.82; -0.37] <sup>2</sup>	-0.26
<b>Specific indirect effects</b>					
a <sub>1</sub> × b <sub>1</sub> (SC → ASP → ANX)	-0.08	0.66 <sup>2</sup>		[-1.32; 1.40] <sup>2</sup>	-0.01
a <sub>2</sub> × b <sub>2</sub> (SC → DP → ANX)	-1.92	0.67 <sup>2</sup>		[-3.36; -0.76] <sup>2</sup>	-0.25
<b>Contrast specific indirect effects</b>					
a <sub>1</sub> × b <sub>1</sub> - a <sub>2</sub> × b <sub>2</sub> (SC → ASP → ANX) - (SC → DP → ANX)	1.84	1.02 <sup>2</sup>		[0.03; 4.18] <sup>2</sup>	0.24
<b>Total effect</b>					
c (SC → anxiety)	-2.15	1.14 <sup>1</sup>	-1.89	[-4.45; 0.15]	-0.28

Superscripts: 1 = heteroscedasticity consistent standard error (Huber-White); 2 = bootstrap-based ( $N = 5000$ ) standard errors and 95% confidence interval (CI) for indirect effects; LB = lower bound; UB = upper bound.

\* $P < 0.05$ ,

\*\* $P < 0.01$ ,

\*\*\* $P < 0.001$ .

**Table 4** Multiple parallel mediation model for depressive symptoms

Effect	Coefficient	SE	t-value	95% CI [LB; UB]	Standardized coefficient
<b>Direct effects</b>					
c' (SC → DEP)	-0.92	1.12 <sup>1</sup>	-0.82	[-3.19; 1.35]	-0.12
a <sub>1</sub> (SC → ASP)	2.59***	0.64 <sup>1</sup>	4.03	[1.29; 3.89]	0.51
a <sub>2</sub> (SC → DP)	3.69***	0.95 <sup>1</sup>	3.88	[1.77; 5.60]	0.48
b <sub>1</sub> (ASP → DEP)	-0.47*	0.21 <sup>1</sup>	-2.19	[-0.90; -0.04]	-0.31
b <sub>2</sub> (DP → DEP)	-0.13	0.12 <sup>1</sup>	-1.09	[-0.38; 0.11]	-0.13
<b>Total indirect effect</b>					
a <sub>1</sub> × b <sub>1</sub> + a <sub>2</sub> × b <sub>2</sub> (SC → ASP → DEP + SC → DP → DEP)	-1.70*	0.85 <sup>2</sup>		[-3.44; -0.10] <sup>2</sup>	-0.22
<b>Specific indirect effects</b>					
a <sub>1</sub> × b <sub>1</sub> (SC → ASP → DEP)	-1.21	0.79 <sup>2</sup>		[-3.09; 0.04] <sup>2</sup>	-0.16
a <sub>2</sub> × b <sub>2</sub> (SC → DP → DEP)	-0.49	0.55 <sup>2</sup>		[-1.46; 0.78] <sup>2</sup>	-0.06
<b>Contrast specific indirect effects</b>					
a <sub>1</sub> × b <sub>1</sub> - a <sub>2</sub> × b <sub>2</sub> (SC → ASP → DEP) - (SC → DP → DEP)	-0.72	1.08 <sup>2</sup>		[-3.34; 0.93] <sup>2</sup>	-0.09
<b>Total effect</b>					
c (SC → DEP)	-2.62*	1.15 <sup>1</sup>	-2.27	[-4.95; -0.29]	-0.34

Superscripts: 1 = heteroscedasticity consistent standard error (Huber-White); 2 = bootstrap-based ( $N = 5000$ ) standard errors and 95% confidence-interval (CI) for indirect effects; LB = lower bound; UB = upper bound.

\* $P < 0.05$ ,

\*\* $P < 0.01$ ,

\*\*\* $P < 0.001$ .

for significance by applying different statistical procedures. Interestingly, the two components of decentring varied in their contribution to the total indirect effect, depending on the outcome. Nearly, the total indirect effect of self-compassion on anxiety could be attributed to taking a distanced perspective, whereas adopting an accepting self-perception was dominant in contributing to the indirect effect of self-compassion on depressive symptoms. Such dissimilar specific indirect effects have not been reported in the literature<sup>28</sup> and should thus be investigated in future studies to replicate and to better understand the nature of these effects. From a psychological perspective, self-acceptance could be especially effective in depressed patients who often hold a negative self-view, whereas taking a distanced perspective

might be particularly useful for reducing hypervigilance and excessive worrying in anxious patients.<sup>38</sup> The discrepancies in internal consistency of both decentring subscales could also have contributed to this finding.

In sum, our results suggest that the beneficial effects of self-compassion on anxiety and depressive symptoms found in other populations<sup>14</sup> might extend to the population of LVAD patients. Given the correlational research design of the present study, no causal inference can be drawn. The inverted models with anxiety and depressive symptoms as predictors and self-compassion as outcome fit the data equally well. The differences that emerged for single regression coefficients can be attributed to unequal numbers of predictors in the hypothesized models vs. the inverted

**Table 5** Multiple logistic regression models predicting functional health status from self-compassion controlling for anxiety (Model A) and depressive symptoms (Model B)

	<i>b</i>	SE <sup>a</sup>	<i>P</i>	OR	95% CI OR [LB; UB]
Model A (controlling for anxiety)					
Constant	9.441	4.555	0.038		
Anxiety (HADS)	0.041	0.113	0.717	1.042	[0.835; 1.299]
Self-compassion (SCS)	-2.393	1.142	0.036	0.091	[0.010; 0.858]
$R^2 = 0.172$ (Cox & Snell), 0.261 (Nagelkerke), 0.193 (McFadden). Model $\chi^2_{(2)} = 8.29$ , $P = 0.016$					
Model B (controlling for depressive symptoms)					
Constant	8.213	4.077	0.044		
Depressive symptoms (HADS)	0.133	0.127	0.293	1.142	[0.891; 1.464]
Self-compassion (SCS)	-2.192	1.063	0.039	0.112	[0.014; 0.898]
$R^2 = 0.195$ (Cox & Snell), 0.297 (Nagelkerke), 0.203 (McFadden). Model $\chi^2_{(2)} = 9.55$ , $P = 0.008$					

LB, lower bound; OR, odds ratio; UB, upper bound.

Coding: 0 = NYHA class I, 1 = NYHA class II/III.

<sup>a</sup>Heteroscedasticity consistent standard error (Huber–White).

models. A reasonable assumption is that a bidirectional causal relationship between self-compassion and psychological adjustment is highly likely. For example, a patient possessing low self-compassion may be less capable to take a decentred perspective and therefore be more vulnerable to anxiety and depressive symptoms, which in turn could further decrease self-compassion.

Beyond the covariation of self-compassion with psychological adjustment, self-compassion also predicted the clinically rated functional health status. Patients with higher self-compassion showed a lower probability for an impaired functional health status compared with patients who reported less self-compassion. This result was robust when controlling for anxiety and depressive symptoms and is remarkable for two reasons. First, the result demonstrates that self-reported self-compassion is also associated with relevant outcomes when employing different measurement methods. Second, the finding suggests that the potential beneficial effects of self-compassion may generalize across different aspects of adjustment. The extent of these effects should be investigated in future studies.

### Limitations and future research

The present study has some limitations to be discussed. Most importantly, the data rely on a cross-sectional correlational research design. As already stated, the observed covariation between individual differences in self-compassion and the experience of anxiety and depressive symptoms cannot be causally interpreted. In the future, longitudinal data would allow investigating the causal relationship between self-compassion and psychological adjustment more rigorously. Additionally, RCTs examining the effects of interventions to boost self-compassion could add confidence to self-compassion as a protective factor for psychological adjustment in LVAD patients.

A second limitation is that patients were recruited only from one medical centre, which could have led to a biased

sample. However, the sociodemographic characteristics and the clinical information of the present study sample were not very different from the sample characteristics of other studies.<sup>4</sup> Future research should draw a larger sample of LVAD patients from multiple medical centres to avoid sampling bias and to increase statistical power.

A third limitation lies in the low internal consistency of the self-accepting perception subscale of the Experience Questionnaire. Gecht *et al.*<sup>39</sup> reported acceptable reliability for both subscales in their validation study of the German version but noted that the items were originally developed to measure the effects of MBCT. The participants of the present study represent a very different clinical population and might have had difficulties relating item content to their personal experience, which subsequently could have contributed to the reduced internal consistency. The recently developed Metacognitive Processes of Decentering Scale<sup>40</sup> may serve as an alternative instrument in future research.

Several additional research questions can be investigated to better understand the effects of self-compassion on LVAD patient outcomes, for example, investigating the extent that self-compassion effects generalize across different LVAD treatment strategies, patient characteristics, and aspects of adjustment. Another research goal could be to test the long-term effects of self-compassion as well as different forms of interventions in enhancing self-compassion in LVAD patients.

### Conclusions

The present study provided preliminary evidence that self-compassion might facilitate psychological adjustment in LVAD patients and that it is associated with better functional health. Consequently, self-compassion interventions should be considered seriously as a means in outpatient follow-up care to support LVAD patients in their adjustment. Diverse interventions that support patients are available ranging from short psychoeducational to more intensive therapeutic programmes.<sup>15,17,18,29,30,41</sup> The implementation and evalua-



tion of such interventions for LVAD patients remain an important and promising task for the future.

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## Conflict of interest

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