Psychiatr. Pol. 2021; 55(2): 331–344
PL ISSN 0033-2674 (PRINT), ISSN 2391-5854 (ONLINE)
www.psychiatriapolska.pl
DOI: https://doi.org/10.12740/PP/118055

Mediating effect of coping strategies on the relation between social support and depressive symptoms among patients after cardiac transplantation

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Summary

Aim. This study aimed to evaluate the role of different types of coping strategies as a mediator in social support and depressive symptoms among patients after cardiac transplantation.

Method. 123 participants after heart transplantation took part in the study. All the participants completed self-report questionnaires using the following instruments: *Beck Depression Inventory Short Form* (BDI-SF), *Berlin Social Support Scales* (BSSS) and *Coping Orientation to Problems Experienced* (the Brief COPE).

Results. Actually received social support and perceived available social support (both emotional and instrumental) proved to have a significant direct impact on the occurrence of depression. Coping strategies mediated the correlation between the actually received social support, the perceived available emotional social support and depressive symptoms. The individuals with low perceived available support and the actually received social support (both emotional and instrumental), as well as those resorting to the coping strategies of avoidance and denial, proved to be prone to experiencing depressive symptoms. A significant mediating effect on depressive symptoms was identified between active coping, planning, positive reframing, self-blame, and the actually received support.

Conclusions. All social support types were found to be directly correlated with symptoms of depression. Coping strategies proved to mediate the correlation between the perceived social support and depression.

Key words: support, depression, transplantation

Introduction

Cardiac transplantation (HTx) is the most effective treatment method applied at the final stage of heart failure [1]. Numerous studies are available confirming the effectiveness of heart transplant treatment, both in terms of reduction of mortality and improvement of the quality of life. The psychosocial status of recipients, however, is not only an integral part conditioning this quality but is also an important predictor of morbidity and mortality after heart transplantation [2]. The research conducted in the area of psychosocial functioning of heart transplant recipients clearly indicates that stress coping strategies, access to social support, and possible symptoms of depression have a significant impact on the adaptation to life with an organ transplant [2].

Depression is a major psychiatric disorder commonly manifested in a significant number of HTx recipients (estimated prevalence 20-30%) [3]. Literature on this subject has shown that individuals with symptoms of depression exhibit lower patient compliance [4]. This is a particularly significant problem in the case of heart transplant recipients, where strict adherence to recommendations, including those concerning multidrug therapy, directly impacts the patient's life. A recently published meta-analysis by Dew et al. [5] dedicated to the subject of depression and mortality has found depression to be correlated with a 65% higher risk of post-transplant mortality.

Coping refers to a wide range of strategies, both behavioral and cognitive, used to manage stress effectively. The strategy used is the result of a process consisting of cognitive, behavioral and emotional effort to remedy stressful events [6]. Activities that are characteristic of coping include planning, goal setting, organizing, and providing mental stimulation [7]. However, the available literature lacks information about which of the strategies can most often be identified in the group of patients after heart transplantation. Based on the available data, we know that depending on the various strategies of coping with stress used by patients, their perception of available support and the possibilities of using it changes [8]. According to the transactional model of stress, social support is listed as a personal resource that can affect coping and psychological adaptation to illness, as well as struggling with or overcoming stressful events [6, 9].

Social support is defined as a resource provided to us through interactions with other people [10]. The following four types of social support are distinguished: (a) informational support, (b) emotional support, (c) appraisal support, and (d) instrumental support [10]. The first of the listed types of social support involves informing or advising another individual in need, particularly solving problematic situations. Oftentimes, appraisal support is considered part of informational support. It involves communicating the key information that is relevant in self-evaluation situations. Emotional support includes providing care, love, trust and empathy, as well as respect and admiration. Instrumental support consists of providing tangible goods and services (e.g., money or groceries, finishing work assigned to someone else) [11]. Perceived support represents a personal

view of the extent of social support that could be obtained from social network groups and represents the cognitive part of social support. In turn, received social support can be regarded as a behavioral component of social support, as it requires interpersonal interactions to take place [12].

In the literature, most of the HTx recipients report a positive perception of interpersonal relationships, and a positive correlation was identified between social support and recovery outcomes [2, 13]. In turn, a lack of social support often results in anger and depression [14]. According to the transactional model of stress and coping, social support can affect how people become mentally accustomed to a medical illness [15].

Aim

This study aimed to evaluate the role of different types of coping strategies as a mediator in social support and depressive symptoms among patients after cardiac transplantation.

Material

This study is a continuation of the study on the role of personal resources in the context of depressive symptoms in heart transplant recipients. The study participants were recruited from a transplant surgery unit of a specific center, and the selection of the study group was not random. Data collection was performed from June 2012 to June 2014. All participants provided their informed consent for the study. The timeframe for the assessment of the medical examinations was specified as up to 3 months before the date of completion of the questionnaire. The study protocol was approved by the bioethics committee (KBET/246/B/2012) and implemented in line with universal ethical principles.

The study included a group of 180 subjects who had undergone cardiac transplantation between 1 year and 20 years before the study. The inclusion criteria were as follows: (1) age ≥18 years, (2) ≥1 year following the HTx procedure, (3) informed consent for participation in the study, and (4) ability to follow directions and answer the questions. As many as 123 participants met the inclusion criteria. The minimal sample size for a 5% margin of error with a confidence interval of 0.95 was 123.

The respondents were aged 18 – 77 years (mean 54.8 years; SD = 13.25), and there were more males (93; 75.6%) than females in the study group. Most study participants were married and lived within the city. The average time elapsed since the heart transplantation was estimated at 9.90 years (±5.43; median 11).

Methods

Instruments

All participants completed the self-report questionnaires using the following standardized research instruments:

a) *Beck Depression Inventory – Short Form* (BDI-SF) containing 13 items was used to measure depressive symptoms. The depression severity scale involves the following cutoffs: 0-4 – absent or minimal, 5-7 – mild, 8-15 – moderate, 16+ – severe. This inventory is characterized by high internal consistency, with alpha coefficients of 0.86 and 0.81 for psychiatric and non-psychiatric populations, respectively. The internal consistency reliability was estimated at 0.78 for the short form [16];

b) *Berlin Social Support Scales* (BSSS) comprising 38 items were used to measure participants' satisfaction with social support. The scales contain 6 subscales (perceived available support (emotional and instrumental), need for support, support seeking, actually provided support, actually received support, and protective buffering). The results of psychometric properties confirmed BSSS to be internally consistent and that they can be applied as a valid measure of social support dimensions (Polish adaptation by A. Łuszczyńska) [10, 17];

c) *Coping Orientation to Problems Experienced* (the Brief COPE) scale is a 28-item tool comprising 14 coping strategies (2 items per strategy). The score ranges from 0-3. Interpretation can also be made on the basis of the Brief-COPE factor structure, where seven factors have been identified: active coping (questions 1-3), helplessness (questions 12-14), support seeking (questions 7 and 8), avoidant behaviors (questions 9-11), and independent factors: religion, acceptance, humor. This abbreviated version of the COPE is characterized by high internal consistency, with alpha coefficients ranging from 0.83 to 0.32. The internal consistency reliability was estimated at 0.78 for the short form (Polish adaptation by Z. Juczyński) [18].

Data analysis

All statistical analyses were performed using the SPSS for Windows version 24.0 and R version 2.11.1. Descriptive statistics (i.e., patient demographics, treatment-related and psychometric data) were presented as means, medians (*Me*), standard deviations (*SDs*), and frequency (%). To compare the variables, the independent-samples t-test was used. The assessment of correlations occurring between the quantitative variables was performed using Spearman's correlation coefficient (e.g., social support, coping strategies and depression). Univariate and multivariate logistic regression analyses were carried out to identify the risk factors for symptoms of depression. The factors

that were statistically significant in factor analyses were included in multivariate logistic regression models.

AMOS (version 20) was used for Structural Equation Modeling (modeling mediators of the depression relationship). A value of $p \leq 0.05$ was considered statistically significant.

Results

Characteristics of satisfaction with social support

The mean score for the subscale of perceived social support was 2.87, 2.80 for the need for support, 2.77 for support seeking, and 3.12 for actually received support. According to our findings, most respondents reported high satisfaction with both the received and the perceived available support (Table 1).

Coping strategies

The sample group used all the coping subscales, with those most frequently used by the study participants being active coping strategies, planning, and acceptance (Table 1).

Table 1. **Descriptive statistics for social support and coping strategies (n = 123)**

Item	Mean	Standard deviation	Minimum-maximum
Social support			
Perceived emotional support	3.30	0.61	1.25-4
Perceived instrumental support	3.36	0.66	1-4
Perceived available support	2.87	1.15	1.25-4
Need for support	2.80	0.57	1,25-4
Support seeking	2.77	0.78	1-4
Actually received support	3.12	0.56	1.13-4
Coping strategies			
1. Active coping	2.19	0.58	0.5-3
2. Planning	2.09	0.65	0-3
3. Positive reframing	1.83	0.62	0-3
4. Acceptance	2.07	0.66	0-3
5. Humor	1.05	0.76	0-3
6. Religion	1.49	1.00	0-3
7. Use of emotional support	1.79	0.69	0-3
8. Use of instrumental support	1.71	0.67	0-3
9. Self-distraction	1.70	0.79	0-3

table continued on the next page

10. Denial	1.06	0.75	0-3
11. Venting	1.22	0.62	0-3
12. Substance use	0.26	0.45	0-2
13. Behavioral disengagement	0.87	0.67	0-3
14. Self-blame	1.25	0.69	0-3

Depressive symptoms

The scores for symptoms of depression varied across four different levels based on the criteria developed by Beck et al [16]. The average BDI score was 6.24 ± 5.31, and 53 (40.45%) of the participants demonstrated significant depressive symptoms (BDI > 8). Half of these respondents (50.4%) reported the level of depression to be low, 8.9% described it as mild, 36% as moderate, and 4% as severe. No statistically significant difference was found between the time elapsed since transplantation and the presence of depressive symptoms (10 years after transplantation, $p > 0.5$).

Correlations between social support, coping strategies and depression

Depression was found to be inversely correlated with the actually received support ($r = – 0.23$; $p < 0.01$) and perceived available support – both emotional and instrumental ($r = – 0.41$; $p < 0.001$; and $r = – 0.47$; $p < 0.01$, respectively). The following coping strategies were positively related with depression: denial ($r = 0.24$; $p < 0.01$), emotional support seeking ($r = 0.22$; $p < 0.05$), substance use ($r = 0.25$; $p < 0.01$), self-distraction ($r = 0.44$; $p < 0.01$), and self-blame ($r = 0.32$; $p < 0.001$). An inverse correlation was identified between depression and the following coping strategies: active coping ($r = 0.31$; $p < 0.01$), planning ($r = – 0.32$; $p < 0.001$) and positive reframing ($r = – 0.31$; $p < 0.001$). The results are presented in Table 2 and Table 3.

Table 2. **Correlation matrix for social support and depression**

			Depression	Emotional support	Instrumental support	Perceived support	Need for support	Seeking support	Actually received support
r	Depression	*r*		-0.414**	-0.467**	0.113	0.046	-0.128	-0.232*
		p		0.000	0.000	0.214	0.612	0.157	0.010

* Significance at 0.05 level (two-tailed), ** significance at 0.01 level (two-tailed).

Table 3. **Correlation matrix for coping strategies and depression**

Coping strategies	Depression	
	R	Significance (two-tailed)
1. Active coping	-0.307**	0.001
2. Planning	-0.321**	0.000
3. Positive reframing	-0.311**	0.001
4. Acceptance	-0.336**	0.000
5. Humor	0.006	0.946
6. Religion	-0.042	0.647
7. Use of emotional support	-0.148	0.108
8. Use of instrumental support	-0.114	0.213
9. Self-distraction	-0.022	0.809
10. Denial	0.236**	0.009
11. Venting	0.224*	0.014
12. Substance use	0.254**	0.005
13. Behavioral disengagement	0.435**	0.000
14. Self-blame	0.318**	0.000

** Significance at 0.01 level (two-tailed).

* Significance at 0.05 level (two-tailed).

Multifactorial model for predicting the occurrence of depression

Logistic regression analysis was conducted in order to create a model for predicting the occurrence of depression. The analysis revealed a significant role of the following variables: age, marital status, emotional strategies, instrumental strategies, perceived support, the need for support, support seeking, actually received support, and gender (χ^2 (9) = 43.55; $p < 0.001$). An analysis of the variation coefficient showed that the model explained from 30% to 42% variation in the results of the occurrence of depression symptoms. The Cox and Snell R-square coefficient was 0.3, and the Nagelkerke R-square was 0.42. Calibration remained good with Hosmer-Lemeshow analysis (χ^2 (8) = 4.09; $p > 0.05$). The analysis of the model coefficients demonstrated that the most significant and strongest impact on depressive symptoms was exerted by the need for support and the female gender. The development of depressive symptoms was hindered by such variables as marital status (single, divorced, widowed), emotional and instrumental strategies, and perceived available support. The results are presented in Table 4.

Table 4. **Regression model for depressive symptoms**

		B	*P* value	Exp *(B)*	95% CI	
					From	To
Model	Age	0.03	0.162	1.03	0.99	1.08
	Marital status (single)	-2.09	0.006	0.12	0.03	0.54
	Emotional support	-1.79	0.009	0.17	0.04	0.64
	Instrumental support	-1.64	0.006	0.19	0.06	0.63
	Perceived available support	-1.82	0.001	0.16	0.06	0.47
	Need for support	2.31	0.000	10.12	3.06	33.39
	Support seeking	0.15	0.694	1.16	0.55	2.45
	Actually received support	-0.24	0.584	0.79	0.33	1.85
	Gender (female)	2.25	0.001	9.52	2.46	36.93
	Constant	0.31	0.893	1.36		

In order to verify the predictions regarding mediation, an analysis was conducted using AMOS.

1) The analysis indicated a total mediating effect of the active coping strategy on the correlation between the actually received support and depression.
Correlation analysis demonstrated a relationship between the actually received support and depression ($r = -0.23$; $p < 0.05$). After introducing a mediator, which was the active coping strategy, the relationship between these variables turned out to be insignificant ($\beta = -0.04$; C. $R = 0.05$; $p = 0.960$). The active coping strategy, however, proved to be an important mediator of the correlation

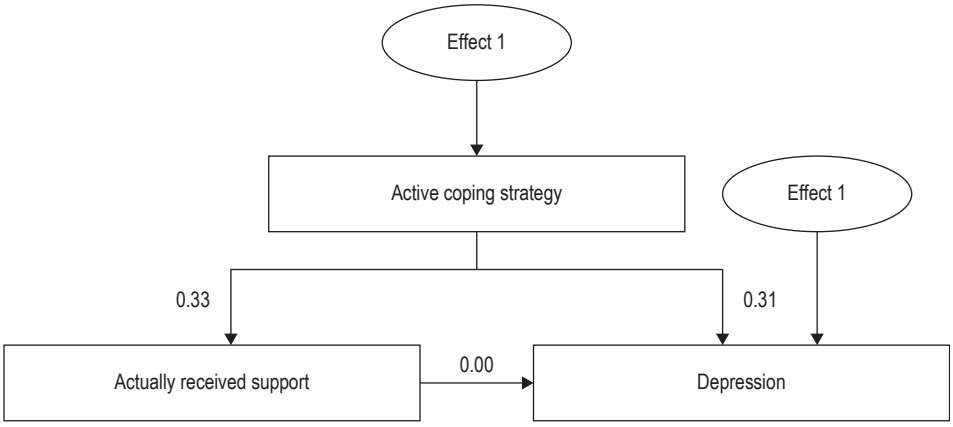

Figure 1. **Model of the mediation role of the active coping strategy on the relationship between social support and depressive symptoms**

between the actually received support and depression ($i = -0.10$; $p < 0.001$ (Lb = – 0.04 – UB = – 0.23). The analysis showed that the actually received support had a significant influence on the active coping strategy (β = 0.33; C. $R = 3.75$; $p < 0.001$), and that the active coping strategy had a significant inverse impact on the level of depression (β = – 0.31; C. $R = 3.38$; $p < 0.001$) (Figure 1).

2) The analysis indicated a total mediating effect of the planning strategy on the correlation between the actually received support and depression.
Correlation analysis demonstrated a relationship between the actually received support and depression ($r = -0.23$; $p < 0.05$). After introducing a mediator, which was the planning strategy, the relationship between these variables turned out to be insignificant (β = – 0.18; C. $R = 0.22$; $p = 0.830$). The planning strategy, however, proved to be an important mediator of the correlation between the actually received support and depression ($i = -0.9$; $p < 0.001$) (Lb = – 0.03 – UB = – 0.13). The analysis showed that the actually received support had a significant effect on the planning strategy (β = 0.26; C. $R = 2.96$; $p < 0.001$), and that the planning strategy had a significant inverse impact on the level of depression (β = – 0.33; C. $R = 3.68$; $p < 0.001$).
3) The analysis indicated a total mediating effect of the positive reframing strategy on the correlation between the actually received support and depression.
Correlation analysis demonstrated a relationship between the actually received support and depression ($r = -0.23$; $p < 0.05$). After introducing a mediator, which was the positive reframing strategy, the relationship between these variables turned out to be insignificant (β = – 0.25; C. $R = 0.31$; $p = 0.760$). The positive reframing strategy, however, proved to be an important mediator of the relationship between the actually received support and depression ($i = -0.08$; $p < 0.001$) (Lb = – 0.02 – UB = – 0.16). The analysis showed that the actually received support had a significant effect on the positive reframing strategy (β = 0.26; C. $R = 2.95$; $p < 0.001$), and that the positive reframing strategy had a significant inverse impact on the level of depression (β = – 0.30; C. $R = 3.68$; $p < 0.001$).
4) The analysis indicated a partial mediating effect of the self-blame strategy on the correlation between the perceived available emotional support and depression.
Correlation analysis demonstrated a relationship between the perceived available emotional support and depression (β = – 0.34; $p < 0.05$). After introducing a mediator, which was the self-blame strategy, the relationship between these variables turned out significant to a lesser degree (β = – 0.29; C. $R = 3.44$; $p < 0.001$). The self-blame strategy, however, proved to be an important mediator of the relationship between the perceived available emotional support

and depression ($i = -0.05$; $p < 0.001$) (Lb = – 0.00 – UB = – 0.13). The analysis showed that the perceived available emotional support had a significant negative effect on the level of the self-blame strategy (β = – 0.18; C. $R = 2.00$; $p < 0.05$), and that the self-blame strategy exerted a significant positive effect on the depression levels (β = 0.25; C. $R = 2.95$; $p < 0.01$).

Discussion

The main objective of this study was to evaluate the role of coping strategies as a mediator between social support and depressive symptoms among patients after cardiac transplantation. The presented results of the study demonstrated that all types of social support turned out to be directly correlated with depressive symptoms. The coping strategies revealed their mediating effect on the correlation between perceived social support and depression.

There is still a deficiency of literature examining the correlation between types of social support, coping strategies, and depression in cardiac transplant recipients. Our findings from this study contribute to this area by describing the role of social support and coping strategies in predicting depression. The results obtained in the course of this study also indicate the need to a wider consideration of the psychological state of HTx recipients – 53 (40.45%) of the subjects exhibited depressive symptoms. There is a lot of evidence of depressive symptoms worsening after cardiac transplantation, and the results of our study in this respect are similar to those presented in previous research [4, 5, 15, 16, 19].

Our sample group employed all the coping strategies subscales. The strategies that were most frequently used by the subjects included the active coping strategy (mean 2.19), planning (mean 2.09), and acceptance (mean 2.07), which belong to the problem-focused strategies. The findings obtained in this study are consistent with previous research. Pfeifer et al. [20] assumed in their study that the respondents used all coping styles with a predominance of the problem-focused strategies. Grady et al. [21] reported that the patients applied more positive coping strategies, i.e., they tried to think positively, keep a sense of humor, live a life as normal as possible. Kaba et al. [22] also found that HTx recipients use different coping strategies: acceptance/optimism, denial/avoidance, seeking social support, faith and changing priorities.

According to the study results, the respondents were largely satisfied with the provided social support. The majority of the study participants reported high satisfaction with both the actually received and the perceived available support. White-Williams et al. [13] revealed that patients were very content with both emotional and instrumental social support over time, which is also consistent with our findings.

The study we have conducted shows that low social support, particularly the actually received support and both emotional and instrumental perceived available support, were correlated with high levels of depression (from $r = -0.23$ to $r = -0.46$). These

findings are supported by previous research and theoretical assumptions [13, 23]. Moreover, maladaptive coping strategies (denial, venting, substance use, behavioral disengagement and self-blame) were found to be related to severe depression. Adaptive coping strategies (active coping, planning and positive reframing) had a direct impact on low levels of depression. Similar results were reported by Allman et al. [23], who provided in their study a critical evaluation of the evidence associated with depression and coping in heart failure patients and determined whether particular types of coping are more commonly observed in heart failure patients suffering from depression. In their review, the authors observed a tendency to use adaptive coping strategies (e.g., active coping, acceptance, and planning), which were associated with a lower level of depression. The respondents who resorted to maladaptive coping methods, such as denial and disengagement, more frequently exhibited severe depression [23].

We found that the strategies of self-blame, active coping, and planning have a significant mediating effect on the correlation between the perceived available emotional support and depression. Thorsteinsson et al. [24] examined the mediating effect of social support and coping strategies on the stress-depression relationship in rural and urban adolescents. According to their findings, the maladaptive coping strategy and social support were partial mediators of the relationship between perceived stress and depression [9, 24]. In the study conducted by Greenglas et al. [25], proactive coping strategies and social support were negatively correlated with depression. What is more, social support was found to be indirectly related to depression through a proactive coping strategy. We have obtained identical results in our study. The mediating impact has been demonstrated for the following coping strategies: active coping, positive reframing, and planning.

The subjects' perception of social support was inversely correlated with depression. This result is consistent with the findings reported by Dew et al. [26] and Sirri et al. [27]. In another study investigating the role of social support and mental distress in lung transplant candidacy, a low level of social support was associated with depression, anxiety, and seeking support ($p < 0.01$). Following the introduction of other factors related to these variables, social support explained a significant proportion of the variance in depression (9%, $p < 0.001$) [28]. Rybarczyk et al. [29] also proved lower satisfaction with emotional support to be a significant predictor of psychological adjustment, whereas Dobbels et al. [30] estimated the prevalence of depression symptoms at 30% at 5 years and 22% at 10 years after HTx. Those patients had significantly higher scores on passive coping and had significantly lower club membership.

Study limitations

The primary limitation of this study was that it was a single-center study. Another limitation was the size of the sample group. Hence, our findings may not be generalizable.

Conclusions

1. All types of social support were found to be directly related to depression. Coping strategies proved to mediate the correlation between perceived social support and depression, with a direct impact on the latter.
2. Variables: level of satisfaction with social support (both emotional and instrumental perceived available support), the received support, the need for support, seeking support, and female gender predict depressive symptoms.
3. The analysis showed that coping strategies have a mediating effect on the correlation between social support and depressive symptoms.

Relevance to clinical practice

The obtained results indicate that the evaluation of social support and coping strategies should be an integral part of the assessment of the patient after heart transplantation. The results also suggest that increasing satisfaction with social support (support received) by strengthening adaptive strategies to manage depression may be beneficial for patients after heart transplantation. It is necessary to replace non-adaptive coping strategies with adaptive strategies and increase the level of social support.

Disclosure
The authors have no conflicts of interest to declare.

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