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Heart-Focused Anxiety as a Mediator Between Illness Perception and Negative Affect in Cardiac Patients

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Abstract

Backgrounds: Psychosocial risk factors related to cardiovascular diseases (CVDs) are associated with disease outcomes, quality of life, and higher mortality and morbidity. Common-Sense Model of Illness suggests that when people are confronted with an illness, they interpret their somatic sensations and develop their own perceptions of that illness in order to make sense of their condition. The way patients interpret their illness may lead to the occurrence of depression and anxiety. The aim of this research was to examine a possible mediating role of heart-focused anxiety (HFA) in the relationship between illness perception and depression and general anxiety. It was hypothesized that HFA would mediate the relationship between illness perceptions and depression/anxiety. Patients with more positive beliefs about the controllability of their illness would experience lower HFA and, as a result, lower levels of depression and general anxiety.

Methods: A total of 177 patients (70.6% male; mean age 63.4 years) hospitalized for major cardiac events participated in the study. They completed the Revised Illness Perception Questionnaire, the Cardiac Anxiety Questionnaire, and the Hospital Anxiety and Depression Scale.

Results: The results of the study clearly show that patients with CVD who express more positive beliefs about the disease, in terms of controllability, show fewer symptoms of anxiety and depression. Focusing on heart symptoms mediates the development of anxiety and depression, but only in CVD patients who believe that they cannot control their disease by treatment. Avoidance of certain activities is not significantly related to a person's perception of how well they can control the illness by themselves, but shows significant, although low, negative correlations with treatment control.

Conclusions: Psychological intervention for CVD patients designed to improve the understanding of cardiac disease and its symptoms and to modify maladaptive beliefs about the controllability of the illness may reduce HFA, as well as the negative affect in cardiac patients. The limitations of this study include the lack of patient follow-up after discharge from the hospital and a relatively small sample size. A significant contribution of this research is the better understanding of the beliefs about the disease in the recovery process and coping with CVD symptoms.

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1. Introduction

Psychosomatic disorders are somatic illnesses caused or exacerbated by mental stress and distress. Many diseases have psychosomatic contributors (Bransfield & Friedman, 2019; Myles & Merlo, 2021), such as heart disease (Sheikh et al., 2019), irritable bowel syndrome (Kano et al., 2020), gastrointestinal disorders (Kano et al., 2018), skeletal muscle and rheumatic disease (Marchi et al., 2019). The most common chronic somatic illnesses, such as diabetes mellitus (Martino et al., 2019a, 2019b), neoplastic diseases, cardiovascular disease (Suciu & Cristescu, 2017), dermatological problems (Baysak et al., 2020), asthma, arthritis, and osteoporosis are often complicated by psychiatric symptoms or subjective emotional suffering (Conversano, 2019; Sprangers et al., 2000).

Cardiovascular diseases (CVDs) are the leading cause of death in Croatia, with a share of 43.7% of total mortality in 2018 (Croatian Institute of Public Health, 2019). According to the World Health Organization, 17.9 million people died from CVDs in 2019, representing 32% of all global deaths (WHO, 2021). In Croatia, this percentage is significantly higher, and although it is geographically a Mediterranean country, due to the high rate of cardiovascular mortality, it ranks among the Central and Eastern European countries that are at high risk for development of CVDs (Croatian Institute of Public Health, 2019).

Psychosocial risk factors that occur in CVDs, impair the quality of life (Staniute et al., 2015), and predict an increase in mortality and morbidity (Kupper & Denollet, 2018). One of the significant risk factors for the development of CVDs is type D personality. Numerous studies have shown the association of type D personality with symptoms of depression, anxiety and chronic stress (Kim et al., 2017; Lambertus et al., 2018; Pedersen & Denollet, 2006; Starrenburg et al., 2013), propensities for maladaptive coping styles, as well as increased risk of adverse prognosis (Booth & Williams, 2015; Borkoles et al., 2018), independently of traditional biomedical risk factors, including disease severity (Pedersen & Denollet, 2006). The Type D personality combines two stable traits, i.e., propensity to experience negative emotions (e.g., fear, sadness, irritability), and social inhibition in different situations (e.g., reluctance to share emotions in social interactions for fear of rejection or disapproval) (Denollet, 2005; Kessing et al., 2016; Kupper & Denollet, 2018). It is stable over time, has a significant underlying genetic component (Kupper et al., 2011), occurs in one of four patients (Grande et al., 2012), and such a personality is a factor of vulnerability for future episodes of emotional distress such as depressive episodes (Al-Qezweny et al., 2016; Doyle et al., 2011) and anxiety (Al-Qezweny et al., 2016).

Outcomes of CVDs depend on many factors, including the psychosocial ones. Among them, depression and anxiety are of particular importance. They are linked to major adverse cardiac events rehospitalisation and death, independent of traditional risk factors (Pedersen et al., 2017). Depression and anxiety are commonly present among patients with various cardiac conditions, and their prevalence rates are considerably higher than in the healthy population (Kapfhammer, 2011; Moser et al., 2010). For example, up to 47% of patients hospitalized for acute myocardial infarction have clinically significant levels of depression (Thombs et al., 2006), and the prevalence of anxiety goes up to 45% for patients with chronic heart failure (Morgan et al., 2014). However, regardless of its high rate of occurrence in cardiac populations, depression and anxiety often go unrecognized and untreated, and as such can be present for months and beyond (Thombs et al., 2006). By influencing the patients' behaviour, these disorders predict adverse short- and long-term cardiac outcomes (Compare et al., 2011).

According to the cognitive behavioural disorder model, somatic symptoms are perceived more strongly and are emotionally misjudged when both distress and minor physical symptoms are present (Rief & Broadbent, 2007). In a person who suffers from CVD and whose mood has lowered during hospitalization, the depressive symptoms may result from a biological change secondary to the physical illness itself, or may reflect a maladaptive cognitive response or inability to cope with the illness (Lynch & Stevens, 1985). Based on this theoretical hypothesis, it is necessary to assess the cognition of patients with CVDs, clarify and correct the factors that cause misconceptions, replace the original unadjusted behaviour, and bring positive feedback to emotions (Zhong & Zhou, 2021). Cognitive theory also implies that emotional responses of patients to the disease are mediated by the way patients perceive their own illness. The model known as the Common-Sense Model of Illness, or the Self-Regulatory Model described by Leventhal et al. (1992), suggests that when people are confronted with an illness, they interpret their somatic sensations and develop their own perceptions or representations of that illness, in order to form a more complete picture and make sense of their condition. This model proposes that patients' illness representations generally include five key components: symptoms that patients associate with their illness, patients' beliefs about the causal factors of their illness, beliefs about the time-course of their illness, about how well they can control the illness by themselves, or how well the illness can be controlled by treatment, and the impact of the illness on the patients' lives. Despite of having the same diagnosis, different patients may have very different perceptions of their disease (Petrie et al., 2007), and the way patients view their illness directly influences their illness-specific behaviours, coping strategies and emotional response to the illness (Petrie & Weinman, 2006).

Morgan and associates (2014) emphasized that in clarifying the occurrence of depression and anxiety in cardiac patients, illness perceptions have a main role, more than other known covariates, and should always be taken into account when investigating causes of those emotional disorders. Moreover, Johnson and Morse (1990) suggest that regaining a sense of control is the core process in psychosocial recovery after a cardiac event. Several studies have shown that belief in the ability to control the course of illness is important, not only for patients' behaviour, but also for patients' mood (Hirani & Newman, 2005). Positive beliefs about controllability of diseases are inversely related to negative emotional representations (Moss-Morris et al., 2002). A study showed that patients who demonstrated a sense of control over their cardiac disease reported lower levels of depression and anxiety, even after socio-demographic variables and functional status were controlled for (Morgan et al., 2014). Moss-Morris and her associates (2002), who further expanded Leventhal's model (1992), suggest that a distinction should be made between personal control, as a self-efficacy belief, and treatment control, as a belief in the efficacy of treatment itself.

Apart from having an impact on the development of depression and general anxiety, illness perceptions may influence the occurrence of heart-focused anxiety (HFA) in cardiac patients (Panzaru & Holman, 2015). HFA refers to the fear of cardiac-related stimuli and sensations based on their presumed negative consequences (Eifert et al., 2000). It differs from general anxiety as it is specific to the heart (Eifert et al., 1999), and it could be considered a subset of anxiety sensitivity (Taylor & Cox, 1998). Although to some extent dependent on subjective suffering, the intensity of HFA cannot be fully explained by the objective severity of cardiac disease (Muschalla et al., 2014). On the other hand, negative illness beliefs are associated with the occurrence of HFA (Eifert et al., 1996).

Eifert and associates (2000) believed that elevated HFA increases the probability of anxiety-related responding, regardless of an individual's medical condition. Accordingly, they suggest that the symptoms indicative of HFA are an overwhelming fear and worries of heart-related sensations, intensive focusing on heart functioning, and avoidance of activities believed to cause cardiac symptoms. HFA troubles a large number of cardiac patients. For example, 18% of people who survived sudden cardiac arrest report constant concern about their heart, even when they have normal test results (Rosman et al., 2015). Moreover, many studies have shown that individuals with higher levels of HFA experience higher emotional distress in the form of depression and general anxiety (e.g., Hamang et al., 2011).

The aforementioned effects of illness perceptions on heart-focused anxiety, as well as effects of HFA on depression and general anxiety, were well-documented in previous research. However,

little is known to date about the potential mediating effect of HFA on the association between illness perceptions on one side, and depression and general anxiety on the other. To better understand the factors that may affect depression and general anxiety in cardiac patients, further research is required.

The aim of the present research was to explore the relationship between some aspects of illness perceptions (namely, personal and treatment control), HFA (fear, attention and avoidance), and general anxiety and depression in patients diagnosed with cardiac diseases. The aim was also to examine the possible mediating role of HFA in the relationship between illness perceptions and depression/general anxiety. It was hypothesized that HFA mediates the relationship between illness perceptions and depression/general anxiety. Patients who have more positive beliefs about the controllability of their illness experience lower HFA and, as a result, lower levels of depression and general anxiety.

2. Materials and Methods

2.1. Participants

The research was conducted on a sample of cardiac patients hospitalized in the cardiology departments of the Clinical Hospital Centre Rijeka and County Hospital Thalassotherapia Opatija (Croatia) for a major cardiovascular event. A total of 177 patients (n=125 men and n=52 women) were enrolled in the study. The inclusion criteria for participation in the study were ischaemic heart disease, myocardial infarction, chronic heart failure or aortic stenosis. The average age of participants was 63.4 years (SD=11.78; ranged from 32 to 89 years), and the average body mass index (BMI) was 27.93 kg/m^2 (SD=4.27; 43.1% overweight and 29.3% obese patients). Of the subjects, 12.3% completed elementary school, 62.6% completed vocational or high school, and 25.1% held undergraduate or graduate degrees.

2.2 Measures

The patient's perceptions of their illness were evaluated using the Revised Illness Perception Questionnaire (IPQ-R; Moss-Morris et al., 2002). The IPQ-R evaluates 9 components of the illness representation based on Leventhal's Self- Regulatory Model. For the purpose of the present study, only 2 subscales were used: Personal control (6 items; e.g., "What I do can determine whether my illness gets better or worse") and Treatment control (5 items; e.g., "My treatment can control my illness"). All items were rated on a 5-point Likert scale (from *strongly disagree* = 1 to *strongly agree* = 5). Mean scores for each subscale were computed, with a possible range of scores from 1 to 5, and with higher scores representing more positive beliefs about the

controllability of the illness. In this sample, the Cronbach's alpha coefficient for Personal control was .66, and for Treatment control it was .71.

Heart-focused anxiety was assessed with the Cardiac Anxiety Questionnaire (CAQ; Eifert et al., 2000). The CAQ consists of 18 items that form 3 subscales: *Fear* (8 items; fear and worry regarding chest and heart sensations), *Avoidance* (5 items; avoiding activities believed to trigger cardiac symptoms), and *Attention* (5 items; increased heart-focused attention and monitoring of cardiac activity). All items were rated on a 5-point Likert scale regarding how frequently the behaviour typically occurs (from *never* = 0 to *always* = 4). Mean subscale scores were computed, with a possible range of scores from 0 to 4, and with higher scores representing greater heart-focused anxiety. Clinically elevated or cut-off scores for the CAQ subscales were defined as 2 SD above the mean of the non-cardiac comparison sample and were as follows: 2.47 for *Fear*, 2.82 for *Avoidance*, and 2.10 for *Attention* (Hoyer et al., 2008). In the present study, Cronbach's alpha coefficients for *Fear*, *Avoidance*, and *Attention* were .83, .81, and .67, respectively.

General anxiety and depression were measured with the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The HADS is a 14-item self-report screening scale for detecting the presence of psychological and cognitive symptoms relevant to general anxiety and depression; 7 items assess general anxiety (HADS-A), and 7 items assess depression (HADS-D) over the past 2 weeks. The items are rated on a 4-point scale (0 through 3). A total score for a subscale is obtained by summing the 7 items, with a possible range of scores from 0 to 21, and with higher scores representing more symptoms of general anxiety and depression. A score of 7 or less is considered to be within the normal range, a score between 8 and 10 is "a possible case", and a score of 11 or more is considered "a probable case" of general anxiety or depression. A cut-off score of 8 has been found to be optimal for case-finding. In the present study, the Cronbach's alpha coefficient for the HADS-A was .81, and the Cronbach's alpha coefficient for the HADS-D was .75.

All three questionnaires were translated to Croatian language by authors of this paper and an English translator. Backward translation method was used, and the questionnaires were adapted for the Croatian population.

2.3 Procedure

The data were collected during the subjects' hospitalization at the aforementioned hospitals. The subjects were asked to complete the self-assessment questionnaires. Questionnaires were administered by hospital psychologists and the medical team obtained the height and weight of each participant. Written informed consent was obtained from all individual participants

included in the study, and the study was approved by the ethics committee at university and each hospital.

2.4 Data analysis

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., 2017). To examine the relationship between all measured variables, we used Pearson correlation coefficients. To explore whether different aspects of HFA act as mediators between illness perceptions and depression/general anxiety, we used bootstrap method of mediation analysis. Mediation analyses were undertaken by using the PROCESS macro for SPSS, version 3 (Hayes, 2018). Percentile bootstrap confidence intervals were used for statistical inference about the significance of the indirect effects (level of confidence 95%), and 5000 bootstrap samples.

3. Results

Means, standard deviations and ranges for all used measures are presented in Table 1. To increase the informativeness of the descriptive data displayed in the table, relative mean subscale scores are shown for the IPQ-R and CAQ subscales. For HADS subscales, the mean scores were not divided by the number of items in the subscales because these subscales have cut-off scores.

Table 1. Means, Standard Deviations and Ranges for All Measures (*N*=177)

Scale name	*N* of items	*M*	*SD*	Range
IPQ-R				
Personal control	6	3.65	0.73	1.67-5.00
Treatment control	5	4.03	0.62	2.00-5.00
CAQ				
Fear	8	1.73	0.91	0-4.00
Avoidance	5	1.95	0.97	0-4.00
Attention	5	1.41	0.28	0-3.20
HADS				
General anxiety	7	5.23	3.88	0-16
Depression	7	4.94	3.75	0-17

Note: IPQ-R - Revised Illness Perception Questionnaire; CAQ - Cardiac Anxiety Questionnaire; HADS - Hospital Anxiety and Depression Scale; for IPQ-R and CAQ subscales, relative mean subscales scores are shown

The results indicated that participants in our study generally believed that their cardiac illness was controllable (personal control relative mean score = 3.65; treatment control relative mean score = 4.03). The results also revealed that they relatively rarely showed symptoms of HFA (relative mean score for fear, avoidance and attention were 1.73, 1.95 and 1.41, respectively). Their scores on CAQ subscales were on average lower than clinically significant scores.

Regarding the level of general anxiety, 12.6% showed signs of possible anxiety, and 11.4% of patients had anxiety. In terms of depressive symptoms, 11.4% had symptoms suggesting possible depression, and 10.3% of the patients had symptoms suggesting probable depression.

To examine the relationships among perception of illness controllability, HFA, general anxiety and depressive symptoms, we conducted a correlation analysis. Correlations between all measured variables are presented in Table 2.

Table 2. Correlations Between All Measured Variables (*N*=177)

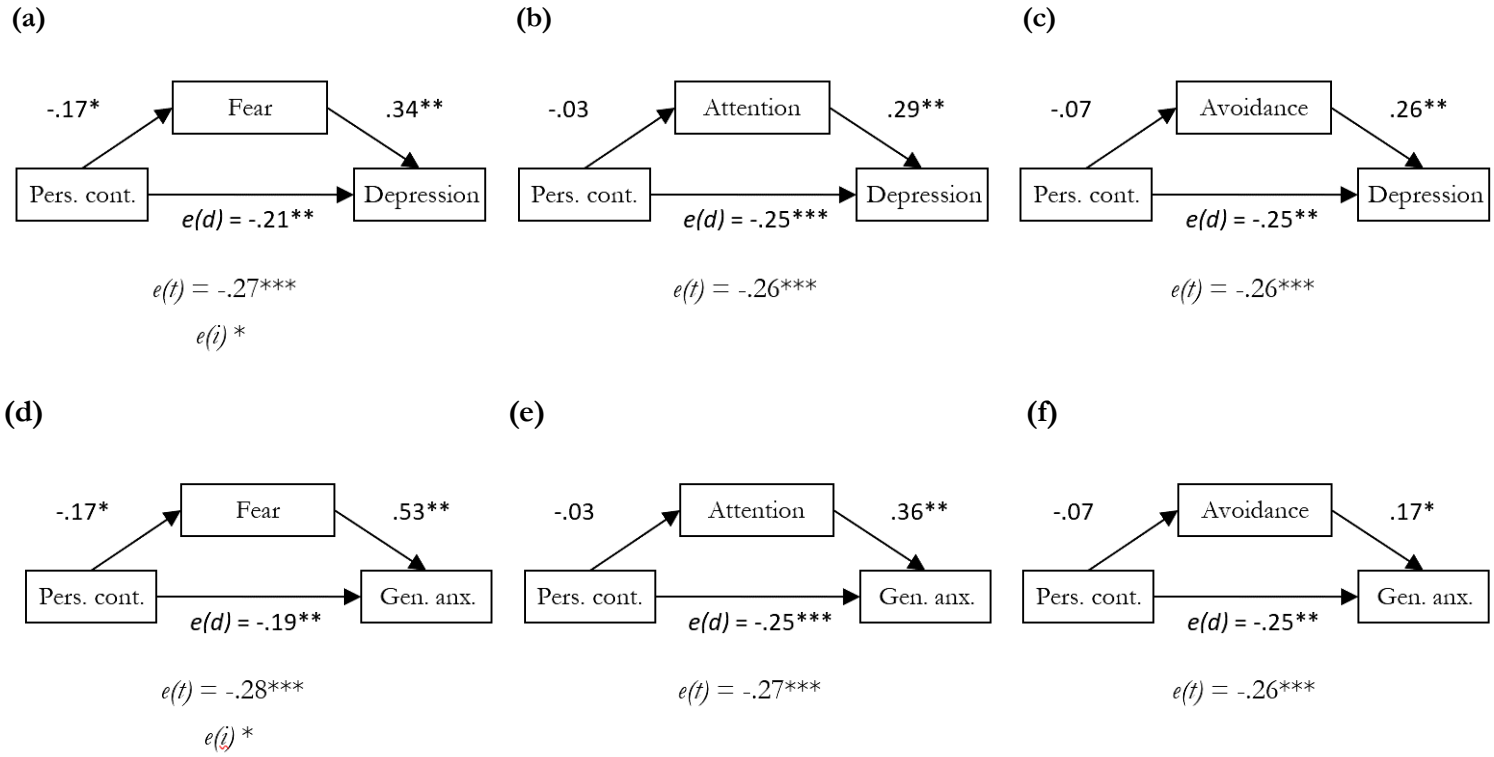
Variables	Treatment control	Fear	Avoidance	Attention	General anxiety	Depression
Personal control	.44***	-.19*	-.11	-.06	-.26**	-.30***
Treatment control		-.26**	-.16*	-.23**	-.36***	-.33***
Fear			.38***	.50***	.53***	.39***
Avoidance				.37***	.21**	.31***
Attention					.37***	.29***
General anxiety						.67***

Note. *p<.05; **p<.01; ***p<.001

As Table 2 shows, positive beliefs about controllability were negatively correlated with HFA in cardiac patients. Higher perceived efficacy of treatment was related to lower levels of fear and concern regarding heart sensations, paying less attention to cardiac activity, and less frequent avoidance of activities that may trigger cardiac symptoms. Correlation analyses showed that patients with more positive beliefs about personal control over their illness were less afraid and showed lower concern for their heart sensations. However, no significant correlations between beliefs about personal control and avoidance of activities that could elicit cardiac symptoms, or between personal control and focusing on heart activity, were found.

An analysis of the correlation matrix (Table 2) reveals that HADS-A and HADS-D scores correlated significantly with scores on all other measures (ranging from .21 to .53). Patients with a higher level of general anxiety, as well as those with a higher level of depression, believed that they had no personal or medical control over their illness. In addition, they felt more fear and showed greater concern regarding heart sensations, focused more attention on their cardiac activity, and avoided activities that may trigger cardiac symptoms.

To explore the mediational effects of different dimensions of HFA (fear, attention and avoidance) in relation between beliefs about the controllability of the illness, as predictors, and depression and general anxiety, as criteria, we used bootstrap method of mediation analysis (Hayes, 2018). To exclude the effects of gender and age on the variables included in the analyses, a simple linear regression was used. Instead of the original variables, all of the mediation analyses were performed with the residuals from the abovementioned model. In total, 12 mediation analyses were conducted. The results of the mediation analyses conducted to examine the mediating role of different dimensions of HFA in the relationship between personal control and depression or general anxiety are shown in Figure 1.



Note: The numbers in the figures present standardized regression coefficients; *e(d)* - direct effect of predictor on criterion; *e(t)* - total effect of predictor on criterion; *e(i)** - a mark indicating that a significant indirect effect of predictor on criterion was found; ***p*<.01; ****p*<.001

Figure 1. Bootstrapped Mediation Models of the Mediating Effect of Different Dimensions of Heart-Focused Anxiety in the Relationships of Personal Control and Depression / General Anxiety.

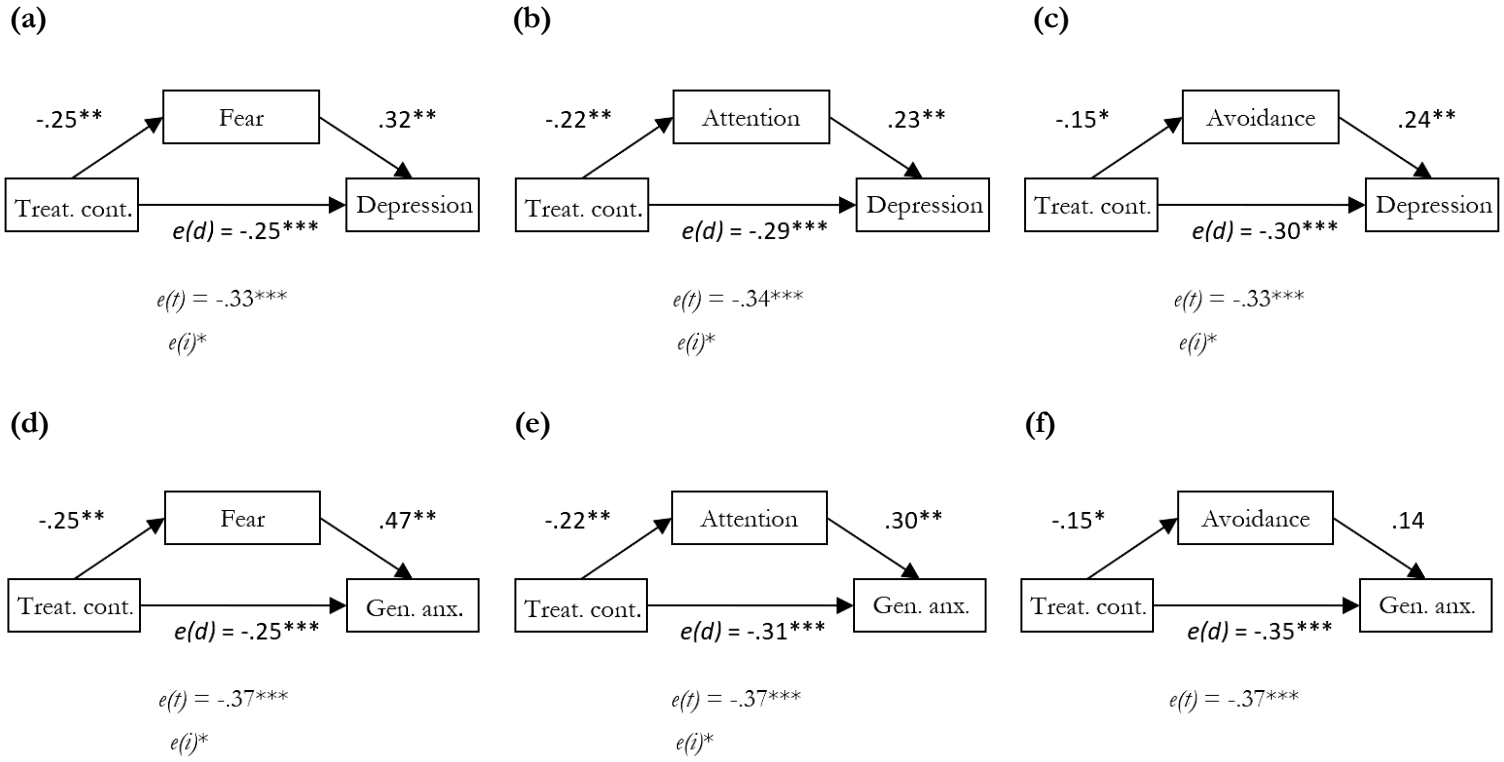
Due to the large number of analyses carried out, only those with significant mediation effects will be described in the following text. As can be seen in Figure 1, the results of the mediation analyses show that fear of cardiac disease was the only dimension of HFA that had mediating role in the relationship between belief in personal control and depression/general anxiety.

Figure 1a shows that belief in the possibility of personal control of the disease was a significant predictor of fear of cardiac disease (β = -0.17, *SE* = 0.08, *t* = -2.17, *p* < .05). Patients with a lower degree of belief in personal control had greater fear of their heart disease. Furthermore, fear of cardiac disease accounted for significant variance in depression, after controlling for belief in personal control (β = 0.34, *SE* = 0.07, *t* = 4.58, *p* < .001). Patients who had greater fear of heart disease expressed more symptoms of depression. Belief in the possibility of personal control influenced symptoms of depression directly (β = -0.21, *SE* = 0.07, *t* = -2.92, *p* < .01), but also indirectly through its effect on fear of cardiac disease (bootstrap effect = -0.06, *SE* = 0.03, *95%CI* = -0.124 to -0.004), which means that fear of cardiac disease was a significant mediator between belief in personal control and depression.

As seen in Figure 1d, fear of cardiac disease was also a significant mediator in the relationship between belief in personal control and general anxiety. Just as described in the previous paragraph, belief in the possibility of personal control of the disease was a significant predictor of fear of cardiac disease (β = -0.17, *SE* = 0.08, *t* = -2.17, *p* < .05). Figure 1d also shows that fear of cardiac disease accounted for significant variance in general anxiety, after controlling for belief in personal control (β = 0.53, *SE* = 0.07, *t* = 7.77, *p* < .001). Patients who had greater fear of heart disease expressed more symptoms of general anxiety. Belief in the possibility of personal control influenced symptoms of general anxiety directly (β = -0.19, *SE* = 0.07, *t* = -2.79, *p* < .01), but also indirectly through its effect on fear of cardiac disease (bootstrap effect = -0.09, *SE* = 0.04, 95%*CI* = -0.184 to -0.008).

Contrary to our hypotheses, the results show that attention focused on heart functioning did not mediate the relation between personal control and depression (Figure 1b; bootstrap effect = -0.01, *SE* = 0.03, 95%*CI* = -0.074 to 0.041), as well as between personal control and general anxiety (Figure 1e; bootstrap effect = -0.01, *SE* = 0.04, 95%*CI* = -0.094 to 0.047). Similarly, avoidance of activities also did not mediate the relation between personal control and depression (Figure 1c; bootstrap effect = -0.02, *SE* = 0.02, 95%*CI* = -0.068 to 0.028), as well as between personal control and general anxiety (Figure 1f; bootstrap effect = -0.01, *SE* = 0.02, 95%*CI* = -0.051 to 0.017).

The results of the mediation analyses conducted to examine the mediating role of different dimensions of HFA in the relationship between treatment control and depression or general anxiety are shown in Figure 2.



Note: The numbers in the figures present standardized regression coefficients; *e(d)* - direct effect of predictor on criterion; *e(t)* - total effect of predictor on criterion; *e(i)** - a mark indicating that a significant indirect effect of predictor on criterion was found; ***p*<.01; ****p*<.001

Figure 2. Bootstrapped Mediation Models of the Mediating Effect of Different Dimensions of Heart-Focused Anxiety in the Relationships of Treatment Control and Depression / General Anxiety.

The results show that fear of cardiac disease was a significant mediator between belief in the efficacy of treatment itself and depression (Figure 2a), as well as between belief in the efficacy of treatment itself and general anxiety (Figure 2d). As can be seen in Figures 2a and 2d, belief in treatment control was a significant predictor of fear of cardiac disease (β = -0.25, *SE* = 0.08, *t* = -3.29, *p* < .01). Patients with a lower degree of belief in treatment control had greater fear of their heart disease. Furthermore, fear of cardiac disease accounted for significant variance in both depression (Figure 2a; β = 0.32, *SE* = 0.07, *t* = 4.40, *p* < .001) and general anxiety (Figure 2d; β = 0.47, *SE* = 0.07, *t* = 7.03, *p* < .001), after controlling for belief in treatment control. Patients who had greater fear of heart disease expressed more symptoms of depression and general anxiety. Belief in treatment control had a significant direct effect on symptoms of depression (Figure 2a; β = -0.25, *SE* = 0.07, *t* = -3.43, *p* < .001) and general anxiety (Figure 2d;

β = -0.25, *SE* = 0.07, *t* = -3.69, *p* < .001). In addition, belief in treatment control indirectly influenced depression (Figure 2a; bootstrap effect = -0.08, *SE* = 0.03, 95%*CI* = -0.158 to -0.026) and general anxiety (Figure 2d; bootstrap effect = -0.12, *SE* = 0.04, 95%*CI* = -0.207 to -0.048) through its effect on fear of cardiac disease.

The results also show that attention focused on heart functioning, as another dimensions of HFA, was a significant mediator in the relationship between belief in the efficacy of treatment itself and depression (Figure 2b), as well as between belief in the efficacy of treatment itself and general anxiety (Figure 2e). As can been seen in Figures 2b and 2e, belief in treatment control was a significant predictor of attention focused on heart functioning (β = -0.22, *SE* = 0.08, *t* = -2.82, *p* < .01). Patients with a lower degree of belief in treatment control were more focused on their heart functioning. Furthermore, attention focused on heart functioning accounted for significant variance in both depression (Figure 2b; β = 0.23, *SE* = 0.07, *t* = 3.07, *p* < .01) and general anxiety (Figure 2e; β = 0.30, *SE* = 0.07, *t* = 4.22, *p* < .001), after controlling for belief in treatment control. Patients who were more focused on their heart functioning expressed more symptoms of depression and general anxiety. Belief in treatment control had a significant direct effect on symptoms of depression (Figure 2b; β = -0.29, *SE* = 0.07, *t* = -3.86, *p* < .001) and general anxiety (Figure 2e; β = -0.31, *SE* = 0.07, *t* = -4.29, *p* < .001). Also, belief in treatment control indirectly influenced depression (Figure 2b; bootstrap effect = -0.05, *SE* = 0.03, 95%*CI* = -0.114 to -0.006) and general anxiety (Figure 2e; bootstrap effect = -0.07, *SE* = 0.03, 95%*CI* = -0.144 to -0.014) through its effect on attention focused on heart functioning.

In contrast to our hypothesis, the results show that avoidance of activities, as third dimensions of HFA, did not mediate the relation between treatment control and general anxiety (Figure 2f; bootstrap effect = -0.02, *SE* = 0.02, 95%*CI* = -0.059 to 0.001). But, as we predicted, avoidance of activities did mediate the effect of belief in treatment control on depression. As shown in Figure 2c, belief in treatment control was a significant predictor of avoidance of activities believed to trigger cardiac symptoms (β = -0.15, *SE* = 0.08, *t* = -1.98, *p* < .05). Patients with a lower degree of belief in treatment control avoided those activities more often. Furthermore, avoidance of activities accounted for significant variance in depression (β = 0.24, *SE* = 0.07, *t* = 3.37, *p* < .001), after controlling for belief in treatment control. Patients who avoided activities more often, expressed more symptoms of depression. Belief in treatment control influenced symptoms of depression directly (β = -0.30, *SE* = 0.07, *t* = -4.08, *p* < .001), but also indirectly through its effect on avoidance of activities (bootstrap effect = -0.04, *SE* = 0.02, 95%*CI* = -0.085 to -0.002).

4. Discussion

The aim of this study was to examine the role of specific symptoms of HFA (fear about cardiac sensations, avoidance of activities, focusing on cardiac symptoms) in the relationship between beliefs about the illness control on one side, and general anxiety and depression on the other side, in patients who had experienced a major cardiovascular event. The results of the study clearly show that patients with CVD who express more positive beliefs about the disease, in terms of controllability, show fewer symptoms of anxiety and depression. Among CVD patients, high levels of anxiety and, in later stages of illness, high levels of depression are dominant psychological problems. In this study, 11.4% of patients have symptoms of anxiety, while 10.3% are depressed. Symptoms of depression and anxiety not only reflect episodic distress but also a more stable tendency to experience distress (Shen et al., 2008), and combined with social isolation predict poor cardiac prognosis (Horsten et al., 2000). Accounting for this general propensity to psychological distress offers the opportunity to recognise high-risk patients that may benefit from a more personalized approach to cardiac care (Denollet et al., 2010).

It should be emphasized that the symptoms of general anxiety are more pronounced in patients who experience a higher level of fear of heart sensations, and who focus more on cardiac symptoms, which has also been confirmed by other authors (Hamang et al., 2011). On the other hand, depressive symptoms are more pronounced in patients who experienced higher levels of fear of heart sensations, who are more focused on those symptoms, but also who more often avoided activities that cause heart sensations, such as rapid breathing or heartbeat. The hypothesis that HFA is a mediator between illness perception (i.e., positive beliefs about the disease), and general anxiety and depression is only partially confirmed. If a patient believes that he or she cannot control their illness by their own behaviour, or does not believe that therapy can help control the symptoms, it will lead to an increase in fear of cardiac symptoms, and ultimately to an increase in the symptoms of anxiety and depression. Hamang et al. (2011) also found that fear of heart sensations is one of the HFA symptoms that significantly predicts psychological difficulties, in a way that patients with a high level of fear show a high level of general anxiety and depression.

Similar results are also obtained from focusing on heart symptoms (e.g., focus on heartbeat, continuous pulse-checking), which mediates the development of anxiety and depression, but only in CVD patients who believe that they cannot control their disease by treatment. These results can be explained by the anxiety model, pointing out that hypervigilance, as well as a

negative emotional response (e.g., anxiety reaction) to physical symptoms, lead to incorrect, distorted beliefs about the meaning of individual symptoms (Clark, 1988; Eifert et al., 1996; Rapee & Medoro, 1994; Taylor & Cox, 1998). When a person is overly focused on heart disturbances and thinks about possible catastrophic outcomes of the disease, they are very likely to make cognitive errors in the interpretation of the symptoms (Marker et al., 2008). As Marker et al. (2008) suggest, with CVD patients in whom the fear of heart sensations component is dominant, cognitive-behavioural interventions that use exposure to threatening symptoms (e.g., interoceptive exposure, which strives to act on "fear of fear" by eliminating the conditioned reaction triggered by bodily sensations), in combination with a cognitive strategy of re-evaluation of beliefs about these symptoms, might prove to be effective. Desirable outcomes of using these techniques would include a reduction of fear and anxiety about physical symptoms due to a more realistic assessment of the core beliefs about these symptoms.

The avoidance of some behaviours, as one of the symptoms of HFA, appears to be a mediator between treatment control of the illness and depression, but not anxiety. Avoidance of certain activities is not significantly related to a person's perception of how well they can control the illness by themselves, but shows a significant, although low, negative correlations with treatment control. This finding means that people who have more positive beliefs about illness, in terms of controllability by treatment, use avoidance less often. It is also evident from the correlation matrix that the more frequent avoidance of certain activities, such as physical effort, exercise, or activities that cause accelerated heart rate, is associated with higher levels of anxiety and depression. Cardio-protective avoidance is described as a key symptom of heart-focused anxiety (Eifert et al., 1996, 2000). On the other hand, cardiologists often recommend avoidance of intense physical activity for CVD patients, so avoidance may be a sign of obeying medical recommendations. Avoiding certain activities, therefore, does not have to be a reflection of fear of illness, but can be an adaptation to the limitations of cardiac disease (Hamang et al., 2011; Hoyer et al., 2008; Pokrajac-Bulian & Ambrosi-Randić, 2020). If we look at avoidance as a preventive strategy or a way of coping with a diagnosis, the question of why it is still associated with anxiety and depression remains open. Obviously, we are looking at a more complex process associated with psychological difficulties in CVD patients.

We must acknowledge the present study has some limitations, such as the lack of patient follow-up after discharge from the hospital. A study by Hoyer et al. (2008) shows that symptoms of HFA differ before and after cardiac surgery. Additionally, fear, avoidance and attention focused on cardiac symptoms do not follow the same patterns of change before and after the surgery.

Assessment with the CAQ questionnaire and interpretation of the results must be carried out within the context of a cardiovascular event that led to the patient's hospitalization. Medical status of the patient should also be considered, since elevated result may be due to both psychological and medical factors. Another limitation is a relatively small sample of patients collected in two different hospitals, but within the same region, as well as a smaller number of women in the sample, although the sex ratio is proportional to the natural distribution of CVD patients. This limitation is reason for caution in generalizing the results. Finally, the limitation of this study is the focus on specific negative emotions such as depression or anxiety, and the investigation of the effect of illness perception on this independent factors rather than multivariable combinations of factors. This approach seems to insufficiently emphasizes the fact that people differ in their sensitivity for chronic stress, and that is very important to take into account the individual differences in personality that may help to explain the variations in cardiovascular risk (Denollet & Pedersen, 2009). Assessment of personality could help health professionals to better understand how to interact with different kinds of patients, and could improve our understanding of the risk factors for CVDs (Denollet, 2012).

A significant strength of this research is in better understanding of beliefs about the disease in the recovery process and coping with the symptoms of CVD. Patients who believe that their behaviour cannot affect their illness and its outcomes feel helpless, become more passive, worry, and develop symptoms of depression and anxiety. Likewise, the belief that therapy will not yield remarkable results because it is ineffective and does not keep the disease under control leads to a reduction in patient's responsiveness and perhaps medication non-adherence, which can have very serious medical and psychological consequences.

Our study may suggest a predictive role of illness controllability for anxiety and depression in CVD patients. Moreover, lower personal and treatment control were associated to higher level of fear of heart sensations, and higher level of anxiety and depression. This evidence may support psychological intervention strategies aimed at a healthy disease's management and better understanding of cardiac disease.

Ethical approval:

This research was approved by the ethical Committee of the Faculty of Humanities and Social Sciences (project number: 13.04.1.3.07), University of Rijeka and Clinical Hospital Center Rijeka, Croatia

Informed Consent Statement:

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement:

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

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Author Contributions:

MK (first author) and APB (second author): MK contributed to the study conception and design, analysis of results, and draft manuscript preparation. APB contributed to the study conception and design, implementation of the research, data collection, interpretation of results, and writing the discussion. All authors reviewed the results and approved the final version of the manuscript.

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