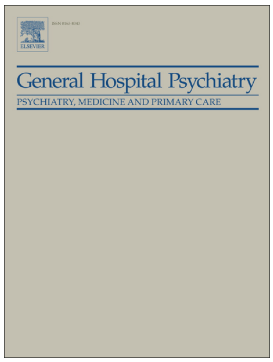

Cardiac-disease-induced PTSD and Fear of illness progression: Capturing the unique nature of disease-related PTSD

Keren Fait, Noa Vilchinsky, Rachel Dekel, Nitza Levi, Hanoch Hod, Shlomi Matetzky

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Cardiac–disease-induced PTSD and Fear of illness progression: Capturing the unique nature of disease-related PTSD

Keren Fait

Department of Psychology, Bar-Ilan University, Ramat-Gan, Israel

fait.keren@gmail.com

Noa Vilchinsky (corresponding author)

Department of Psychology, Bar-Ilan University, Ramat-Gan, Israel

noa.vilchinsky@biu.ac.il

Rachel Dekel

The Louis & Gabi Weisfeld School of Social Work, Bar-Ilan University, Ramat-Gan, Israel

rachel.dekel@biu.ac.il

Nitza Levi

RN, Leviev Heart Institute, Chaim Sheba Medical Center, Tel-Hashomer, Israel

niza.levi@sheba.health.gov.il

Hanoch Hod

Leviev Heart Institute, Chaim Sheba Medical Center, Tel-Hashomer, Israel; The Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel

Hod.Hanoch@sheba.health.gov.il

Shlomi Matetzky

Leviev Heart Institute, Chaim Sheba Medical Center, Tel-Hashomer, Israel ;The Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel.

shlomi.matetzky@sheba.health.gov.il

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Abstract

According to Edmondson's Enduring Somatic Threat (EST) Model of PTSD Due to Acute Life-Threatening Medical Events, the nature of PTSD in the context of illness may differ from the nature of "traditional" PTSD in that it includes future-oriented alongside past-related intrusive thoughts. Yet almost no empirical studies to date have assessed the putative future-oriented quality of cardiac–disease-induced PTSD (CDI-PTSD). In the current study, we assessed the hypothesized associations between CDI-PTSD and fear of illness progression (FoP) – a novel theoretical conceptualization of patients' future-related anxieties. We hypothesized that FoP would be positively associated with CDI-PTSD, and especially with its specific items of intrusive thoughts. Patients (N = 112) were interviewed three months post-hospitalization for an acute coronary event via use of the PSS-SR-5 (to assess PTSD symptomatology), the FoP-Q-SF (to assess fear of illness progression), and the HADS (to assess anxiety and depression levels). Results indicated a strong positive association between CDI-PTSD and FoP, even when controlling for anxiety and depression. As hypothesized, the concepts of CDI-PTSD and fear of illness progression were strongly associated both at the level of the clusters as well as at the level of the specific items. The current study provides an initial empirical validation of the EST Model, especially regarding the future-oriented nature of PTSD resulting from acute cardiovascular disease.

Key words: Cardiovascular disease; CDI-PTSD; EST Model; Fear of illness progression; PTSD

Cardiac–disease-induced PTSD and Fear of illness progression:

Capturing the unique nature of disease-related PTSD

1. Introduction

Although advances in medical technology have increased survival rates from cardiovascular diseases [CVD; 1, 2], they are still a leading cause of death and disability throughout the world [3] and are considered to present a serious threat to people's lives. This significant threat to those coping with CVD can cause them to experience meaningful emotional distress that can actually meet the criteria for a diagnosis of posttraumatic stress disorder [PTSD; 4]. The perceived nature of CVD – the event's abruptness, the imminent possibility of death, the patient's feelings of utter helplessness and impotence in the face of it [5] – may all conspire to result in PTSD. The consistent finding that one's illness perceptions – and not only the objective severity of the illness – strongly predicts one's emotional outcomes [6], serves to strengthen this postulation

Indeed, in the past three decades, a large body of evidence has accumulated, showing that CVD and especially its acute clinical expression – that is, 1) acute coronary syndrome (ACS) which refers to myocardial infarction (MI) and/or severe unstable angina (UA), or 2) cardiac arrest (CA) – can induce posttraumatic stress symptoms (PTSS) and even full-blown PTSD [4]. Studies conducted thus far on cardiac-disease-induced PTSD (CDI-PTSD) point to a prevalence ranging from 0% to 38%, with an average of 4-16%, depending on the utilized diagnostic tool [4]. A recent meta-analysis yielded an aggregated prevalence estimate of 12% for clinically significant symptoms of ACS-induced PTSD [7]. As with PTSD originating from other causes, CDI-PTSD has been associated with high levels of negative outcomes

among patients [8, 9]. Among these outcomes are higher levels of anxiety, depression, and hostility; lower levels of quality and satisfaction of life [8, 10]; non-adherence to medical regimens [11, 12]; and higher odds for recurrence and mortality [13, 14].

Based on their recent systematic review of the studies in the CDI-PTSD field, Vilchinsky et al. [2017; 4] concluded that acute cardiac events meet the DSM-5 definition of Criterion A, and can thus be seen as potential causes of PTSD. Yet Edmondson [2014; 15] has suggested that PTSD resulting from illness must be regarded as an enduring somatic threat, with a unique display of symptoms. In his Enduring Somatic Threat Model (EST Model), Edmondson points out the significant differences between “traditional” PTSD (which manifests itself, for example, among veterans of war or assault victims) and PTSD resulting from a life-threatening illness. In the former, symptoms are related to a discrete and external source, whereas in the latter, symptoms are related to an internal, ongoing threat [15]. Despite the vast literature accumulating in the field of CDI-PTSD, and despite the fact that a cardiac event is clearly somatic and enduring, no explicit effort to date has been undertaken to empirically test the EST postulations in this context. The current study's main aim was therefore to propose an empirical assessment of the EST assumptions, focusing on the unique future-oriented nature of CDI-PTSD.

The EST Model assumptions

According to the EST Model [15], the manifestation of posttraumatic symptoms is qualitatively different between the "traditional" PTSD and illness-related- one. For example, avoidance – a strategy used to cope with intrusive memories and elevated arousal – is an almost impossible strategy for the MI patient, who because of his/her condition must continue to engage with the medical establishment (i.e., attend doctor appointments, be admitted to hospitals, etc). In

addition, the ongoing existence of physical symptoms such as a racing heart, shortness of breath, or dizziness do not allow the patient to forget the traumatic cardiac event he/she underwent. Worse, the hyperarousal symptoms characteristic of CDI-PTSD are at times exactly the same as those symptoms that indicate a life-threatening cardiac event. The CDI-PTSD patient, therefore, is essentially trapped in this continuous cycle of anxiety and sympathetic/cardiovascular reactivity. Finally, given that the illness is often the acute manifestation of a long-term physiological disruption, the source of the threat is internal; the threat and the individual, therefore, cannot be separated [15, 16]. This threat is not exclusively related to past experience; rather, it is chronic, and in many ways it is anchored in fears and worries about the future, vis-a-vis treatment, illness progression, potential recurrence, and even death [16, 17].

These unique illness characteristics shape the nature of CDI-PTSD symptoms. Whereas the classic PTSD intrusive symptoms focus on the past event, in cardiac disease the intrusive symptoms may also relate to the future [15, 17]. Thoughts and images related to the threat of another cardiac event, fear of future death, worries about forthcoming doctor appointments, and other future-oriented concerns may constitute what Holmes and colleagues (2007) termed “flash-forward” intrusions [18].

Although the EST Model is a very appealing theoretical conceptualization of CDI-PTSD, the need for empirical data to validate it remains. To date, only very few studies have focused, for example, on the future-oriented component within CDI-PTSD. Sheldrick, Tarrier, Berry & Kincey (2006) assessed MI patients' perceptions of their illnesses [19]. The authors found a positive correlation between CDI-PTSD levels and perceptions of the illness as chronic and ongoing rather than acute and episodic. Yet, the full spectrum of an individual's worries regarding the progression of his/her illness is not expressed solely via "perceptions of the illness as chronic."

Therefore, we suggest that the theoretical concept of future-oriented worries may be better captured by the concept of "fear of illness progression" [20].

Fear of illness progression

Fear of illness progression (FoP) indicates people's essentially rational fear that their disease will advance and that their condition will likely deteriorate over time [20, 21]. The fear stems from people's experiences of a chronic, life-threatening, and/or incapacitating illness, and it is therefore considered a reasonable response to an "unreasonable" situation [20]. Understandably, due to FoP, patients may eventually end up being overly attentive to potential signs of recurrence and bodily symptoms, engage in checking behavior, and – as often as not – misinterpret symptoms [22]. These reactions are in line with Edmondson's EST Model [15] in terms of the stressor's location and how it impacts the way CDI-PTSD symptoms display themselves.

Studies conducted on patients coping with cancer showed a strong association between fear of illness progression and PTSD or PTSS [23, 24], For example, in a study conducted among women who survived breast cancer [24], intrusive cognitions were detected in 37% of the sample. Fear of illness progression was found to be highly correlated with intrusive thoughts, avoidance, and hyperarousal.

Despite its apparent relevance, no study to date has assessed FoP in the context of cardiac illness. This gap is critical since it prevents a deeper understanding of the unique manifestation of CDI-PTSD symptoms. Moreover, CDI-PTSD has been, and currently is, diagnosed and measured using instruments designed for the assessment and diagnosis of “traditional” PTSD; its unique manifestations of future-oriented intrusions are therefore not accounted for [4, 15]. Thus, we aimed to reveal the existence of future-oriented content, possibly embedded in CDI-PTSD.

Current study hypotheses

The current study focused on the associations between CDI-PTSD and FoP in a sample of 102 patients, assessed three months after their acute cardiac events. We hypothesized that FoP would be positively associated with CDI-PTSD and especially positively associated with the intrusion cluster. Due to the already well-established comorbidity of PTSD and CDI-PTSD with depression and anxiety [25, 26], we assessed the formerly mentioned associations while controlling for depression and anxiety symptoms. Controlling for these symptoms enabled us to detect whether a specific association existed between fear of progression and PTSD above and beyond the abovementioned association between CDI-PTSD and distress symptoms; it also enabled us to differentiate between the FoP and PTSD association and the possible association between FoP and depression or anxiety, which has been detected in former studies in the context of cancer [27-29].

In order to obtain a better resolution of the interface between fear of progression and CDI-PTSD, at the level of the particular items, an Exploratory Factor Analysis (EFA) was carried out. We hypothesized that the FoP items would converge most strongly with those symptoms of CDI-PTSD that reflected ruminative, intrusive cognitions.

2. Method

2.1. Participants and Procedure

The current study was part of a large-scale dyadic longitudinal prospective study conducted on CDI-PTSD among patients diagnosed with an acute coronary event and their intimate partners. The data were collected between the period of March 2015 until December 2016, and the sample consisted of patients hospitalized in the Intensive Cardiac Care Unit (ICCU) of the Sheba Medical Center, the largest

medical center in Israel. The target population was defined as patients diagnosed with an acute coronary event (ACS, UA, MI, CA) who were in a significant intimate relationship. Exclusion criteria included a cardiac diagnosis other than an acute coronary event (aside from a cardiac risk factor such as diabetes, high blood pressure, and hypercholesterolemia); elective hospitalization; patients' cognitive, physical, or language difficulties which precluded participation in interviews; CABG (coronary artery bypass graft) surgery during hospitalization; patients over the age of 85; patients who had died during hospitalization; tourists; and patients under guardianship. Eligible patients were approached by a member of the research team during their hospitalization in the ICCU. Upon patients' agreement, the research team also approached the patients' partners. Couples consisting of two partners who a) were eligible to participate and b) agreed to participate, signed a consent form and were asked to complete Time-1 questionnaires during hospitalization (either by self-report or with the help of an interviewer). Three months post-discharge a research assistant contacted all consenting participants (both patients and partners) by phone and arranged a follow-up interview at their private residences in order to complete Time-2 questionnaires. Participation in the study was on a voluntary basis, and couples received no reward for their participation. This study was approved by the Sheba Medical Center's institutional review board.

Of the 406 eligible *patients*, 64 (15.8%) were discharged before the research team was able to approach them, and 34 (8.4%) had an intimate partner who could not be interviewed due to various cognitive, physical, or language barriers. Of the 308 eligible *couples*, 141 couples agreed to participate in the study and completed the study questionnaires during the patient's hospitalization (45.8% recruitment rate during Time-1). Of those couples, 107 couples (24.1% attrition rate) also completed

Time-2 questionnaires (3 months post patient's discharge). The questionnaires of five couples were removed from further analysis due to substantial missing data; all of the other couples' questionnaires had complete data. Thus, the final study sample consisted of 102 couples, of which, for the purposes of the current study, only the patients' data was analyzed. Figure 1 presents the flowchart of the recruitment process.

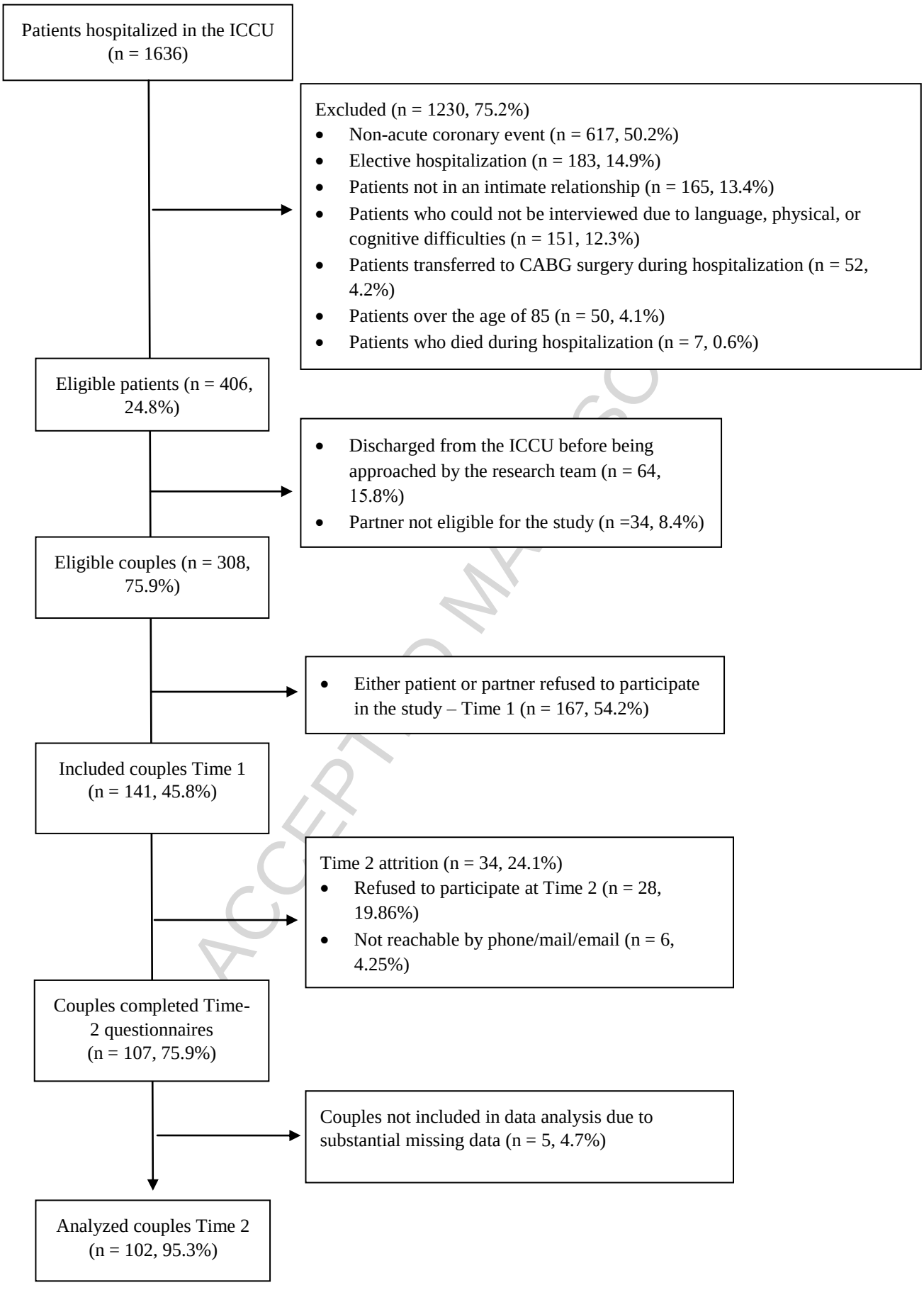

Figure 1. Flowchart of the study recruitment process

Note: ICCU = intensive cardiac care unit; CABG = coronary artery bypass graft

2.2. Measures

CDI-PTSD. CDI-PTSD during Time 2 was measured using the Hebrew version of the **PTSD Scale - self-report for DSM 5** [PSS-SR-5; 30]. The PSS-SR-5 is based on the Post-Traumatic Stress Diagnostic Scale [PDS; 31] with added items in order to reflect the changes made to the PTSD diagnostic criteria in the DSM-5. The PSS-SR-5 consists of 20 items all tapping criteria B, C, D, and E of the DSM-5: that is, re-experiencing, avoidance, negative alterations in cognitions and mood, and arousal symptoms. The symptoms are measured on a scale ranging from 0 (*not at all*) to 4 (*six or more times a week*). The PSS-SR-5 also includes additional items tapping feelings of distress and interference in daily functioning (Criterion G) and duration and onset of symptoms (Criterion F). In order to generate a continuous measure for CDI-PTSD, symptom item scores were summed, so that a higher score indicated a more severe level of symptoms. Cronbach's α for the Hebrew version of the PSS-SR-5 in the current study was 0.89.

Fear of Illness Progression. Patients' fear concerning illness progression at Time 2 was measured using the short form of the **Fear of Progression Questionnaire** [FOP-Q-SF; 32]. The FoP-Q-SF is a 12-item measure (e.g., "I am afraid that I will not be able to work anymore due to my illness"; "I am afraid of disease progression") based on the Fear of Progression Questionnaire [FoP-Q; 20]. The FoP-Q-SF items are scored on a five-point Likert- scale ranging from 1 (*never*) to 5 (*very often*), and higher values indicate higher levels of fear. For the purposes of the current study, the FoP-Q-SF was translated into Hebrew using Triandis and Brislin's (1984) back-translation technique [33]. Cronbach's α for the Hebrew version was 0.86.

Anxiety and Depression. Anxiety and depression levels at Time 2 were assessed using the Hebrew version of the **Hospital Anxiety and Depression Scale** [HADS; 34]. The HADS was developed and has been used extensively in populations coping with physical illness, and specifically cardiac illness [35, 36], given that it avoids reliance on those somatic aspects of depression or anxiety that may also be related to being physically ill [34]. The HADS includes two subscales, depression and anxiety, each consisting of 7 items. Each participant was asked to rate the degree to which he/she experienced each symptom during the previous week on a scale ranging from 0 (*not at all*) to 3 (*most of the time*). Internal consistency (Cronbach's α) of the HADS subscales was 0.83 for the depression scale and 0.89 for the anxiety scale at Time 2.

Demographic measures. In order to assess sample characteristics and related variables, the following demographic information was collected: age, gender, years of education, duration of current intimate relationship (in years), number of children, and income level (below the average income in Israel, equal to the average income, or above the average income).

Illness severity. Illness severity was assessed by a senior cardiologist based on two criteria: an echocardiogram (examines the structure and functioning of the heart), and an angiogram (examines obstructed artery status). The echocardiogram and angiogram were both measured on a scale ranging from 1 (*mild*) to 4 (*most severe*).

2.3. Method of analysis

The data were analyzed using the IBM SPSS Statistics for Windows, version 21 [37]. Pearson correlations were applied in order to assess the inter-correlations between FoP, CDI-PTSD, depression and anxiety, while controlling for confounding

variables. Next, in order to pinpoint which FoP item converged most strongly with each of the PSS-SR-5 scales, we applied four Exploratory Factor Analyses (EFAs), each time looking at the FoP items together with the items of one of the four PTSD clusters. For each analysis, a two-factor solution and 25 iterations were requested. We deliberately requested a two-factor solution in order to view whether the two instruments' items converged each time into two distinct factors (i.e., FoP and one of the PTSD cluster items each time). Each two numbered columns in Table 2 represent the factors' loadings of an independent analysis (all-together, four analyses comprised of two factors each). The loadings of each analysis are not customarily presented by the order of the loading size, but by the pre-determined order of the items in each instrument. This order of events allowed us to examine which FoP item converged most highly with each CDI- PTSD cluster, separately. We made use of EFA, since this procedure is performed in order to detect the maximum common variance from all variables. Due to the hypothesized inter-correlations between factors [38], we applied a Promax rotation with Kaiser Normalization.

3. Results

3.1. Sample characteristics

The majority of patients were male (*N*= 94, 92.2%) with a mean age of 60.41 years (*SD* = 10.70), and a mean of 13.88 years of education (*SD* = 3.68). As this study was part of a larger study focusing on CDI-PTSD in patients and their intimate partners, all participants were married or cohabiting with an intimate partner. The average duration of relationships was 31.28 years (*SD* = 14.78), and couples had an average of 3.26 children (*SD*=1.41). The majority of participants (57.7%) reported that their income was below the average income in Israel that year. In addition, illness

severity for most patients was found to be mild to moderate according to both angiogram (M = 2.25, SD = 1.28) and echocardiogram (M = 2.10, SD = 1.10) scores.

No significant differences in age or gender were found between patients who agreed to participate in the study and patients who refused to participate (or whose partners refused to participate). In addition, no significant differences were found between patients who completed Time-2 questionnaires and patients who either could not be reached or who refused to continue their participation in the study (patients were compared regarding age, gender, education, relationship duration, income level, illness severity, and depression and anxiety levels taken during hospitalization).

3.2 Correlations analyses

In order to detect putative confounding variables, Pearson correlations were calculated among all psychological, medical, and demographic variables. No significant correlations were found among the psychological measures (i.e., CDI-PTSD and FoP) and the demographic or medical measures, except for a significant positive correlation detected between years of education and FoP ($r = 0.23$, $p<.05$). Thus, years of education was controlled for in all further analyses.

Table 1 presents the inter-correlations among the PSS-SR-5 total score – and separate symptom cluster scores – with FoP, anxiety, and depression. As can be seen, CDI-PTSD measured with the use of the PSS-SR-5 was highly correlated with both the depression and the anxiety scales. Unsurprisingly, FoP was also found to be positively correlated with depression, and even more so with anxiety. As hypothesized, CDI-PTSD and FoP were strongly and positively correlated even after controlling for anxiety and depression. It is important to note that the correlations between FoP and CDI-PTSD, albeit substantial, were not at the level that might

suggest multicollinearity (we tested for multicollinearity in the regression analysis, described in section 3.4 to come).

Table 1

Pearson Correlations among PSS-SR-5 total score, PSS-SR-5 symptom cluster scores, FoP total score, and anxiety and depression levels (N=102)

	FoP	PSS-SR-5	Intrusions	Avoidance	Hyper-Arousal	Negative alterations in cognition and mood	Anxiety	Depression
FoP	1.00	**.74****	**.68****	**.68****	**.64****	**.62****	**.60****	**.37****
		(.57)[a]**	**(.53**)[a]**	**(.50**)[a]**	**(.41**)[a]**	**(.43**)[a]**	(.18)[b]	(.00)[b]
PSS-SR-5		1.00	**.85****	**.75****	**.90****	**.92****	**.69****	**.51****
			(.79)[a]**	**(.62**)[a]**	**(.80**)[a]**	**(.89**)[a]**	**(.45**)[c]**	**(.37**)[c]**
Intrusions			1.00	**.65****	**.64****	**.69****	**.55****	**.34****
Avoidance				1.00	**.61****	**.57****	**.60****	**.29****
Hyper-Arousal					1.00	**.79****	**.68****	**.53****
Negative alterations in cognition and mood						1.00	**.57****	**.51****
Anxiety							1.00	**.63****
Depression								1.00

**p<0.01 level (2-tailed)

[a] controlling for anxiety and depression levels

[b] controlling for CDI-PTSD levels

[c] controlling for FoP levels

Note: the correlations were controlled for years of education. FoP = Fear of progression scale; PSS-SR-5 = PTSD scale

3.3 Applying Exploratory Factor Analysis

Results are presented in Table 2. First and foremost, Table 2 shows that the items of the PSS-SR-5 converged well with the four known PTSD clusters. There were only three items that did not produce loadings >0.4 (one for the negative cognition cluster and two for the arousal cluster).

Table 2 makes evident that the FoP items most related to the cluster of intrusions were related to the specific anxiety that emerges when one needs to visit the cardiologist or undergo a regular medical checkup The FoP item tapping the physical symptoms of anxiety is also most related to the cluster of intrusions. The anxiety one undergoes before meeting the cardiologist, as well as the fear of pain and worries about the future suffering of one's family, due to the patient's illness, were found to be related to the avoidance cluster. Finally, future-oriented worries regarding one's ability to pursue one's career and hobbies were mostly related to the PTSD clusters of negative cognitions and hyper-arousal.

Table 2
Content and Structural Coefficients of the Fear of Progression (FoP) and PTSD Scale- self report for DSM 5 (PSS-SR-5) (N = 102)

Scales	Items	1	2	1	2	1	2	1	2
FoP	I become anxious if I think my disease may progress	.388	.401	.382	.430	.312	.520	.285	.522
	I am nervous prior to cardiologist appointments or periodic examinations	.014	**.665**	**.775**	-.152	-.109	.627	-.061	.559
	I am afraid of pain	.278	.227	**.523**	.004	-.173	.603	-.063	.520
	I have concerns about reaching my professional goals because of my illness	.427	.217	-.231	.886	**.823**	.018	**.747**	-.017
	When I am anxious, I have physical symptoms such as a rapid heartbeat, stomach-ache, or agitation	.127	**.537**	**.455**	.178	.182	.463	.165	.467
	The possibility of my children contracting my disease disturbs me	.265	.199	**.480**	-.037	-.093	.453	-.200	.585
	It disturbs me that I may have to rely on strangers for activities of daily living	.604	-.029	.259	.292	.173	.343	.081	.458
	I am worried that at some point in time I will no longer be able to pursue my hobbies because of my illness	.893	-.109	-.040	.849	**.510**	.325	**.537**	.275

	I am afraid of severe medical treatments during the course of my illness	.804	.056	.361	.549	.360	.540	.277	.601
	I worry that my treatment could damage my body	.655	-.124	.343	.241	-.008	.568	.076	.483
	I worry about what will become of my family if something should happen to me	.353	.231	**.753**	-.129	-.354	.886	-.188	.763
	The thought that I will not be able to work because of my illness worries me.	.659	.031	.000	.711	.431	.297	**.579**	.131
Intrusion	Unwanted upsetting memories about the cardiac event	-.187	**.837**						
	Bad dreams or nightmares related to the cardiac event	.042	**.586**						
	Reliving the event or feeling as if it were actually happening again	-.108	**.837**						
	Feeling very emotionally upset when reminded of the event	.291	**.438**						
	Having physical reactions when reminded of the cardiac event (for example, sweating, racing heart)	.171	**.492**						
Avoidance	Trying to avoid thoughts or feelings related to the cardiac event			**.579**	.095				
	Trying to avoid activities or places related to the cardiac event			**.413**	.163				
Negative cognitions and affect	Inability to recall important aspects of the cardiac event					**.314**	.006		
	Seeing yourself, others, or the world in a more negative way (for example, ”I can’t trust people,” “I’m a weak person”)					**.672**	-.038		
	Blaming yourself or others for what happened					**.438**	-.147		
	Having intense negative feelings like fear, horror, anger, guilt, or shame					.161	.504		
	Losing interest or not participating in activities you used to take part in					**.714**	-.158		
	Feeling distant or cut off from others					**.816**	-.157		
	Having difficulty experiencing positive feelings					**.787**	-.085		
Arousal	Treating others with aggression							**.922**	-.248
	Acting in a dangerous way							**.587**	-.086
	Being overly alert or on guard							**.428**	.057
	Being jumpy or more easily startled (for example when someone walks up behind you)							**.718**	-.096
	Having trouble concentrating							.140	.368
	Having trouble falling or staying asleep							.238	.243

Note. Numbers in bold represent loadings of the items grouped under each CDI-PTSD cluster.

3.4 Post hoc analyses

The findings portrayed in Table 1 show very clearly that after controlling for CDI-PTSD levels, the significant substantive correlations between FoP and anxiety, and especially between FoP and depression, become insignificant. The pattern of correlations seems to point to the possibility of a complex interface among CDI-PTSD FoP and both anxiety and depression. Exploring this complexity may shed additional light on the relationship between FoP and CD-PTSD. We therefore applied two post hoc linear regression analyses in order to investigate this interface.

First, it is important to note that no multicollinearity between PTSD and FoP was detected [Average VIF = 1.87 (should be<10); TF = 0.45 (should be >0.1); 39]. As can be seen in Table 3, in predicting both anxiety and depression levels, after introducing CDI-PTSD to the model, the significant contribution of FoP found in the first step becomes insignificant. Thus, it seems that a complete mediation effect exists between FoP and both anxiety and depression levels, with CDI-PTSD being the me mediator.

Table 3
Summary of Hierarchical Regression Analysis for Variables Predicting Anxiety and Depression levels (N = 102)

	Variables	B	SE (B)	β	t	R^2	R^2 change	F change
Explaining anxiety symptom levels								
Step1						.36	.36	**27.77****
	Education	.07	.10	.06	.68			
	FoP	.27	.04	.59	**7.07****			
Step2						.49	.13	**24.60****
	Education	.09	.09	.08	1.07			
	FoP	.08	.05	.18	1.65			
	CDI-PTSD	.24	.05	.54	**4.96****			
Explaining depression symptom levels								
Step1						.14	.14	**7.94****
	Education	.02	.09	.02	.22			
	FoP	.13	.03	.37	**3.82****			
Step2						.25	.11	**14.14****
	Education	.04	.08	.04	.47			
	FoP	-.00	.05	-.00	-.03			
	CDI-PTSD	.16	.04	.49	**3.76****			

**p<.001; *Note*: FoP = fear of progression scale

4. Discussion

The current study is the first in a series of studies trying to unfold the unique content of the experience of CDI-PTSD. In the current study we focused on the theoretical concept of fear of illness progression as a means of detecting the future-oriented nature of CDI-PTSD, as predicted by the EST Model [15].

First, significant and high correlations were found between FoP and CDI-PTSD, above and beyond the contribution of depression and anxiety. The lack of multicollinearity contributes to our conclusion that FoP and CDI-PTSD are two independent yet connected constructs. Thus, we could suggest that the more traumatized patients are by the cardiac event, the more worried they are about the future consequences of their illness. However, due to the cross-sectional design of the current study, the opposite conclusion could be equally deduced, suggesting that the more troubled patients are with worries about the future ramifications of their illness,

the more traumatized they become. Either way, the strong association between negative illness cognitions about the future and CDI-PTSD resulting from a cardiac event was verified at the level of the full scales.

When we look at the specific items, findings show that intrusions characterizing the CDI-PTSD experience are strongly related to the context of needing to visit the cardiologist, a visit which consists of the possibility of being told the illness has progressed. This fear, as well as the fear of the pain that the illness might bring about, also seems to be associated with post-traumatic related avoidance tendencies: the efforts to avoid painful thoughts as well as concrete reminders of the illness. In addition, avoidance tendencies seem to be associated with worries about the future suffering of the patient's family, due to the patient's illness. Thus, cardiac patients – seeing the cardiac event as not only a past trauma but also as a future threat – tend to avoid reminders of the illness. Finally, cardiac patients' posttraumatic cognitions seem to be marked by worries regarding their future un-productivity as a result of their illness; these cognitions are also associated with patients' nervousness and aggression. Thus, based on the shared variance found between CDI-PTSD and FoP both at the level of the scales as well as at the level of the separate items, we may cautiously infer that, as the EST Model [6] suggests, the content of patients' post-traumatic intrusions is very much connected to thoughts about the progression of the illness in the future, and not only to recollections of the event that happened in the past.

Lastly, our post hoc analyses revealed an interesting dynamic among FoP, CDI-PTSD, and mental distress (depression and anxiety symptoms). The finding that the associations between FoP and mental distress disappear once the levels of CDI-PTSD are controlled for strengthens the postulation that the negative mental

consequences of FoP are salient only insofar as FoP is a part of the CDI-PTSD experience. In other words, FoP is not necessarily debilitating, but it can become such as part of a more profound posttraumatic experience. The partial correlation (Table 1) showing that the associations between CDI-PTSD and mental distress decrease significantly in the present of FoP (meaning that part of the variance between CDI-PTSD and distress is shared by FoP) corroborates this conclusion.

4.1. Limitations

The current study's findings seem to provide additional empirical validation of the postulations of the EST Model [15], at least with regard to the future-oriented nature of PTSD resulting from an acute and life-threatening illness. Yet this conclusion should be arrived at cautiously due to the fact that the current study was cross-sectional and had a relatively small sample. Future studies are advised to apply a longitudinal prospective design where FoP and CDI-PTSD would be measured along the illness timeline. Doing so might facilitate our understanding of the cause-and-effect relationship between these experiences. Measuring FoP as early as during hospitalization might have allowed for an assessment of its predictive contribution to PTSD at the three-month follow-up. Future studies, using FoP measured at the three-month post-ACS follow-up, might well provide this insight to predict future PTSD. Another major limitation of the current study was the fact that our sample consisted of patients who were in committed relationships only. Given that social support is known to moderate PTSD [4], our sample may therefore have been biased in terms of PTSD prevalence. Future studies should assess the relationship between fear of progression and PTSD in more comprehensive samples; as such, one would be better able to generalize from the results.

4.2. Final conclusions and recommendations

The current findings shed further light on the diagnostic and conceptual question regarding the correct way to assess CDI-PTSD [4, 15]; that is, are the standard instruments used to assess PTSD applicable to the cardiac patient population? It may well be that new and more accurate instruments should be developed and applied – instruments which would consist of items tapping the unique manifestations of CDI-PTSD, such as future-oriented cognitions. To achieve this aim, future studies should make use of diagnostic interviews, such as the Clinician-Administered PTSD Scale- CAPS [40]. They should also utilize qualitative interviews in order to better understand the content of patients' intrusions, negative cognitions and avoidance tendencies, all of which constitute illness-related PTSD. More suitable illness-related PTSD measures may be better able to detect those individuals whose unique CDI-PTSD manifestations are not picked up by the standard PTSD instruments. In addition, a better understanding of the nature and manifestation of PTSD resulting from cardiac illness, or from any other illness, would help researchers and clinicians develop appropriate and effective interventions and treatment protocols for those who are suffering both physically and emotionally from their illnesses. These interventions must address the factors that make CDI-PTSD unique: that is, CDI-PTSD is essentially a response to a threat that is both internal and ongoing.

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