Report of Empirical Study

A picture paints a thousand words: Heart drawings reflect acute distress and illness perception and predict posttraumatic stress symptoms after acute myocardial infarction

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Abstract

The aim of this study was to examine whether heart drawings of patients with acute myocardial infarction reflect acute distress symptoms and negative illness beliefs and predict posttraumatic stress symptoms 3 months post-myocardial infarction. In total, 84 patients aged over 18 years drew pictures of their heart. The larger the area drawn as damaged, the greater were the levels of acute distress ($r = 0.36$; $p < 0.05$), negative illness perceptions ($r = 0.42$, $p < 0.05$), and posttraumatic stress symptoms ($r = 0.54$, $p < 0.01$). Pain drawings may offer a tool to identify maladaptive cognitions and thus patients at risk of posttraumatic stress disorder.

Keywords

drawings, illness perceptions, myocardial infarction, psychological stress, traumatic stress

Introduction

Patient's perceptions concerning their illness predict health behaviors (e.g. treatment adherence and functional outcomes) (Broadbent et al., 2004, 2006a) and affect myocardial infarction (MI) recovery (Broadbent et al., 2004, 2009a; Brooks et al., 2012; French et al., 2005, 2006), while negative perceptions increase the risk of posttraumatic stress symptoms (Serap, 2014). Petrie et al. showed that patients' illness perceptions affected recovery from MI in many ways (Petrie et al., 1996, 2002; Petrie and Weinman, 2006). Moreover, results from a brief illness perception intervention showed that negative illness beliefs following acute MI in both patients and their spouses could be reduced (Broadbent et al., 2009a, 2009b). Illness perceptions have usually been measured with a structured interview or the self-rated Illness Perception Questionnaire (IPQ) (Broadbent et al., 2006c). Another innovative and complementary tool for this purpose is patient drawings. For instance, pain drawings have been used as a supplementary diagnostic technique to differentiate functional pain from nociceptive pain (Egloff et al., 2012). Another important benefit of patients' drawings is their use as predictors of disability. One study found heart damage drawn by patients to be associated with negative illness perceptions, depression, and poor physiological functioning (Reynolds et al., 2007). These findings concur with the report of Broadbent et al. (2006a), showing that damage drawn on the heart relates to negative illness perceptions such as longer illness timeline and less control over the heart disease. In that study, heart damage drawn at hospital discharge was a better predictor of recovery than were clinical indicators of objective heart muscle damage

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(e.g. troponin-T level) (Broadbent et al., 2004). Thus, several studies have shown that MI patients' ideas about what happened to their heart, and the extent of heart damage, likely contribute to distress levels during the acute phase of MI (Broadbent et al., 2009b, 2004; Petrie et al., 1996, 2002), as well as to the development of posttraumatic stress disorder (PTSD) symptoms in the aftermath of MI (Serap, 2014). PTSD is characterized by three symptom clusters, namely, re-experiencing of the event, avoidance of event-related stimuli, and hyperarousal for at least 1 month following a trauma (American Psychiatric Association (APA), 1994). On average, 15 percent of patients develop PTSD in the aftermath of acute MI (Gander and Von Kanel, 2006; Shemesh et al., 2004; Edmonson et al., 2012). Symptoms of PTSD attributable to MI are clinically important in terms of future risk of hospital readmissions due to cardiovascular causes (von Känel et al., 2011), poor quality of life, and impaired general health (Brown et al., 1999).

Drawings of a damaged heart have been associated with impaired physical functioning, delayed return to work, anxiety of future cardiac events, greater use of health care, increased activity restriction, and reduced physical activity (Broadbent et al., 2006a). In patients with acute MI, the relationship of heart drawings with the amount of distress and PTSD symptoms has not previously been investigated.

The primary aim of this exploratory study was to examine whether heart drawings may indicate psychological symptoms, such as distress during MI and negative illness beliefs, and predict PTSD symptoms 3 months after acute MI. The secondary aim of our study was to examine whether distress levels, negative illness cognitions, and PTSD symptoms differ between patients drawing heart damage and those plotting blocked vessels. This hypothesis bases on the assumption that patients who draw blocked arteries compared to patients who draw damaged areas have potentially different perceptions of their heart disease and related coping strategies.

Methods

Study participants and design

Study participants were 130 consecutive acute MI patients enrolled in the Myocardial Stress Prevention Intervention (MI-SPRINT) randomized controlled trial aiming to reduce posttraumatic stress by a counseling session offered early after MI. The detailed study protocol with inclusion and exclusion criteria has been described elsewhere (Meister et al., 2013). In brief, all patients were over 18 years of age, spoke German, and had a positive distress screening at the time of admission; that is, they scored at least 5 for chest pain plus at least 5 for fear of dying and/or helplessness on numeric rating scales ranging, for example, for pain from 0 (no pain at all) to 10 (unbearable pain). All patients were admitted to the coronary care unit (CCU) of the Bern University Hospital with an acute MI as diagnosed by a cardiologist. After we had obtained informed consent, patients

were asked to draw pictures of their heart within 48 hours after MI onset. Since they did the drawing before the psychological intervention, patients from both intervention arms were grouped together. After 3 months of enrollment in the study, participants were invited for an assessment of posttraumatic stress.

Illness severity

Patients' peak values of troponin-T and other medical variables were recorded at hospital entry. All medical variables necessary to compute the prognostic GRACE Score were also recorded (Eagle et al., 2004). These include heart rate, systolic blood pressure, plasma creatinine concentration, Killip classification, and whether the patient had cardiac arrest, ST segment elevation MI, and elevated cardiac enzymes. The GRACE Score estimates the probability of death 6 months after admission and is therefore an objective marker of the severity of patients' cardiac illness.

Psychometric assessment

Heart drawings

Patients were asked to draw their hearts in two 49 cm^2 squares. They received the following instructions (translated from German):

> Please draw a picture of what you think your heart looked like before your heart attack and another picture of what you think has happened to your heart after your heart attack. We are not interested in your drawing ability—a simple sketch is fine. We are interested in what you think has happened to your heart.

Of the 130 patients, 28 participants did not fill in questionnaires and 4 refused to draw pictures of their hearts. Overall, 98 participants completed the drawing task; these patients did not significantly differ in age, gender, GRACE Score, and depressive symptoms from the 32 non-completers. Patients were categorized into four groups based on the different types of their drawings of their heart (Figure 1, Appendix 1). This categorization relies on Broadbent's et al. work (2004), whereby we formed an additional group, termed "altered sizes." A number of patients drew areas of damage to their heart (numbers 1–3), while others drew blockages of blood vessels (numbers 4–6). A smaller number of patients expressed emotional feelings (numbers 7–9) about their MI, whereas the fourth group drew no damage or only differences in the size of their heart before and after MI (numbers 10–12).

Illness perception

Patient's cognitive representation of their MI was assessed using the validated brief German version of the self-rated Brief Illness Perception Questionnaire–Revised (BIPQ-R) (Broadbent et al., 2006c), with the following dimensions:
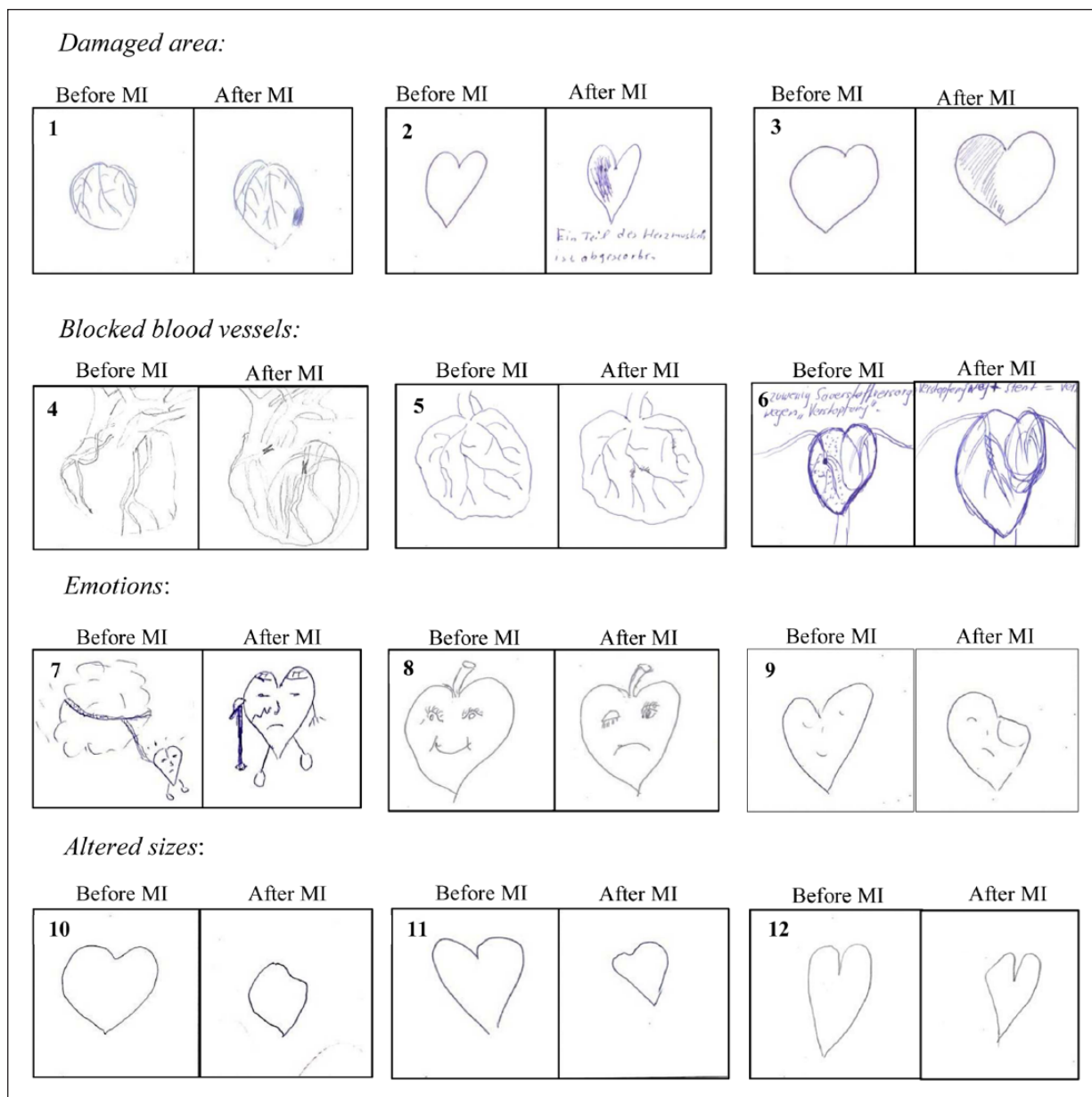
Figure 1. Examples of patients' heart drawings.

item 1 "consequences," item 2 "timeline," item 3 "personal control," item 4 "treatment control," item 5 "identity," item 6 "illness concern," item 7 "coherence," and item 8 "emotional representation." Each item uses a response scale from 0 to 10. Item 3, for example, asks, "How much control do you feel you have over your illness?" 0 means *absolutely no control* and 10 means *extreme amount of control*. The questionnaire showed acceptable internal consistency in this sample (Cronbach's $\alpha = 0.74$).

Acute stress

We administered the German version of the Acute Stress Disorder Scale (ASDS) (Bryant et al., 2000; Helfricht et al., 2009), a commonly used self-report inventory to index symptoms of acute stress disorder (ASD) after a traumatic event that is useful to predict PTSD. It consists of 19 items, for example, "Do you have bad dreams or nightmares about the heart attack," with a response scale from 0, *not at all*, to 4, *very strongly*. The questionnaire comprises four subscales (dissociation, re-experiencing, avoidance, and arousal) based on *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; DSM-IV; APA, 1994) criteria. The total score ranges from 0 to 76. Sum scores over 56 points are judged to be clinically significant. The questionnaire showed good internal consistency (Cronbach's $\alpha = 0.82$) in the present sample.

Depressive symptoms

We used the Beck Depression Inventory-II (BDI-II) (Alexandrowicz et al., 2014) to assess depressive symptomatology as a potential predictor of posttraumatic stress. Only the cognitive symptom subscale was used to limit burden on patients and to prevent somatic distress during acute MI to be falsely assigned to somatic/affective symptoms. The validated German version of BDI-II (Kuhner et al., 2007) cognitive subscale is a 13-item self-report screening scale with a Likert scale ranging from 0 to 3 (total score from 0 to 39). The BDI-II cognitive subscale has been used in patients with medical conditions including MI (Curzik and Begic, 2012). The reliability of the cognitive symptom subscale in this sample was found to be acceptable (Cronbach's $\alpha = 0.71$).

Posttraumatic stress

At 3-month follow-up, we assessed posttraumatic stress symptoms with the validated German version of the Clinician-Administered PTSD Scale (CAPS) (Blake et al., 1995) and the self-rated Posttraumatic Diagnostic Scale (PDS) (Breslau et al., 1999).

The CAPS is a structured psychometric interview to diagnose PTSD, according to the DSM-IV, measuring 17 PTSD symptoms, which cluster across three symptom groups (re-experiencing, avoidance, and hyperarousal). The frequency and intensity of each symptom is quantified on a 5-point Likert-type scale that ranges from "never" (0) to "almost always" (4). To be gauged as "present," each symptom requires a frequency score of at least 1 and an intensity score of at least 2. The total CAPS Score ranges from 0 to 136 and provides a measure of symptom severity.

A diagnosis of full PTSD requires the presence of symptoms from Cluster B, C, and D altogether. Following Blanchard et al. (1995), we also utilized a subthreshold diagnosis of PTSD for which symptom Cluster B and either symptom Cluster C or D need to be present. The symptomatology must have been present for at least 1 month and should have led to significant impairment in important areas of functioning (Cluster F). In the present sample, the CAPS sum score showed good internal consistency (Cronbach's $\alpha = 0.80$), whereas less reliability could be observed for the three subscales (re-experiencing: Cronbach's $\alpha = 0.70$; avoidance: Cronbach's $\alpha = 0.68$; hyperarousal: Cronbach's $\alpha = 0.49$).

The PDS is a 17-item self-report questionnaire based on DSM-IV criteria for PTSD (Powers et al., 2012) measuring re-experiencing, avoidance, and hyperarousal symptoms. Each item is rated on a 4-point Likert scale (0 = *not at all* to 3 = *very much*) covering the previous month. The PDS is validated against psychiatric ratings and DSM-IV criteria, which assumes "PTSD caseness" if one item of re-experiencing, three items of avoidance, and two items of hyperarousal are present. Ratings for symptom severity were 0 (no symptom rating), 1–10 (mild symptoms), 11–20 (moderate symptoms), 21–35 (moderate-to-severe symptoms), and >36 (severe symptoms). A total score of 15 or higher is considered as clinically meaningful. We applied the validated German version of the PDS (Ehlers et al., 1996). The scale showed good reliability in our sample (re-experiencing: Cronbach's $\alpha = 0.81$; avoidance: Cronbach's $\alpha = 0.83$; hyperarousal: Cronbach's $\alpha = 0.78$; PDS sum score: Cronbach's $\alpha = 0.90$).

Data analysis

The statistical software package SPSS Version 22.0 (SPSS, Inc., Chicago, IL, USA) was used to analyze the data. All tests were two-tailed with significance level at $p < 0.05$. Data are presented as medians with interquartile range (IQR) or as mean ± standard deviation (SD). All data were verified for normal distribution using the Kolmogorov–Smirnov test. Spearman's correlation coefficients and Mann–Whitney *U* tests were calculated for data that were not normally distributed. Partial correlation coefficients and Student's *t* test were applied to normally distributed variables. Control variables were defined a priori based on our knowledge that age, gender, illness severity (GRACE Score, peak troponin-T), and depressive symptoms (BDI-II Score) influence psychological outcomes in patients with acute MI (Frasure-Smith et al., 1999; Lane et al., 2001; Sheifer et al., 2000).

To analyze the heart drawings, ImageJ (Schneider et al., 2012) was applied to measure the outside perimeters of the hearts and the areas drawn as damaged. Thereafter, the ratio of these two values was computed and the percentage drawn as damaged was calculated. The number of blocked vessels was also recorded. Two independent raters assessed the damage and categorized each drawing across four groups: damaged area, blocked vessels, emotions, and altered heart size. Raters had to assign each drawing to one of the four predefined groups. Inter-rater reliability was high ($r = 0.81$), and disagreements ($n = 11$) were resolved by discussion and consensus. Due to the small number of participants who drew emotion-related content and patients who drew no damage or only differences in sizes ($n < 20$), we restricted our group comparison to those drawing heart damage and those drawing blocked vessels.

Results

Patient characteristics

The mean age of the study sample was 60.3 ± 10.4 years, and 82 (81.5%) of the participants were men. All 130 participants enrolled were of European Caucasian origin. At the time of their MI, 57 (43.8%) worked full time, 16 (12.4%) worked part time, and 57 (43.8%) were retired or unemployed. A previous diagnosis of MI had been diagnosed in 15 (11.5%) participants. At enrollment, 83 (63.8%)
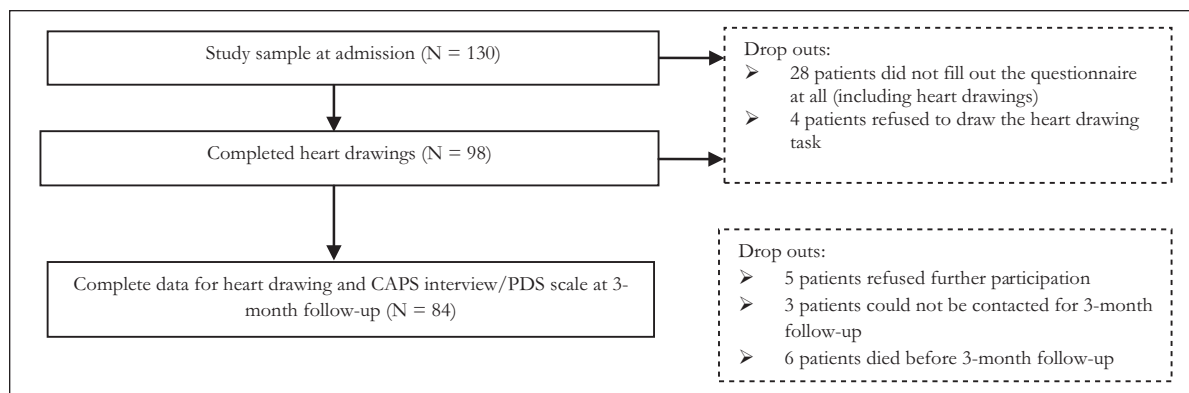
Figure 2. Participant flow.

were married, 22 (16.9%) were divorced, 7 (5.4%) were widowed, and 18 (13.8%) were single; 37 (28.5%) of the participants lived alone and 93 (71.5%) were cohabiting. Most participants' educational level was "apprenticeship or vocational school" (*n* = 89). Of the 96 patients who were included at the 3-month follow-up, 84 (87.5%) had provided heart drawings at study enrollment such that data for heart drawings and posttraumatic stress were available for 84 patients (cf. detailed flowchart in Figure 2).

Analysis of heart drawings

Of the 84 patients who had completed drawings of their heart and were enrolled at 3-month follow-up, 31 drew damage to their heart, 26 drew blocked vessels, 13 expressed emotional feelings through their drawings, and 14 drew altered sizes. The mean of the area drawn as damaged was 17.4 ± 13.8 percent of the size (cm^2) of the heart. The size of damage and the group (damage vs blockages) did not significantly differ by gender, age, previous MI, marital status, and depression at admission. At 3-month follow-up, one patient fulfilled the diagnostic criteria for full PTSD with the CAPS interview and 10 patients qualified for a diagnosis of subthreshold PTSD; 73 participants did not meet the diagnostic criteria of DSM-IV PTSD nor qualified for a diagnosis of subthreshold PTSD. With the self-reported PDS scale, 72 reported mild PTSD symptoms, 9 patients had moderate symptoms, and 3 reached moderate-to-severe symptom levels. There was a significant correlation between the total PTSD symptoms scores from the CAPS interview and the self-rated PDS ($r = 0.66$, $p < 0.01$).

Associations of damaged heart area with acute distress levels and illness perception at admission (n = 31)

The associations of the size of the damaged heart area with the level of ASD symptoms and illness perception

Table 1. Spearman correlations between size of heart damage drawn, acute distress level, and negative illness beliefs (*n* = 31).

	Damage drawn (%)	*p* value
Acute distress (ASDS)		
ASDS dissociative	0.32	0.064
ASDS re-experiencing	0.45*	0.011
ASDS avoidance	0.46**	0.001
ASDS arousal	0.39*	0.022
ASDS sum score	0.36*	0.047
Illness perceptions (BIPQ-R)		
Consequences	0.42*	0.013
Timeline	0.29	0.108
Personal control	0.09	0.603
Treatment control	0.14	0.429
Identity	0.17	0.351
Concern	0.41**	0.014
Coherence	−0.07	0.696
Emotional representation	0.36*	0.036
Medical variables		
Peak troponin-T	0.14	0.430
GRACE Score	0.23	0.191

BIPQ-R: Brief Illness Perception Questionnaire–Revised.
Partial correlation coefficients after controlling for age, gender, and Beck Depression Inventory-II (BDI-II) for Acute Stress Disorder Scale (ASDS) sum score.
*$p < 0.05$; **$p < 0.01$.

are presented in Table 1. The size of the damaged area was directly related to the levels of acute distress. The ASDS sum score was significantly associated with the size of the damaged area after controlling for age, gender, and depressive symptoms. Greater negative illness perceptions were significantly associated with greater damage size in three out of eight BIPQ-R subscales. Specifically, significant relationships with the size of the damaged area were found for perceptions of consequences, illness concern, and emotional representation.

There were no significant correlations between the sizes of the damaged area and both peak troponin-T and the GRACE Score.

Associations of heart drawings with posttraumatic stress at follow-up

We examined the relationship between the size of damaged area and the level of posttraumatic stress at the 3-month follow-up (Table 2). The size of the damaged area was significantly related to the total sum score, re-experiencing and avoidance symptoms of interviewer-rated posttraumatic stress (per the CAPS), as well as to the total sum score of self-rated posttraumatic stress (per the PDS), re-experiencing and avoidance symptoms. Due to normal distribution, partial correlation was calculated for CAPS and PDS sum score controlling for age, gender, and depressive symptoms.

Table 2. Spearman correlations between heart damage drawn and 3-month outcomes (n = 31).

	Damage drawn (%)	p value
PDS		
PDS re-experiencing	0.52**	0.005
PDS avoidance	0.44*	0.022
PDS hyperarousal	0.32	0.080
PDS sum score	0.54**	0.002
CAPS		
CAPS re-experiencing	0.45*	0.017
CAPS avoidance	0.43*	0.025
CAPS hyperarousal	0.31	0.109
CAPS sum score	0.41*	0.022

PTSD: posttraumatic stress disorder.
Partial correlation coefficients after controlling for age, gender, and Beck Depression Inventory-II (BDI-II) for Clinician-Administered PTSD Scale (CAPS) and Posttraumatic Disorder Scale (PDS) sum score.
*p < 0.05; **p < 0.01.

Moreover, the unstandardized coefficient *B* indicated that for a mean ± standard error increase in the damaged heart area of 1.85 ± 9.07 percent, there was a one-point increase in the PDS sum score after adjustment for age, gender, and depressive symptoms (p = 0.007). As an example, this would mean that an increase in 27.8 percent of the damaged heart area corresponds to a PDS Score of 15 indicating clinically meaningful (i.e. moderate to severe) symptomatology.

Comparison of patients with heart damage versus blocked vessels

As a final step, we compared patients who had drawn damage to their heart (n = 31) with those who had plotted blockages of blood vessels (n = 26) with respect to ASD symptoms, illness perceptions, posttraumatic stress, and somatic measures of illness severity. Regarding the latter, there were no significant differences in levels of peak troponin-T and GRACE Scores between the two groups. Moreover, there were also no such differences between patients who drew one versus more than one blocked vessel. There was no significant difference between patients who drew damage and those who drew blockages in terms of ASD symptoms (p = 0.38). In contrast, patients who drew damage to their heart rated their illness to be significantly more severe (BIPQ-R item "consequences") than patients who drew blocked vessels (median = 6.0 (IQR = 3–8) vs 3 (IQR = 2–5), (p = 0.032)). At the 3-month follow-up, patients who had drawn damage to their heart reported higher posttraumatic stress symptoms than those who had drawn blocked blood vessels in several interviewer- and self-rated PTSD subscales and in the PDS total sum score (Table 3).

Discussion

We found a significant correlation between the size of damaged area and several BIPQ-R factors (consequences, concern, and emotional representation). Patients who drew greater areas of damage to their heart rated their illness as

Table 3. Patients drawing damage on the heart versus blockages and posttraumatic stress symptoms.

Posttraumatic stress symptoms	Damaged area (n = 31) median (IQR)	Blocked vessels (n = 26) median (IQR)	p value
PDS			
PDS re-experiencing	1.5 (0.5–3)	0 (0–1)	0.007
PDS avoidance	2 (1–4)	0 (0–2)	0.004
PDS arousal	2.5 (1–4.5)	2 (1–3)	0.138
PDS sum score	5.8 (3.5–12.5)	3 (1–5)	0.002
CAPS			
CAPS re-experiencing	3 (0–6)	2 (0–6)	0.152
CAPS avoidance	3.6 (2–8)	2 (0–2)	0.018
CAPS arousal	5.3 (3–8)	5.3 (4–7)	0.967
CAPS sum score	12.3 (6.5–22.5)	8 (6–14)	0.125

IQR: interquartile range; PDS: Posttraumatic Diagnostic Scale; CAPS: Clinician-Administered PTSD Scale; PTSD: posttraumatic stress disorder.

affecting their life more severely and also had more negative beliefs about their MI. The findings support the validity of patients' drawings for measuring illness perception. In our study sample, neither peak troponin-T levels nor the GRACE Score was significantly correlated with the size of damaged area. This suggests that cognitions of damage, rather than actual/objective myocardial damage, have an impact on behavior (e.g. avoidance).

Our results are consistent with previous findings showing that heart drawings relate to negative illness perceptions following acute MI (Broadbent et al., 2004, 2006b). Specifically, a patient's belief that the heart disease would have serious consequences was significantly related to later disability in domestic duties, recreational activities, and social interactions (Petrie et al., 1996). Furthermore, the significant correlation between the size of the damaged area and the scores of ASDS shows that the drawings reflect the degree of psychological distress.

The main and novel finding of our study is that the damaged area of the heart is significantly related to posttraumatic stress symptoms at 3 months after hospital admission. For instance, an increase in the damaged area of 27.79 percent would change the PDS Score from being 0 to a clinically meaningful level of 15. The damaged area of the heart drawn by patients in our study was, on average, three times as large as the damaged area drawn by patients in Broadbent's study in which the same 49 cm^2 area was used to draw the heart (Broadbent et al., 2004). An explanation might be that all of the patients of our study group had to have high emotional distress (an inclusion criterion was at least 5 for fear of dying and/or feelings of helplessness or worrying on numeric rating scales ranging between 0 and 10) at admission.

As a final analysis, we compared patients drawing heart damage versus those drawing blocked vessels on psychometric measures. At admission, the two groups only differed significantly in the perception of consequences. Interestingly, there was no group difference in the degree of acute distress levels as measured by the ASDS. An explanation could be that the two patient groups felt similarly stressed, but were not similarly afraid of the consequences (as item 1 in BIPQ-R shows); therefore, those who plotted blocked vessels seem to have dealt better with their heart condition between hospital admission and follow-up. This idea is supported by the fact that after 3 months, the level of avoidance was significantly lower in patients who drew blockages in the blood vessels compared to those who drew damage. It may be that patients who drew blocked arteries dealt with a comparably more medical model of their heart disease and developed better coping strategies.

Clinical implications

Drawings can illustrate beliefs in a more integrative way than words (i.e. psychological symptoms) and are an economical, global, and easy-to-administer tool to assess information such as psychometric tests (Broadbent et al., 2006a). Therefore, drawings could be implemented as a valuable tool to complement BIPQ-R to assess the different dimensions of illness perceptions. Another advantage of drawings over questionnaires might be that the former can be used to initiate a dialogue between medical staff and patients and the use of the drawing. Drawing the heart seems to have a high level of acceptance by patients, since only four patients refused to undertake this task.

To gain better insight into patients' illness perceptions, it would be interesting to find out, for instance, whether patients who drew emotions differ in outcome from the other groups (e.g. those who drew damage to their hearts). More precise instructions considering the drawing task might lead to less variability in heart pictures, but at the same time might also impose on patient's preconceived ideas of the researcher.

Limitations

Limitations of this study are that the drawings and the BIPQ-R were assessed at admission only. There might have been changes in maladaptive beliefs that also affected posttraumatic stress symptoms at 3-month follow-up. PTSD levels were low, since 70 percent of patients reported mild PTSD symptoms. Therefore, the interpretation of our results has to consider reduced variability in PTSD symptoms. Furthermore, there was a direct association between distress levels and the damaged area drawn at admission. Therefore, a direct relationship between the heart area drawn as damaged and PTSD symptoms could also be assumed. Additionally, functional outcomes, for example, return to work or number of visits to general practitioners not relying on self-report, would be an interesting subject for future studies in patients with high distress levels following an acute MI.

Since this is an intervention study, it is also possible that posttraumatic stress symptoms were differently influenced by the two interventions performed at admission. As the trial is still running, the study protocol did not allow us controlling for this in the present analysis. The small number of patients in each group precluded calculation of group differences with sufficient reliability across all four categories of drawings. Moreover, since we lost data by categorizing the drawings into the four groups, an alternative analysis might have been considering changes in the size of patients' drawings measured from the lowest to the highest point in millimeters with this measure having shown predictive value for cardiac anxiety and poorer recovery (Broadbent et al., 2006a). The reported results are based on DSM-IV criteria for PTSD and need to be replicated using *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-V)-related instruments.

Conclusion

Taken together, the results of our study show that heart drawings represent acute distress levels and negative illness beliefs; furthermore, these can indicate a risk of developing posttraumatic stress 3 months after acute MI. Heart drawings could be introduced as a simple screening tool to detect emotional distress and maladaptive cognitions about the illness, which could be used to identify a risk constellation for developing clinically relevant PTSD symptomatology.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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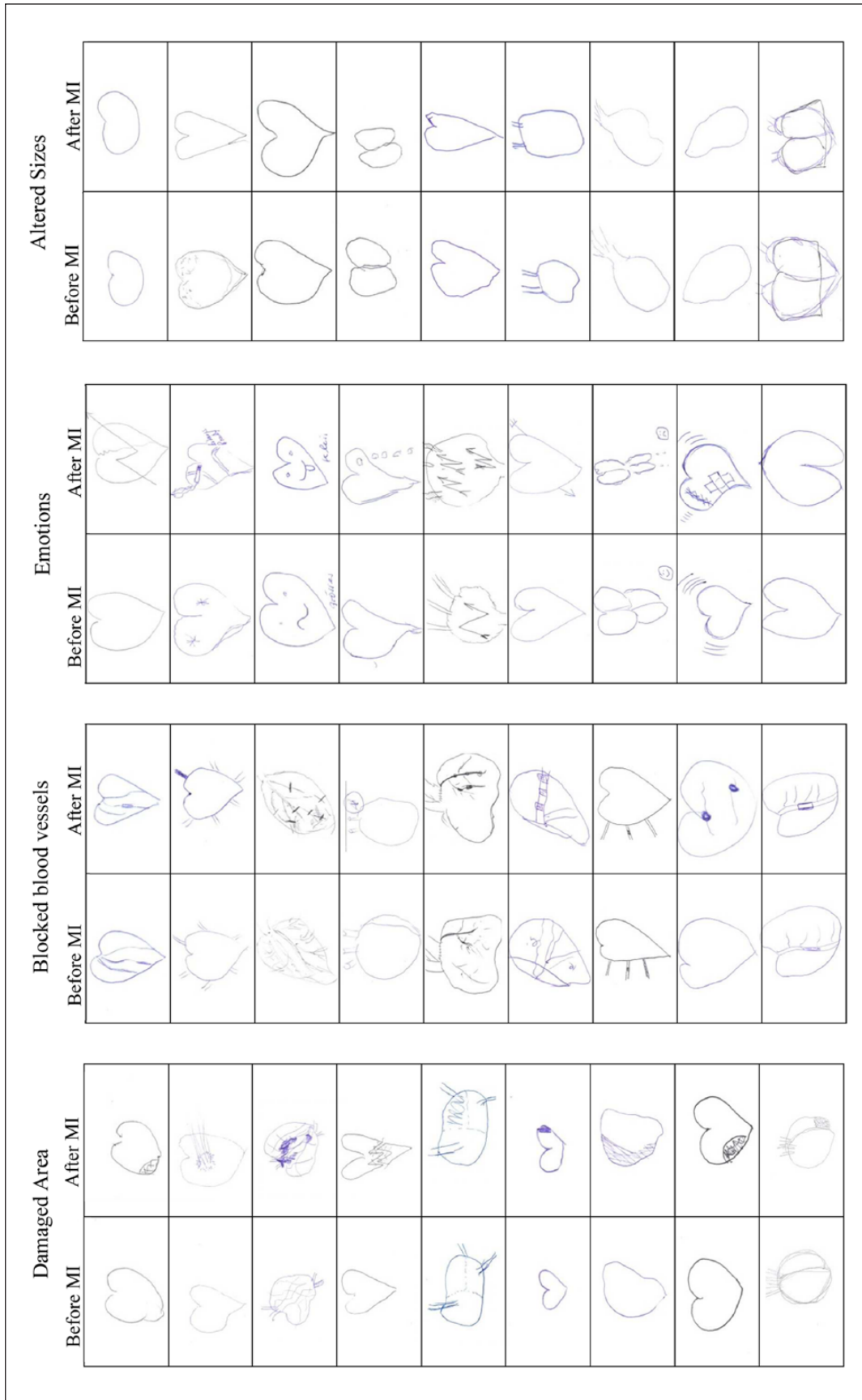
Appendix 1. Further examples of patient's heart drawings.