

# Psycho-social factors are important for the perception of disease in patients with acute coronary disease

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## ABSTRACT

**INTRODUCTION:** Little is presently known about determinants of cardiac illness perceptions, especially regarding psycho-social factors.

**MATERIAL AND METHODS:** Questionnaire study among 97 consecutively recruited inpatients (72.2% male; mean age 60.6 years) with acute coronary syndrome. We examined the role of socio-demographic, illness-related and psycho-social factors (Multidimensional Scale of Perceived Social Support, General Self-Efficacy Scale and Life Orientation Test-Revised) for perceived consequences, controllability and causes (Revised Illness Perception Questionnaire) with standard multiple regression.

**RESULTS:** In final models, dispositional pessimism was associated with perceptions of more severe consequences, less personal control and more attribution of illness to immune system factors. Dispositional optimism was associated with less severe perceived consequences. Higher general self-efficacy was associated with less attribution of illness to psychological factors, smoking and poor medical care. Greater perceived social support was associated with higher perceived treatment control and less attribution of illness to immune system factors, poor medical care, chance and accident. Also, gender, educational status, previous heart disease and family history of cardiovascular disease were significantly related to illness perceptions, whereas present disease severity (Global Registry of Acute Coronary Events) was not.

**CONCLUSION:** Psycho-social resources and illness history were more important determinants of cardiac illness perceptions than present disease severity.

**FUNDING:** This study was supported by unrestricted grants from The FOOD Study Group and The Danish Ministry of Food, Agriculture and Fisheries; The Beckett-Foundation; and The Augustinus Foundation.

**TRIAL REGISTRATION:** not relevant.

Coronary heart disease (CHD) patients surviving the acute phase face the challenge of functionally and emotionally adjusting to the disease. However, there may be great variation in how patients perceive and cope with their illness. One explanation can be found in the Common-Sense Model of self-regulation (CSM). According to the CSM, patients construct their own cognitive models of their condition based on five coherent components which provide a basis for their coping responses [1]. As de-

scribed further in **Table 1**, the CSM components are: causes, identity, consequences, perceived timeline and controllability – also known as illness perceptions. The model suggests that inner or outer situational stimuli (such as chest pain) lead to cognitive and emotional representations of the health treat. These representations will elicit one or more coping procedure(s), e.g. seeking medical care, which is followed by an appraisal state where the action is evaluated. The appraisal may then update the representations leading to new coping behaviour [1].

Illness perceptions have been found to predict functional and emotional recovery, health-related behaviours and rehabilitation attendance among heart patients, e.g. [2-4]. Furthermore, brief in-hospital illness perception interventions given in addition to standard care have been found to be successful by favourably changing myocardial infarction (MI) patients' illness perceptions and improving rates of return to work, enhancing exercise and lowering the number of phone calls to the general practitioner about the condition [5]. However, despite suggestions that personal, social and cultural factors play a central role in illness perception formation [1], relatively little is known about the determinants of cardiac illness perceptions, especially with respect to psycho-social factors. Further knowledge may help explain the wide variation in illness perceptions among patients with the same diagnosis and may be used in tailored interventions.

Previous findings have suggested that socio-demo-

## ORIGINAL ARTICLE

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Dan Med J  
2014;61(8):A4885



TABLE 1

The five coherent components in the common-sense model of self-regulation<sup>a</sup>.

Cognitive component	Clarification
Causes	Patients' understanding of the likely causes of their disease
Identity	Labelling the disease and attributing symptoms
Consequences	Patients' anticipated outcomes of the disease
Timeline	The expected timeframe (e.g. acute, chronic, cyclic)
Controllability	Patients' beliefs in disease responsiveness to personal or professional interventions

a) Emotional responses to the condition are thought to be processed in parallel to and in association with these cognitive illness perceptions [1].

TABLE 2

Descriptive characteristics of the study sample.

Sample characteristics	n (%) (N = 97)	Mean (± SD)
<i>Sociodemographic variables</i>		
Age, yrs	–	60.6 (± 10.2)
Gender, male	70 (72.2)	–
Education ≤ upper secondary (11–13 years)	60 (61.9)	–
<i>Clinical variables</i>		
Diagnosis:		
AMI	77 (79.4)	–
Unstable angina	20 (20.6)	–
Previous hospital admission due to heart disease	24 (24.7)	–
Family history of CVD	43 (44.3)	–
<i>Presenting characteristics</i>		
Heart rate, bpm	–	77.1 (± 17.7)
Systolic blood pressure, mmHg	–	142.7 (± 27.0)
Initial serum creatinine, micromol/l	–	76.1 (± 21.0)
Killip class:		
I	94 (96.9)	–
II	3 (3.1)	–
Cardiac arrest at admission	1 (1.0)	–
ST segment deviation	67 (69.1)	–
Elevated cardiac biomarkers	55 (56.7)	–
<i>Heart disease severity</i>		
GRACE risk score, % (n = 85)	–	19.8 (± 8.4)
<i>Illness perceptions</i>		
Consequences (α = 0.68)	–	19.0 (± 4.0)
Personal control (α = 0.72)	–	23.8 (± 3.6)
Treatment control (α = 0.60)	–	20.3 (± 2.9)
Psychological attributions (α = 0.79)	–	14.3 (± 4.7)
Immune attributions (α = 0.64)	–	6.1 (± 2.2)
<i>Risk factor attribution items</i>		
Heredity	–	3.2 (± 1.4)
Diet/eating habits	–	3.3 (± 1.1)
Poor medical care in past	–	1.6 (± 0.8)
My own behaviour	–	3.3 (± 1.2)
Ageing	–	2.4 (± 1.2)
Alcohol	–	2.0 (± 1.1)
Smoking	–	3.0 (± 1.5)
<i>Chance/accident attribution items</i>		
Chance/bad luck	–	2.4 (± 1.1)
Accident/injury	–	1.7 (± 0.9)
<i>Psychosocial variables</i>		
Perceived social support (α = 0.93)	–	5.7 (± 0.97)
General self-efficacy (α = 0.93)	–	3.2 (± 0.54)
Optimism (α = 0.49) <sup>b</sup>	–	8.9 (± 2.1)
Pessimism (α = 0.60) <sup>b</sup>	–	4.7 (± 2.7)

α = Cronbach's alpha; AMI = acute myocardial infarction; CVD = cardiovascular diseases; GRACE = Global Registry of Acute Coronary Events; SD = standard deviation.

a) The prognostic markers were: increasing age, heart rate and systolic blood pressure at presentation, initial serum creatinine, Killip classification, cardiac arrest at admission, ST segment deviation on the electrocardiogram and elevated cardiac biomarkers [12].

b) Internal consistencies were low. This is, however, not unusual with few items making up the scale, and the mean inter-item correlations were acceptable (optimism subscale: 0.26; pessimism subscale: 0.35).

optimism/pessimism and perceived social support) are associated with illness perceptions in heart patients and other patient groups [6–8]. Elaborating on these findings, we addressed the ability of socio-demographic, illness-related and psycho-social factors to explain the variance in selected illness perceptions among acute coronary syndrome (ACS) patients.

## MATERIAL AND METHODS

A total of 97 hospitalised patients (≥ 18 years) with ACS were recruited consecutively from Aarhus University Hospital, Denmark, in 2008/2009 as part of a larger prospective questionnaire study (78% response rate) [9]. ACS was classified using standard criteria [10]. The exclusion criteria were: severe co-morbidities; major psychiatric problems; senile dementia; severe alcohol or drug abuse; ineligibility for cardiac rehabilitation; inability to complete questionnaires in Danish; or inaccessibility for a six-month follow-up visit. For full details of patients' eligibility, please see [9]. The protocol was assessed by the Regional Research Ethics Committee, approved by the Danish Data Protection Agency and the study was conducted in accordance with the Helsinki Declaration.

## Outcome variables

Three subscales (consequences, personal control and treatment control) and the 18 illness attribution items from the Revised Illness Perception Questionnaire (IPQ-R) [11] were selected based on previous work [2, 3]. Responses are rated on a five-point scale from 1–5. The six-item consequence subscale assesses personal beliefs about disease severity and expected effects of the disease with high scores representing negative beliefs. The personal (six items) and treatment control (five items) subscales assess disease-related self-efficacy beliefs and belief in treatment, respectively, with high scores representing positive beliefs. Finally, illness attributions reflect personal beliefs about the aetiology. These items may be analysed separately or grouped into four subscales (psychological attributions, risk factors, immunity and accident/chance). As only the six-item psychological attribution and three-item immunity subscales demonstrated acceptable internal consistencies (Table 2), the remaining items were analysed separately. The seven risk factor attribution items and the two accident/chance items are shown in Table 2.

## Predictor variables

Socio-demographic (age, gender and education) and clinical information (the number of previous hospital admissions due to heart disease and family history of cardiovascular diseases (CVD)) were self-reported and/or collected from medical records. We used the web-based Global Registry of Acute Coronary Events (GRACE) risk

graphic (gender, age and education), illness-related (disease severity and personal/vicarious illness history) and psycho-social factors (general self-efficacy, dispositional



TABLE 3

Standard multiple regression analyses of predictors of illness perception subscales. Variables were tested in the following order: 1) gender and educational status (variables not affected by the onset of ACS), 2) previous hospital admission (heart disease history), 3) the GRACE risk score (present disease severity), 4) family history of CVD (a socially mediated experience), 5) perceived social support and general self-efficacy (known correlates of cardiac illness perceptions from a previous study [5]) and 6) optimism and pessimism. Age was not included as age is comprised in the GRACE risk score. Variables reaching a significance level of  $p < 0.10$  in the standard multiple regression analysis were carried forward in the next step of the analysis.

Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R <sup>2</sup>	Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R <sup>2</sup>
<i>Consequences</i>					<i>Psychological attributions</i>				
1	Gender <sup>a</sup>	0.15 (0.142)	0.15 (0.162)		1	Gender <sup>a</sup>	0.06 (0.578)	0.06 (0.600)	
	Education <sup>b</sup>	-0.13 (0.221)	-0.12 (0.253)			Education <sup>b</sup>	-0.05 (0.616)	-0.05 (0.641)	
2	Previous hospital admission <sup>c</sup>	-0.07 (0.521)	-0.07 (0.521)		2	Previous hospital admission <sup>c</sup>	0.11 (0.285)	0.11 (0.285)	
3	GRACE risk score	-0.08 (0.480)	-0.08 (0.480)		3	GRACE risk score	0.01 (0.902)	0.01 (0.902)	
4	Family history of CVD <sup>d</sup>	-0.10 (0.371)	-0.10 (0.371)		4	Family history of CVD <sup>d</sup>	0.06 (0.551)	0.06 (0.551)	
5	Perceived social support	0.04 (0.673)	0.06 (0.551)		5	Perceived social support	-0.23 (0.026)	-0.17 (0.093)	
	General self-efficacy	-0.08 (0.471)	-0.09 (0.405)			General self-efficacy	-0.30 (0.004)	-0.26 (0.012)	
6	Optimism	-0.24 (0.018)	-0.30 (0.004)		6 <sup>e,g</sup>	Optimism	-0.28 (0.007)	-0.19 (0.110)	
	Pessimism	0.20 (0.056)	0.26 (0.010)			Pessimism	0.08 (0.437)	0.11 (0.310)	
FM	Optimism	–	-0.30 (0.004)	0.12	FM	General self-efficacy	–	-0.30 (0.004)	0.09
	Pessimism	–	0.26 (0.010)		<i>Immune attributions</i>				
<i>Personal control</i>					1	Gender <sup>a</sup>	0.30 (0.004)	0.29 (0.005)	
1	Gender <sup>a</sup>	-0.01 (0.900)	-0.01 (0.898)			Education <sup>b</sup>	-0.10 (0.346)	-0.08 (0.423)	
	Education <sup>b</sup>	-0.01 (0.958)	-0.01 (0.952)		2 <sup>h</sup>	Previous hospital admission <sup>c</sup>	0.08 (0.470)	0.09 (0.390)	
2	Previous hospital admission <sup>c</sup>	-0.22 (0.030)	-0.22 (0.030)		3 <sup>h</sup>	GRACE risk score	0.13 (0.237)	0.14 (0.206)	
3 <sup>e</sup>	GRACE risk score	-0.08 (0.486)	-0.08 (0.442)		4 <sup>h</sup>	Family history of CVD <sup>d</sup>	-0.06 (0.585)	-0.09 (0.398)	
4 <sup>e</sup>	Family history of CVD <sup>d</sup>	-0.01 (0.920)	0.01 (0.924)		5 <sup>h</sup>	Perceived social support	-0.28 (0.006)	-0.32 (0.002)	
5 <sup>e</sup>	Perceived social support	0.19 (0.069)	0.16 (0.133)			General self-efficacy	-0.20 (0.052)	-0.07 (0.461)	
	General self-efficacy	0.01 (0.908)	0.01 (0.955)		6 <sup>e,h</sup>	Optimism	-0.18 (0.086)	-0.18 (0.074)	
6 <sup>e</sup>	Optimism	-0.06 (0.540)	0.00 (1.00)			Pessimism	0.26 (0.013)	0.23 (0.022)	
	Pessimism	-0.23 (0.024)	-0.23 (0.027)		FM	Gender <sup>a</sup>	–	0.32 (0.001)	0.26
FM	Previous hospital admission <sup>c</sup>	–	-0.22 (0.029)	0.10		Perceived social support	–	-0.25 (0.014)	
	Pessimism	–	-0.23 (0.023)			Optimism	–	-0.18 (0.074)	
<i>Treatment control</i>						Pessimism	–	0.23 (0.022)	
1	Gender <sup>a</sup>	0.04 (0.728)	0.03 (0.766)						
	Education <sup>b</sup>	-0.09 (0.415)	-0.08 (0.428)						
2	Previous hospital admission <sup>c</sup>	-0.21 (0.046)	-0.21 (0.046)						
3 <sup>e</sup>	GRACE risk score	-0.02 (0.836)	-0.03 (0.792)						
4 <sup>e</sup>	Family history of CVD <sup>d</sup>	0.004 (0.968)	0.02 (0.823)						
5 <sup>e</sup>	Perceived social support	0.32 (0.002)	0.25 (0.015)						
	General self-efficacy	0.23 (0.031)	0.20 (0.053)						
6 <sup>e,f,g</sup>	Optimism	0.12 (0.260)	0.02 (0.846)						
	Pessimism	-0.17 (0.110)	-0.14 (0.187)						
FM	Previous hospital admission <sup>c</sup>	–	-0.21 (0.043)	0.17					
	Perceived social support	–	0.25 (0.015)						
	General self-efficacy	–	0.20 (0.053)						

ACS = acute coronary syndrome; CVD = cardiovascular diseases, ellipses, not applicable; FM = final model; GRACE = Global Registry of Acute Coronary Events.

a) 0: men, 1: women.

b) 0: ≤ 13 yrs of education, 1: > 13 yrs of education.

c) 0: no, 1: yes.

d) 0: no, 1: yes.

e) Adjusted for previous hospital admission.

f) Adjusted for perceived social support.

g) Adjusted for general self-efficacy.

h) Adjusted for gender.

score to predict the risk of recurrent MI or death from hospital admission to six months [12]. The prognostic markers are shown in Table 2. Perceived social support from family, friends or a significant other was assessed with the 12-item Multidimensional Scale of Perceived Social Support (MSPSS) [13].

Responses were rated on a seven-point scale from 1–7 with higher scores indicating a higher perceived social support. The ten-item General Self-Efficacy Scale (GSE) was used to assess general self-efficacy, i.e. the belief that one's actions are responsible for successful outcomes [14]. The response format

ranges from one to four with higher scores representing a greater general self-efficacy. Based on confirmatory factor analysis (data available from the first author), the Life Orientation Test-Revised (LOT-R) [15] was used to measure dispositional optimism and pessimism as two separate constructs rather than a unidimensional construct, see also [16]. The scale includes four filler items and six items measuring generalised expectancies for positive (three items) and negative (three items) outcomes. Responses are rated on a five-point scale ranging from 0–4 with higher scores representing greater optimism/pessimism.

TABLE 4

Standard multiple regression analyses of predictors of illness attribution items. Variables were tested in the following order: 1) gender and educational status (variables not affected by the onset of ACS), 2) previous hospital admission (heart disease history), 3) the GRACE risk score (present disease severity), 4) family history of CVD (a socially mediated experience), 5) perceived social support and general self-efficacy (known correlates of cardiac illness perceptions from a previous study [5]) and 6) optimism and pessimism. Age was not included, as age is comprised in the GRACE risk score. Variables reaching a significance level of  $p < 0.10$  in the standard multiple regression analysis were carried forward in the next step of the analysis.

Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R2	Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R2
Heredity					Own behaviour				
1	Gender <sup>a</sup>	0.05 (0.623)	0.05 (0.618)		1	Gender <sup>a</sup>	−0.14 (0.178)	−0.14 (0.178)	
	Education <sup>b</sup>	0.02 (0.884)	0.02 (0.860)			Education <sup>b</sup>	−0.01 (0.950)	−0.02 (0.884)	
2	Previous hospital admission <sup>c</sup>	0.35 (0.001)	0.35 (0.001)		2	Previous hospital admission <sup>c</sup>	−0.10 (0.332)	−0.10 (0.332)	
3 <sup>e</sup>	GRACE risk score	0.04 (0.743)	0.05 (0.660)		3	GRACE risk score	−0.04 (0.702)	−0.04 (0.702)	
4 <sup>e</sup>	Family history of CVD <sup>d</sup>	0.54 (< 0.001)	0.51 (< 0.001)		4	Family history of CVD <sup>d</sup>	−0.06 (0.577)	−0.06 (0.577)	
5 <sup>e, f</sup>	Perceived social support	0.01 (0.894)	0.06 (0.512)		5	Perceived social support	−0.03 (0.777)	−0.03 (0.809)	
	General self-efficacy	−0.05 (0.658)	−0.10 (0.254)			General self-efficacy	−0.02 (0.837)	−0.02 (0.884)	
6 <sup>e, f</sup>	Optimism	−0.06 (0.580)	0.01 (0.899)		6	Optimism	−0.14 (0.184)	−0.15 (0.169)	
	Pessimism	−0.10 (0.338)	−0.06 (0.525)			Pessimism	0.01 (0.927)	0.04(0.697)	
FM	Previous hospital admission <sup>c</sup>	–	0.30 (0.001)	0.38	FM	No variables entered the final model			
	Family history of CVD <sup>d</sup>	–	0.51 (< 0.001)		Ageing				
Diet/eating habits					1	Gender <sup>a</sup>	−0.02 (0.879)	0.00 (0.999)	
1	Gender <sup>a</sup>	−0.18 (0.084)	−0.18 (0.092)			Education <sup>b</sup>	0.26 (0.011)	0.26 (0.012)	
	Education <sup>b</sup>	0.07 (0.494)	0.06 (0.558)		2 <sup>k</sup>	Previous hospital admission <sup>c</sup>	0.07 (0.509)	0.05 (0.653)	
2 <sup>g</sup>	Previous hospital admission <sup>c</sup>	−0.01 (0.899)	−0.02 (0.848)		3 <sup>k</sup>	GRACE risk score	−0.002 (0.983)	0.02 (0.847)	
3 <sup>g</sup>	GRACE risk score	−0.22 (0.049)	−0.22 (0.044)		4 <sup>k</sup>	Family history of CVD <sup>d</sup>	0.10 (0.374)	0.10 (0.349)	
4 <sup>g, h</sup>	Family history of CVD <sup>d</sup>	−0.06 (0.608)	−0.02 (0.893)		5 <sup>k</sup>	Perceived social support	−0.06 (0.544)	−0.05 (0.625)	
5 <sup>g, h</sup>	Perceived social support	0.18 (0.084)	0.21 (0.069)			General self-efficacy	−0.14 (0.180)	−0.19 (0.081)	
	General self-efficacy	0.04 (0.680)	−0.07 (0.552)		6 <sup>i, k</sup>	Optimism	−0.17 (0.096)	−0.14 (0.244)	
6 <sup>g, h, i</sup>	Optimism	0.03 (0.769)	−0.03 (0.811)			Pessimism	−0.03 (0.756)	0.07 (0.501)	
	Pessimism	0.02 (0.87)	0.08 (0.511)		FM	Education <sup>b</sup>	–	0.26 (0.011)	0.07
FM	Gender <sup>a</sup>	–	−0.21 (0.053)	0.12	Alcohol				
	GRACE risk score	–	−0.20 (0.068)		1	Gender <sup>a</sup>	−0.12 (0.262)	−0.11 (0.305)	
	Perceived social support	–	0.19 (0.083)			Education <sup>b</sup>	0.19 (0.073)	0.18 (0.084)	
Poor medical care in past					2 <sup>k</sup>	Previous hospital admission <sup>c</sup>	0.00 (1.000)	−0.02 (0.870)	
1	Gender <sup>a</sup>	−0.01 (0.937)	−0.01 (0.947)		3 <sup>k</sup>	GRACE risk score	0.07 (0.526)	0.09 (0.427)	
	Education <sup>b</sup>	0.02 (0.849)	0.02 (0.853)		4 <sup>k</sup>	Family history of CVD <sup>d</sup>	−0.02 (0.831)	−0.02 (0.840)	
2	Previous hospital admission <sup>c</sup>	0.06 (0.582)	0.06 (0.582)		5 <sup>k</sup>	Perceived social support	−0.12 (0.260)	−0.10 (0.342)	
3	GRACE risk score	0.08 (0.479)	0.08 (0.479)			General self-efficacy	−0.16 (0.132)	−0.18 (0.099)	
4	Family history of CVD <sup>d</sup>	−0.04 (0.721)	−0.04 (0.721)		6 <sup>i, k</sup>	Optimism	−0.03 (0.764)	0.06 (0.595)	
5	Perceived social support	−0.35 (0.001)	−0.29 (0.005)			Pessimism	−0.04 (0.724)	0.01 (0.916)	
	General self-efficacy	−0.35 (0.001)	−0.28 (0.005)		FM	Education <sup>b</sup>	–	0.22 (0.034)	0.07
6 <sup>i, j</sup>	Optimism	−0.16 (0.124)	−0.01 (0.939)			General self-efficacy	–	−0.20 (0.058)	
	Pessimism	0.19 (0.077)	0.15 (0.131)		Continued >				
FM	Perceived social support	–	−0.29 (0.005)	0.20					
	General self-efficacy	–	−0.28 (0.005)						

## Statistics

Simple linear regression (unadjusted Beta) and standard multiple regression (adjusted Beta) were applied. To avoid including variables with little relation to the outcome variable while accounting for the sample size, a significance level of  $p < 0.10$  was used to decide which variables to carry forward in the adjusted analyses. In line with Aalto et al [6], variables were assessed according to a temporal (before versus simultaneously with the study), personal (own versus socially mediated experiences) and conceptual (disease-specific versus generic

factors) order. A significance level of  $p < 0.05$  was used to evaluate the statistically significant unique contribution of each variable in the final models. All analyses were performed with SPSS Version 20 (SPSS Inc., Chicago, Illinois, USA).

*Trial registration:* not relevant.

## RESULTS

Sample characteristics are presented in Table 2. Results from regression analyses are presented in Table 3 and



TABLE 4, CONTINUED

Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R2	Step	Predictor variable	Beta unadjusted (p-value)	Beta adjusted (p-value)	R2
<i>Smoking</i>					<i>Accident/injury</i>				
1	Gender <sup>a</sup>	-0.13 (0.215)	-0.14 (0.194)		1	Gender <sup>a</sup>	0.05 (0.645)	0.06 (0.595)	
	Education <sup>b</sup>	-0.10 (0.363)	-0.10 (0.322)			Education <sup>b</sup>	0.12 (0.258)	0.12 (0.247)	
2	Previous hospital admission <sup>c</sup>	-0.08 (0.435)	-0.08 (0.435)		2	Previous hospital admission <sup>c</sup>	0.02 (0.844)	0.02 (0.844)	
3	GRACE risk score	-0.001 (0.990)	-0.001 (0.990)		3	GRACE risk score	0.21 (0.066)	0.21 (0.066)	
4	Family history of CVD <sup>d</sup>	-0.09 (0.423)	-0.09 (0.423)		4 <sup>h</sup>	Family history of CVD <sup>d</sup>	-0.04 (0.688)	-0.07 (0.559)	
5	Perceived social support	-0.20 (0.061)	-0.15 (0.153)		5 <sup>h</sup>	Perceived social support	-0.26 (0.013)	-0.22 (0.052)	
	General self-efficacy	-0.24 (0.025)	-0.20 (0.059)			General self-efficacy	-0.15 (0.146)	-0.08 (0.461)	
6 <sup>j</sup>	Optimism	-0.09 (0.380)	0.04 (0.723)		6 <sup>j</sup>	Optimism	0.00 (1.000)	0.01 (0.916)	
	Pessimism	-0.10 (0.347)	-0.10 (0.376)			Pessimism	0.21 (0.041)	0.17 (0.129)	
FM	General self-efficacy	–	-0.24 (0.025)	0.06	FM	Perceived social support	–	-0.26 (0.013)	0.07
<i>Chance/bad luck</i>									
1	Gender <sup>a</sup>	0.19 (0.076)	0.18 (0.083)						
	Education <sup>b</sup>	-0.06 (0.562)	-0.05 (0.633)						
2 <sup>e</sup>	Previous hospital admission <sup>c</sup>	0.08 (0.433)	0.09 (0.390)						
3 <sup>e</sup>	GRACE risk score	0.02 (0.852)	0.02 (0.835)						
4 <sup>e</sup>	Family history of CVD <sup>d</sup>	-0.17 (0.125)	-0.19 (0.084)						
5 <sup>f, g</sup>	Perceived social support	-0.25 (0.019)	-0.28 (0.010)						
	General self-efficacy	-0.08 (0.455)	0.03 (0.810)						
6 <sup>f, g, i</sup>	Optimism	-0.04 (0.688)	-0.06 (0.593)						
	Pessimism	0.23 (0.028)	0.17 (0.122)						
FM	Gender <sup>a</sup>	–	0.23 (0.027)	0.11					
	Perceived social support	–	-0.28 (0.007)						

ACS = acute coronary syndrome; CVD = cardiovascular diseases, ellipses, not applicable; FM = Final model; GRACE = Global Registry of Acute Coronary Events.

a) 0: men, 1: women.

b) 0: ≤ 13 yrs of education, 1: > 13 yrs of education.

c) 0: no, 1: yes.

d) 0: no, 1: yes.

e) Adjusted for previous hospital admission.

f) Adjusted for family history of CVD.

g) Adjusted for gender.

h) Adjusted for GRACE.

i) Adjusted for perceived social support.

j) Adjusted for general self-efficacy.

k) Adjusted for educational status.

**Table 4.** Preliminary analyses showed that assumptions of normality, linearity, multicollinearity and homoscedasticity were not violated. Only one statistically significant association between psycho-social predictor variables was found, namely between dispositional optimism and general self-efficacy. This association was, however, only moderate (Spearman's  $\rho = 0.44$ ,  $p < 0.01$ ).

#### Determinants of perceived consequences and controllability

In the final model, patients who scored high on dispositional optimism reported less severe perceived consequences, whereas those scoring high on dispositional pessimism reported more severe perceived consequences, altogether explaining 12% of the variance.

Previous hospital admission and a higher degree of dispositional pessimism were both associated with weaker personal control beliefs, explaining 10% of the variance.

In the final model explaining 17% of the variance in perceived treatment control, previous hospital admission was associated with lower treatment control beliefs, and higher levels of perceived social support were associated with perceptions of more treatment control, whereas general self-efficacy did not make a statistically significant unique contribution (Table 3).

#### Determinants of psychological and immune attributions

In the final model, general self-efficacy was associated with less psychological attribution, explaining 9% of the variance. In the final model, explaining 26% of the variance in immune attributions, women were found more likely than men to attribute their illness to immune system factors as were patients with high levels of pessimism. Also, higher levels of perceived social support were associated with less attribution of illness to immune system factors, whereas optimism did not make a statistically significant unique contribution (Table 3).

#### Determinants of risk factor attribution items

In the final model, previous hospital admission and having a family history of CVD were both associated with more attribution of illness to heredity, explaining 38% of the variance. Higher levels of perceived social support and higher levels of general self-efficacy were both associated with less attribution of illness to poor medical care in the past, explaining 20% of the variance. A higher educational level was associated with more attribution of illness to ageing, explaining 7% of the variance. In the final model, explaining 7% of the variance in attribution of illness to alcohol, a higher educational level was associated with more attribution of illness to alcohol, whereas general self-efficacy did not make a statistically



There may be great variation in how heart patients perceive and cope with their illness.



significant unique contribution. Finally, a higher level of general self-efficacy was associated with less attribution of illness to smoking, explaining 6% of the variance (Table 4).

#### Determinants of chance or accident attribution items

In the final model, women were found more likely than men to attribute their illness to chance as were patients with low levels of perceived social support, altogether explaining 11% of the variance. Also, higher levels of perceived social support were found to be associated with less attribution of illness to accident, explaining 7% of the variance (Table 4).

#### DISCUSSION

Overall, our findings are in accordance with the CSM which suggests that personal and social factors influence the nature of patients' illness perceptions [1]. In the present study, psycho-social factors were found to be more important in determining patients' perceptions of their illness than the severity of the illness itself. This finding corresponds with suggestions that illness perceptions are highly individualised and not necessarily in accordance with medical facts [1]. Also, previous heart disease emerged as a more important associate of illness perceptions than present disease severity, which is also consistent with suggestions that individual illness history plays a central role in present illness perception formation [1]. While it may be somewhat surprising that present disease severity was not found to be associated with illness perceptions, others have also found few associations between disease severity and illness perceptions among MI patients [17, 18]. On the other hand, our finding was in contrast to that of Aalto et al [6]; however, these authors did not apply an established clinical risk model. Others have pointed out that patients' illness perceptions are formed early during the hospital stay, and information on medical facts – such as present disease severity – may be evaluated in relation to these early cognitive representations and rejected if not consistent with patients' own understanding of their disease [17].

To our knowledge, this is the first study to demonstrate that dispositional optimism/pessimism is associated with illness perceptions among ACS patients. Dispositional pessimism was a slightly better predictor of illness perceptions than dispositional optimism in the fully adjusted models, which is largely in accordance with previous studies among both healthy adults and heart patients reporting that pessimism tends to be a better predictor of outcomes [16, 19]. Also, overall in line with previously reported findings [4, 6, 18], patients with higher levels of perceived social support and higher levels of general self-efficacy were less inclined to make strong illness attributions and to report negative illness perceptions in the present study.

As for the clinical variables, previous hospital admission was associated with perceptions of less controllability, and although not all have found this to be the case [7], it is possible that patients suffering a re-infarction may find that the disease is somewhat out of their control. In addition, both previous hospital admission and having a family history of CVD were associated with attribution of illness to heredity – the latter corresponding to findings by others [4, 7]. Similarly, our finding that women were more likely than men to attribute their disease to factors beyond their control such as immune system factors and chance is overall consistent with previous findings [4, 7]. It may be speculated that this finding pertains to heart attack being perceived as a man's disease, see also [4]. Finally, we found that a higher educational status was associated with attribution of illness



#### FACT BOX

*Supplementary material available from the first author upon request*

#### Confirmatory factor analysis of the Life Orientation Test-Revised

We applied confirmatory factor analysis using LISREL 8.8 [1] to examine the factor structure of the Life Orientation Test-Revised (LOT-R) [2]. Two models were specified and tested. The first was a one-factor model with all six items specified to load on one latent variable. The second model was a correlated two-factor model with the three positive items loading on the first factor (optimism) and the three negative items loading on the second factor (pessimism). The one-factor model showed a poor fit,  $\chi^2$  (9,  $n = 96$ ) = 35.90;  $p < 0.001$  (RMSEA = 0.18; 90% CI = 0.12–0.24). The two-factor model, however, was a satisfactory fit,  $\chi^2$  (8,  $n = 96$ ) = 7.63;  $p = 0.47$  (RMSEA = 0.00; 90% CI = 0.00–0.12). Furthermore, a  $\chi^2$  difference test suggested that the two-factor model was a better fit,  $\Delta\chi^2$  (1,  $n = 96$ ) = 28.27;  $p < 0.001$ . Factor loadings for the optimism factor were all positive (0.50, 0.82, 0.40) and statistically significant ( $p < 0.05$ ). Factor loadings for the pessimism factor were all positive (0.44, 0.98, 0.46) and statistically significant ( $p < 0.05$ ), and the correlation between factors was  $r = -0.01$  ( $p > 0.05$ ).

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to risk factors such as ageing and alcohol, which is overall in line with some [4], but not all [6] previous findings.

Others have suggested that psycho-social factors such as optimism and social support may eventually facilitate or hinder changes in heart patients' health behaviours [20], and it may be speculated that this pertains to illness perceptions as well. Thus, it remains to be investigated if targeting patients' illness perceptions in conjunction with underlying traits and preceding illness history leads to more efficient interventions.

### Limitations

Due to somewhat strict inclusion criteria, the present findings should only cautiously be applied to older ACS patients and ethnic minority patients [9]. Also, given the cross-sectional nature of the study, we cannot rule out that the self-reporting on psycho-social measurements may, to some extent, have been influenced by being hospitalised and the illness perceptions associated with this event. Furthermore, not all patients had their heart rate and systolic blood pressure recorded at presentation; thus, the GRACE risk score could only be calculated for 85 patients. Finally, in models testing attribution of illness to poor medical care in the past, alcohol, smoking and accident/injury, minor deviations from normality were seen. Thus, caution should be exercised when generalising these findings.

### CONCLUSION

Psycho-social factors and individual illness history were found to be more important determinants of illness perceptions following ACS than present disease severity. We suggest that the efficacy of interventions aimed at altering illness perceptions may be improved by targeting not only the illness perceptions per se but also the psycho-social factors and individual illness history that precede these, thereby accounting to a greater extent for patients' personal models of their illness. This, however, remains to be investigated.

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**ACCEPTED:** 22 May 2014

**CONFLICTS OF INTEREST:** Disclosure forms provided by the authors are available with the full text of this article at [www.danmedj.dk](http://www.danmedj.dk).

**ACKNOWLEDGEMENTS:** **WE ARE** grateful to Professor *Mark Shevlin* for statistical assistance and study nurse *Claus Sørensen* for data collection.

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