PERSONALITY AND TIME DELAY TO TREATMENT OF ACUTE MYOCARDIAL INFARCTION.

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Abstract:

**Background.** To assess whether personality, psychosocial factors and coping strategies could explain differences in time delay from onset of symptom of acute myocardial infarction (AMI) and arrival at the hospital emergency room.

**Methods and Subjects.** 400 patients, aged 26-70 years, with an acute myocardial infarction participated in the study. Tests measuring stress adaptation were completed by 180 of the patients. Coping strategies, personality assessment and a questionnaire on depression were completed by 323 of the patients and an interview was performed with all 400 patients when clinically stable. The patients were categorised into quartiles, based on time from onset of symptoms until arrival at hospital: 0-45 minutes (Q1), 46 minutes – 2 hours (Q2), 2-12 hours (Q3) and 12-72 hours (Q4). The quartiles were compared using logistic regression and general linear models.

**Results.** In this study women showed more depressive symptoms as well as higher levels of neuroticism when compared with men. There was, however no association between personality factors (i.e., extraversion, neuroticism, openness, agreeableness, conscientiousness) or depressive symptoms and time between onset of symptoms and arrival at hospital. Nor was there any significant relationship between the patients self-reported coping strategies and time delay.

**Conclusion.** It is concluded that differences in personality, coping or depression can not explain the differences in time for seeking hospital after an AMI.
Background

Different psychosocial factors have increasingly been recognized as risk factors for coronary heart disease (CHD) and myocardial infarction (MI). Rozanski and collaborators have suggested that the psychosocial factors associated with adverse cardiac events can be divided into emotional factors and chronic stressors [1]. The most prominent emotional factor that has been linked to CHD in several studies is depression [2, 3]. Various personality traits are other types of emotional factors that have been linked to CHD. Personality can be described in wider categories, as Type D personality (characterized by distress and suppression of negative emotions) [4]. The distinctive personality traits anxiety [5] and hostility [6] have shown associations with CHD. The psychosocial factors that can be considered chronic stressors are low socioeconomic status, low social support, and the different arenas where individuals are exposed to stress [1]. Individual behaviour in association with stressful events has also been assumed to be a risk factor in association not only with myocardial infarction (MI) but also with increased risk of death after myocardial infarction [7, 8].

Until recently the risk factors associated with cardiovascular disease were considered to be the same for men as for women. Current research has however shown that differences exist in many regards. These differences concern pathology and electrophysiology, genesis of infarction, symptoms and prevalence of psychosocial factors e.g. panic attacks, depression, and social support [9]. Women also seem to be more vulnerable to stress maybe because of a higher involvement in social relations [10].

However there are still many uncertainties regarding how psychosocial risk factors differ between men and women.

Rapid medical intervention of acute myocardial infarction (AMI) can prevent mortality and reduce morbidity [11]. Early arrival at hospital is necessary for successful treatment, and in order to minimize negative consequences it is important that the time between onset of symptoms and hospital admission is as short as possible. There are however many patients who fail to recognize the seriousness of their symptoms and thus wait unnecessarily long to seek medical care.
There is little knowledge of the impact of psychosocial factors on delay from onset of symptoms to seeking hospital. O’Carroll and colleagues have in their study found several factors that could explain the delay in seeking treatment. The patients who had longer time delay showed lower scores on neuroticism and scored higher on denial [12]. Different coping strategies like praying, waiting, resting, using self-treatment e.g. taking non prescribed medication are factors that explain the prolonged delay in seeking medical care[13]. A recent study in the USA found that low income and neighbourhood characterized by low social ties, were also contributors to prolonged delay in seeking hospital [14]. Difficulty to describe symptoms and chronic illness from other diseases confuse the symptoms more in women than in men [9].

Prehospital delay has been found in many studies, and the reasons for time delay have been several [15]. One recent study show that no trust to others was one reason for delay [16], problem to recognize symptoms was another reason [17] as well as bad or none injuring will delay the patients [18]. Large education campaigns in the United States have not shown results in reducing time for seeking acute care [19].

However it is still important to find factors witch can help to understand the patients, as the knowledge that time to reperfusion has significance for determination the size of the infarction [20] and the prognosis in the future is depending on the time of onset of symptoms and treatment [15].

The purpose of this study is to analyse the relationship between personality and psychosocial factors and the time lag, between onset of coronary symptoms and seeking emergency hospital care. A further aim is to describe the distribution of personality factors and socio-demographic background data between men and women, in a patient cohort of acute MI.

Methods
Participants and Study design
The sample of patients was selected to represent a general clientele of patients admitted to a Coronary Care Unit (CCU) diagnosed with MI (ICD – code I21) excluding individuals older than 70 years of age. The patients were enrolled in the study within 24 hours following admission to the CCU. Clinically stable patients were informed about the study both in written form and orally and an informed consent was obtained. The research nurse interviewed the patients.
Within 36 hours of arrival at CCU a clinical psychologist performed tests measuring stress adaptation, coping strategies, personality and depression. After discharge from hospital all patients in the study were followed-up in a nurse-conducted rehabilitation program including life style changes, at the Secondary prevention unit at the Malmo University Hospital. The nurse who included the patients was not involved in the secondary prevention program. The study was approved by the Ethic Research Committee, Faculty of Medicine, University of Lund. (LU230-02)

Patients admitted to the CCU at Malmo University Hospital in Sweden from July 2002 to January 2005 were eligible for the study. The care unit has a catchment area of about 275000 inhabitants.

This study is based on the SECAMI study (Secondary Prevention and Compliance Following Acute Myocardial Infarction) which was performed with the purpose of exploring psychological and personality factors in patients with MI and the effects on prognosis and adherence to secondary prevention and given treatment.

The inclusion criteria for this study were patients admitted to the CCU with 1) a diagnosed acute MI, according to the definition of the European Society of Cardiology guidelines [21], 2) aged less than 71, 3) living within the hospital catchment area, 4) adequate communication skills and knowledge of the Swedish language and 5) research staff available.

Eight hundred and forty-seven patients were eligible for the study. A total of 208 patients were not able to participate because they were admitted at times when the research staff was not available and 101 patients were excluded due to residential areas outside hospital catchment area. Seventy-two patients were excluded since they did not understand Swedish. Another 21 patients could not participate due to severe illness or low mental and physical capability. Of the total population of 445 patients who fulfilled the entry criteria 45 patients declined to enter the study. A total of 400 patients participated in the study.

Data Collection

Social and demographic data

A comprehensive questionnaire was designed for the study, to give information about risk factors for CHD. The questionnaire concerned previous disease, medication, occupation, education level, marriage, nationality, smoking and snuff and alcohol habits as well as time from symptoms to arrival at hospital. The patient was asked about the time of symptom onset. The time was also checked with relatives and bystanders when this was possible. From hospital records the time for arrival was taken. No data is missing. The marital status for this
study was classified as single, widowed, divorced or married/cohabiting, educational level as university education, intermediate level and less than 9 years. The patients were asked whether they had a job, had retired, were retired due to sickness. Smoking and snuff habits were categorized as current, former or never. Body mass index (BMI) was calculated as weight (kg)/height (m²). The following tests are used in measuring personality factors and social network; Color Word Test, Coping interview, Beck Depression Inventory.

**Measurements of psychosocial factors**

*The serial Color Word Test (CWT)*

The serial Color Word Test (CWT) is a test with a semi-experimental approach of measuring how individuals adapt in a stressful situation [22]. The test is a version of the Stroop test that originally was designed for the study of interference. It has been described in several earlier studies [7, 22, 23]. To summarize, the test is made up of color words printed in an incongruent color where the subject is asked to name the color of the print and disregard the written word. The amount of time it takes for a subject to finish two rows of color words is expressed in seconds. By presenting the test in a serial manner it is possible to study cognitive adaptation as a process [24]. Behaviour in the test is categorized according to appearance of the time-patterns and the time-patterns are assumed to show how individuals adapt to cognitive conflicts in everyday life [23]. André-Petersson and collaborators have shown that both the Variability-dimension and the Regression-dimension of the CWT are related to cardiovascular disease [8, 24-26]. In each dimension four different patterns can be distinguished and they are equally labelled in the two dimensions. The names of the time-patterns are in accordance with their graphic appearance and are thus named Stabilized, Cumulative, Dissociative and Cumulative-dissociative. The Dissociative and the Cumulative-dissociative patterns are associated with difficulties to manage stressful situations.

*Beck Depression Inventory*

The Beck Depression Inventory is a 21-item self-rating instrument used to assess existence and severity of depressive symptoms. A cut-off at 10 points or above is used to indicate depressive symptoms in this study. Beck Depression Inventory (BDI) has repeatedly been validated [27] and is often used in cardiovascular populations [28].

*Coping*

Coping can be described as either actions or thoughts that individuals use when dealing with stressful events [29]. An unstructured interview regarding coping strategies with critical life
events was included in the psychological examination. Answers were categorized into ten different categories. The categories were: Confrontive coping, Distancing, Self-controlling, Seeking social support, Accepting responsibility, Escape-Avoidance, Planful problem solving, and Positive reappraisal. The categories Altruism and “Failure to find a coping strategy” were added in this study. In addition an alternative category labelled “flexibility of coping” was used. Individuals mentioning more than one strategy were categorized as having a flexible coping style.

**Personality**

To obtain measures on the personality of the participants the abbreviated version of the NEO Personality Inventory was used [30]. There are sixty items which give measures on Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness.

**Statistical analysis**

The Pearson’s chi-square test (for dichotomous variables) and logistic regression (for ordinal variables) were used to compared background factors and clinical characteristics between men and women. Sex was used as dependent variable in these calculations. The patient cohort was divided into quartiles (Q1-Q4) according to the time from onset of symptoms until arrival at hospital. The time for Q1 was 0-45 minutes, for Q2 46 minutes to 2 hours, for Q3 2 to 12 hours (121-720 minutes) and for Q4 12 to 72 hours (721-4320 minutes). Logistic regression was used to compare dichotomous variables by quartile of time delay. The quartiles of time delay were fitted as an ordinal variable in the logistic regression model and p for the trend over the quartiles was used. The logistic regression model was also used to adjust the p-values for age and sex. For continuous variables, a general linear model was used. The quartiles of time delay were used as a fixed factor and the p-value for the linear association over the factor levels was used. The general linear model was also used to adjust for age and sex.

**Results**

**Baseline characteristics**

Baseline characteristics of the patients are presented in Table 1. The mean age was 60.6 years (range 37-70 SD ±8.0) for the women and 57.7 years (range 26 -70 SD ±8.4) for the men. Men were more often employed (50.8%) than women (36.0%) p=0.02. A greater proportion
of women were living alone and women had higher BMI than men. Education and the proportion of immigrants were not significantly different between men and women. Depressive symptoms were more prevalent in women than in men (mean 10.5 ±8.0 vs.7.6±7.0 p<0.001). Of the personality factors, the neuroticism scale showed higher scores in women than in men (mean: 19.7±10.7 vs. 16.5± 8.4 p=0.006). Extraversion, agreeableness, openness and conscientiousness showed no significant differences between men and women. 75.9% of the men and 24.4% of the women had ST-elevation AMI. Left ventricular ejection fraction, < 40% was found in 24.0 % of the men and 27.9% in women. The Color-Word test was performed by 137 men (48.4%) and 43 women (36.8%). The results from this test showed no significant difference between men and women (not shown in table).

**Time delay**

The relationship between patient characteristics and time to hospital is shown in table 2. Patients with experiences of a previous MI did not arrive at the hospital earlier than patients without previous MI. Older patients had longer time delay. There was no significant relationship between scores on the neuroticism, extraversion, agreeableness, openness or the conscientiousness scale and time delay. Further we found no correlation between time delay and degree of education, immigrant status, depression, or other psychosocial factors. The relationships between time delay and personality factors or depression, respectively remained insignificant after adjusted for age and sex.

**Discussion**

The main finding of this study is that different personality factors (e.g. neuroticism and agreeableness), depressive symptoms, and living alone do not seem to influence delay time in seeking acute medical care. Wong et al found that pre –existent depression is associated with delayed presentation.[31]

In our study none of the personality factors or depression was associated with delay time. In a prospective cohort study, participants were followed- up for 21 years in order to examine if mortality was influenced by neuroticism and extraversion [32]. They found that high neuroticism was significantly associated with an excess risk of mortality from cardiovascular disease.

A review by Wulsin and Singal found that depressive symptoms was associated with a significantly increased risk for cardiovascular disease [2]. Psychosocial stress has been related
to risk of ischemic heart disease [33]. The reason for the relationships between psychosocial factors and cardiovascular disease are still unclear. However, the present results suggest that the increased cardiovascular risk in individuals with these risk factors cannot be explained by a lower willingness to seek acute care at the time of an acute coronary event.

To our knowledge, no study has compared the serial CWT in men and women with an AMI. Our findings of no difference between men and women concerning how they managed the stressful situation assessed by CWT is therefore of interest. The study of “Men born in 1914” showed an almost three fold increased risk of an MI in hypertensive men, who had difficulties managing the stressful CWT [7]. In our study, only 180 patients participated in the CWT which may explain the stressful and exhausting nature of the test per se. It is likely that patients who did not complete the test were more vulnerable to stress.

The inventories used in the present study represent established concepts of personality and psychosocial stress and have shown relationships with various health conditions in several previous studies [7, 34]. Studies using the Beck depression inventory as well as CWT and the personality scales have shown association with cardiovascular disease and mortality. Parakh et al found that depression after an MI was associated with increased mortality in a short-time perspective [35]. A study using the Color Word Test has shown that male patients who have difficulties in adaption to a stressful situation seemed to have an increased risk of death following a myocardial infarction [8].

There are many different instruments for measuring coping strategies which makes it difficult to compare coping result between studies. Our study did not find any relationship between coping and delay time in seeking treatment. Other studies have reported longer delay time associated with specific coping strategies involving efforts to wish and pray that the symptom disappear, or trying to relax [13]. Lefler and Bondy [17] found in a meta synthesis several reasons for women’s delay in seeking treatment. The most significant reasons were atypical presentation of symptoms, severity of presenting symptoms and presences of other chronic illnesses.

However, the present study only included survivors after a myocardial infarction. About one third of all persons with an acute MI die without reaching hospital[36]. Since depression, personality factors as neuroticism and being unmarried previously have been associated with reduced survival [32, 37], it is possible that selective mortality of unmarried subjects or persons with specific personality traits reduce a possible relationship with time delay of seeking hospital care. It is also possible that other unmeasured factors are more important
explanations for the variation in time delay. For instance patients might not consider the pain as a symptom of a dangerous condition.

The time delay is influenced both by the patient’s individual decisions [38] and by the geographical distance and transports. In the present study the university hospital is the only hospital for acute somatic care in the city and it can be reached within 15 minutes from all areas in the city. Acute care and ambulance transports are provided at a nominal fee, differences with respect to the geographical distance or accessibility explain the absence of significant relationships with personality traits. This is special interesting since the findings in a study from US, where Smolderen and colleges found that patients without or with bad insurance had prolonged time from onset of symptoms to seeking emergency care. [18]

This study has some limitations as well as strengths. A strength is that all measurements and interviews were performed by the same specialized researchers. One limitation of the study is that all patients could not be included because of absence of the researcher during holiday. Another shortcoming is the absence of participants older than 70 years. Other limitations are that the researchers did not ask for who called for emergency service and neither asked about the patients’ last contacts for medical care, as well as exclusion of patients not speaking or reading Swedish. The choice of instrument measuring stress may have influenced the participating rate in that part of the study, since some patients may avoid the test situation because of fear of not being able to handle the test.

Conclusion

Although acute treatment without unnecessary delay is of vital importance after myocardial infarction, not much is known about the relationship between pre-hospital delay and personality factors. The present study showed that personality factors and depressive symptoms were unrelated to the time delay from onset of MI symptoms to arrival at hospital. Nor were coping strategies or educational level predictive for time to arrival at hospital.

Authors’ contributions

MS, LA-P and PT examined and interviewed the patients. All authors contributed to the design of the study. MS drafted the first manuscript and all authors gave critical input to the manuscript. MS and LAP performed the statistical analysis. All authors have read and approved the final version of the manuscript.
Competing interest

Prof Gunnar Engström is employed as senior epidemiologist at AstraZeneca R&D. The other authors have no conflicts of interest to disclose.

References


Table 1. Background factors and clinical characteristics of the study population

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-50 years</td>
<td>45 (19.0)</td>
<td>10 (11.6)</td>
<td></td>
</tr>
<tr>
<td>51-60 years</td>
<td>93 (39.2)</td>
<td>30 (34.9)</td>
<td></td>
</tr>
<tr>
<td>61-70 years</td>
<td>99 (41.8)</td>
<td>46 (53.5)</td>
<td>0.04</td>
</tr>
</tbody>
</table>

| Living alone | 63 (66.5%) | 36 (40.4%) | 0.06    |

| Employed or professionally active | 121 (50.8%) | 32 (36.0%) | 0.02    |

| Immigrant | 46 (19.4%) | 10 (11.6%) | 0.09    |

| Education |                   |       |         |
| Low (<9 years) | 71 (30.0%) | 26 (30.2%) |       |
| Intermediate | 135 (57.0%) | 49 (57.0%) |       |
| High (University) | 31 (13.1%) | 11 (12.8%) | 0.94    |

| Medical history |                   |       |         |
| Current smoking | 103 (43.5%) | 46 (53.5%) | 0.11    |
| Previous myocardial infarction | 39 (16.5%) | 12 (14.0%) | 0.59    |

| Treatment for hypertension | 90 (38.0%) | 41 (47.7%) | 0.12    |
| Treatment for hypercholesterolemia | 57 (24.1%) | 16 (18.6%) | 0.30    |

| Diabetes mellitus | 37 (15.6%) | 14 (16.3%) | 0.89    |
| Body Mass Index ≥30 | 54 (22.8%) | 32 (37.2%) | 0.01    |
| History of family MI | 81 (34.2%) | 22 (25.6%) | 0.14    |

Data are given as n %.

MI Myocardial infarction,
Table 2. Distribution of clinical, psychosocial and personality background characteristics by time to hospital arrival

<table>
<thead>
<tr>
<th>Time to hospital (minutes)</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>p-value</th>
<th>p-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=323</td>
<td>80</td>
<td>79</td>
<td>83</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>56.7±9.8</td>
<td>58.6±8.0</td>
<td>58.8 ±7.9</td>
<td>59.3 ±7.3</td>
<td>0.05</td>
<td>0.07</td>
</tr>
<tr>
<td>Men</td>
<td>78.8</td>
<td>74.7</td>
<td>71.1</td>
<td>69.1</td>
<td>0.14</td>
<td>0.21</td>
</tr>
<tr>
<td>Immigrant</td>
<td>25.0</td>
<td>11.4</td>
<td>13.3</td>
<td>19.8</td>
<td>0.46</td>
<td>0.79</td>
</tr>
<tr>
<td>Married</td>
<td>70.0</td>
<td>79.7</td>
<td>65.1</td>
<td>66.7</td>
<td>0.28</td>
<td>0.37</td>
</tr>
<tr>
<td>Education</td>
<td>17.1</td>
<td>11.2</td>
<td>13.1</td>
<td>11.1</td>
<td>0.51</td>
<td>0.39</td>
</tr>
<tr>
<td>high(University)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous MI</td>
<td>15.0</td>
<td>16.5</td>
<td>15.7</td>
<td>16.0</td>
<td>0.89</td>
<td>0.93</td>
</tr>
<tr>
<td>STEMI</td>
<td>38.8</td>
<td>35.4</td>
<td>33.7</td>
<td>35.8</td>
<td>0.66</td>
<td>0.67</td>
</tr>
<tr>
<td>BMI ≥ 30</td>
<td>18.8</td>
<td>30.4</td>
<td>24.1</td>
<td>33.3</td>
<td>0.09</td>
<td>0.09</td>
</tr>
<tr>
<td>Current smoker</td>
<td>46.2</td>
<td>43.0</td>
<td>50.6</td>
<td>44.6</td>
<td>0.93</td>
<td>0.62</td>
</tr>
<tr>
<td>Beck depression inventory</td>
<td>8.8±8.0</td>
<td>7.31±6.6</td>
<td>8.5±7.2</td>
<td>8.9±7.4</td>
<td>0.73</td>
<td>0.87</td>
</tr>
</tbody>
</table>

NEO personality

| Neuroticism                | 17.6±9.9 | 16.2±8.0 | 17.4±9.8 | 18.1±8.9 | 0.53 | 0.44 |
| Extraversion               | 30.2±7.0 | 28.7±6.7 | 29.2±6.2 | 29.0±7.1 | 0.36 | 0.39 |
| Agreeableness             | 30.4±5.7 | 30.6±5.5 | 30.3±5.4 | 29.7±5.3 | 0.42 | 0.36 |
| Openness                  | 27.8±6.9 | 27.7±6.3 | 27.5±6.6 | 26.9±7.0 | 0.38 | 0.37 |
| Conscientiousness         | 34.7±6.3 | 34.4±6.1 | 34.4±6.3 | 34.1±6.2 | 0.53 | 0.44 |

Coping strategies

<p>| Confrontive               | 10.0  | 15.2  | 12.0  | 4.9  | 0.23 | 0.24 |
| Distancing                | 15.0  | 20.3  | 12.0  | 12.3 | 0.36 | 0.55 |
| Self-controlling          | 8.8   | 13.9  | 14.5  | 14.8 | 0.26 | 0.34 |
| Seeking social support    | 8.8   | 7.6   | 16.9  | 8.6  | 0.56 | 0.71 |</p>
<table>
<thead>
<tr>
<th>Coping Strategy</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accepting responsibility</td>
<td>15.0</td>
<td>3.8</td>
<td>7.2</td>
<td>11.1</td>
<td>0.57</td>
<td>0.61</td>
</tr>
<tr>
<td>Escape-avoidance</td>
<td>10.0</td>
<td>7.6</td>
<td>10.8</td>
<td>9.9</td>
<td>0.84</td>
<td>0.73</td>
</tr>
<tr>
<td>Planful problem solving</td>
<td>17.5</td>
<td>17.7</td>
<td>10.8</td>
<td>17.3</td>
<td>0.68</td>
<td>0.75</td>
</tr>
<tr>
<td>Positive reappraisal</td>
<td>2.5</td>
<td>1.3</td>
<td>1.2</td>
<td>3.7</td>
<td>0.63</td>
<td>0.70</td>
</tr>
<tr>
<td>Found no coping strategy</td>
<td>7.5</td>
<td>8.9</td>
<td>12.0</td>
<td>12.3</td>
<td>0.24</td>
<td>0.32</td>
</tr>
<tr>
<td>Altruism</td>
<td>5.0</td>
<td>3.8</td>
<td>2.4</td>
<td>4.9</td>
<td>0.87</td>
<td>0.85</td>
</tr>
<tr>
<td>Used more than one coping strategy</td>
<td>48.8</td>
<td>36.7</td>
<td>37.3</td>
<td>42.0</td>
<td>0.42</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Values are mean ± standard deviation or proportions, %

*p for trend, adjusted for age and sex

STEMI: ST elevation myocardial infarction