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General self-efficacy and health-related quality of life after myocardial infarction

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Fatigue after myocardial infarction (MI) has been found to be distressing. A person's self-efficacy will influence his/her health behaviour and play an active role in tackling illness consequences. This study investigated associations between fatigue, disturbed sleep, general self-efficacy and health-related quality of life (HRQoL) in a sample of 145 respondents admitted to hospital for MI two years earlier. The aim was to identify the predictive value of general self-efficacy and to elucidate mediating factors between self-efficacy and HRQoL. General self-efficacy measured four months after myocardial infarction was positively related to HRQoL after two years. In tests of indirect effects, fatigue mediated the effects between self-efficacy and the physical and the mental dimension of HRQoL, respectively. The indirect effect of disturbed sleep went through that of fatigue. To conclude, patients who suffer from post-MI fatigue may need support aimed at helping them increase their self-efficacy as well as helping them adapt to sleep hygiene principles and cope with fatigue, both of which will have positive influences on HRQoL.

Keywords: disturbed sleep, fatigue, health-related quality of life, myocardial infarction

Introduction

Because of illness consequences following myocardial infarction (MI), health-related quality of life (HRQoL) could be negatively affected for several years (Brown et al., 1999; Plevier et al., 2001). Fatigue after MI has been found to be distressing and difficult to cope with (Alsén, Brink & Persson, 2008) and, identified as a predictor of lower HRQoL (Brink, Grankvist, Karlson & Hallberg, 2005).

Sleep disturbance as a risk factor for coronary heart disease has been relatively well documented (Lee et al., 2009; Schwartz et al., 1999), but the relationships between disturbed sleep, fatigue and HRQoL after MI have not been studied to the same extent. However, there are indications of associations between disturbed sleep and post-MI fatigue (Johansson, Karlson, Grankvist & Brink, 2010),

A person's self-agency will influence his/her health behaviour and play an active role in tackling illness consequences (Brink, 2009). Central to the self-agentic perspective is people's belief in their ability to maintain some degree of control over their own functioning and to meet situational demands (Bandura, 2001). Efficacy beliefs are the foundation of self agency, and in particular, the concept of *self-efficacy* has become influential in preventive work with enhancing desired health behaviour in patients with chronic illness. People with high self-efficacy are more likely to adopt advantageous health behaviours than are those with low self-efficacy (Bandura, 1997). General self-efficacy refers to the belief that one's actions (self-agency) are responsible for successful outcomes in general (Schwarzer, R., & Jerusalem, M. (1995) and, cardiac- specific self-efficacy refers to the belief that one's self-agency is associated with illness- specific outcomes (Sullivan, LaCroix, Russo, & Katon, 1998).

In a sample of patients with stable coronary heart disease, low cardiac self-efficacy was associated with poor health status, including high symptom burden, low functional status and low quality of life (Sarkar, Ali & Whooley, 2007). In addition, low cardiac self-efficacy was

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found to predict an increased risk for heart failure and hospitalization among these patients, due to the fact that low self-efficacy at baseline was explained by poorer cardiac function (Sarkar, Ali & Whooley, 2009). In patients with MI, self-efficacy has been found to be positively associated with self-management and psychological well-being (Joeke, Van Elderern & Schreurs, 2007) and quality of life (Boersma, Maes, Joeke & Dusseldorp, 2006).

The aim with the present study was to identify associations between fatigue, disturbed sleep, self-efficacy and HRQoL in patients with MI, and more specifically to identify the predictive value of general self-efficacy and to elucidate mediating factors between self-efficacy and the physical component score (PCS) and between self-efficacy and the mental component score (MCS) of HRQoL. The two hypotheses of the present study on patients with MI were: a) self-efficacy will predict HRQoL, e.g. high levels of self-efficacy will be associated with better HRQoL scores and b) disturbed sleep will be associated with fatigue and both these variables will be associated with low HRQoL scores.

Method

Participants

The participants had been consecutive patients with the diagnosis MI and ≤ 80 years of age admitted to the coronary care unit in two Swedish hospitals two years earlier. They participated in a longitudinal follow-up study of adaptation, four months and two years after MI. Excluded were patients with other severe diseases and patients who could not speak Swedish fluently. Of 168 possible respondents 145 (43 women, 102 men) returned the two year follow-up questionnaire fully completed. Demographic data were obtained from a questionnaire finalized during the first week in hospital. Four months after the MI, they filled in the general self-efficacy scale, and after two years, they answered questionnaires about fatigue, disturbed sleep and health status. The project was approved by the Research Ethics

Committee at the University of Gothenburg. The informants gave their informed written consent to participate, and the investigation conformed to the principles outlined in the Declaration of Helsinki.

Measures

Disturbed sleep

The questionnaire addresses 5 symptoms from the Karolinska Sleep Questionnaire (Åkerstedt et al, 2002) indicating disturbed sleep during the past week. The items concerned were disturbed/troubled sleep, difficulties falling asleep, repeated wake-ups with difficulties in falling asleep again, a feeling of unsatisfactory sleep upon waking, and premature waking. Each question was answered using a 6-point scale with scores from *never* = 1 to *always* = 6 (range 5-30). Reliability of the scale has been tested in a sample of MI patients (Johansson et al., 2010). The Cronbach's alpha coefficient in the present sample was .87.

Fatigue

Fatigue was measured using the Somatic Health Complaints Questionnaire (SHCQ), which addresses common health problems in cardiac patients (Brink, Cliffordson, Herlitz & Karlson, 2007). In the present study, the subscale fatigue, consisting of items about general fatigue, weakness, lack of energy and dizziness, was used. Each question was answered using a 6-point scale with scores from *never* = 1 to *always* = 6 (range 4-24). The Cronbach's alpha coefficient in the present sample was .86.

General Self-Efficacy Scale

The General Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995) was used to measure self-efficacy. It is a 10-item questionnaire concerning self-confidence in, e.g., dealing efficiently with unexpected events, handling unforeseen situations, and finding solutions to

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problems. Each question was answered using a 4-point scale with scores from *not at all true* = 1 to *exactly true* = 4 (range 10-40). The Cronbach's alpha coefficient in the present sample was .90.

The Short Form-36 Health Survey

Short form-36 (SF-36) is a generic HRQoL questionnaire that groups items into eight multi-item scales including physical functioning, role limitations due to physical problems, role limitations due to emotional problems, bodily pain, general health, vitality, social functioning and mental health. Response alternatives for each scale range from 0 (worst health) to 100 (best health), summarized through algorithms. The measure has been shown to reflect changes in HRQoL due to changes in disease severity (Ware & Gandek, 1998). The measurement also provides a summary of physical and mental scores – the physical component score (PCS) and the mental component score (MCS) (Ware, Kosinski & Keller, 1994) – and these two components were used in the present study.

Data analysis

Descriptive statistics were calculated: frequencies, means (m), standard deviations (SD) and *t*-tests were used for mean score comparisons. The physical and mental dimension scores of HRQoL (SF-36) in patients with MI were compared to Swedish normative reference scores (Sullivan, Karlsson & Taft, 2002).

To explore relationships between variables, Pearson's correlation coefficients were scrutinized. With these results as a starting point, we tested whether the relationship between self-efficacy and PCS and MCS, respectively, in whole or in part, could be explained by plausible mediating variables. This was done by imposing hypothesized relationships among variables in two path models, one with PCS and the other with MCS as dependent variable.

Self-efficacy was hypothesized to be the independent variable and disturbed sleep and fatigue were supposed to be mediator variables, in both models. A variable function as a mediator when a) the independent variable accounts for variations in the mediator, b) variations in the mediator variable account for variations in the dependent variable and c) if the relationships in *a* and *b* are controlled for, a previously significant association between the independent and dependent variable decreases or becomes zero (Baron & Kenny, 1986).

Results

Demographic data

The mean age was 64.4 years (SD=9.4) with no gender difference present. In the follow-up after two years, 145 individuals participated. The number of persons of working age was 66 (17 women, 49 men), and of them 29% of women and 61% of men had returned to work. Regarding activities in the home, half of the respondents had decreased their efforts to some degree. Half of the group reported regular engagement (three times a week or more) in physical activity to promote physical fitness, while one fourth were never engaged in such physical activity. Nearly the same proportions were reported for the balance between activity and rest during daily life. Half of the respondents were more active than resting, while one fifth reported more rest than activity during a day. No gender differences were identified regarding activity and rest. One third had never smoked, while half of the group had stopped smoking during recent years, meaning that about 14% could be classified as smokers at the time of measurement (5 women, 15 men). Only 4% of participants reported pain in daily life, while 26% experienced breathlessness often.

Descriptive findings

The mean score (SD) for general self-efficacy was 30.54 (4.96), with a gender difference (Table 1). Slightly more than one fourth (28%) of the participants reported fatigue often to always (summed fatigue scale scores 13–24), one fourth reported fatigue sometimes, and 47% experienced hardly any fatigue at all. Women reported more fatigue compared to men (Table 1). Just under half of the respondents reported sleep disturbance to some extent, while 25% of them experienced it regularly. Women reported more disturbed sleep than men did (Table 1).

Scores of HRQoL were compared to Swedish normative scores. In these comparisons, the sample was divided into three age groups; 30-49 years, 50-64 years and 65+. The only significant finding was that the group of respondents 65+ scored lower on mental health (MCS) compared to normative scores ($p < .01$). Women in the present sample reported lower scores on physical health (PCS) compared to men (Table 1).

Model testing

Correlation analyses showed associations between variables (Table 2). In line with the first hypothesis, the independent variable self-efficacy was significantly correlated with the dependent variable PCS and somewhat more strongly correlated with the dependent variable MCS. The second hypothesis, too, was supported; disturbed sleep was correlated with fatigue, and disturbed sleep and fatigue were correlated with both PCS and MCS. In addition, age was correlated with PCS and some gender differences regarding PCS, self-efficacy, fatigue, and disturbed sleep were indicated (Table 1). Therefore, in the next step, path models for the relationships between self-efficacy and PCS and MCS, respectively, were tested. These models included age, gender, fatigue and disturbed sleep as possible mediator variables. The

analyses showed that age and gender played no role as mediator variables, and these were therefore excluded from further analyses.

The two final path models, one for PCS and one for MCS, are presented in Figure 1 and Figure 2. The purpose of these models was to explicate mediating effects that account for a part of the relation or the relation as a whole between self-efficacy and PCS and MCS, respectively. In both models, self-efficacy was the independent variable, which means that it has direct effects on PCS and MCS, and its causal sources lie external to the path models. Self-efficacy had causal total effects on both PCS (.177) and MCS (.246). In a path diagram, the correlation between any two variables is accounted as the sum of the compound paths connecting these two points. A correlation between two variables that is due to the presence of one or more additional variables will be called indirect or mediated. The formulated hypotheses imply that we expected the following causal relationships: Self-efficacy will affect PCS and MCS (direct effects), Self-efficacy will affect disturbed sleep and fatigue, disturbed sleep will affect fatigue, and finally disturbed sleep and fatigue will affect PCS and MCS (indirect or mediating effects).

First, an explanation and presentation of results from the analysis of the path model for PCS (Figure 1) will be provided. In addition to the direct effect of self-efficacy on PCS, which is low and not significant (-.078), there are three paths consisting of the mediating variables disturbed sleep and fatigue, each alone or together: 1) self-efficacy on disturbed sleep, and disturbed sleep on PCS ($-.283 \times -.114 = .032$); 2) self-efficacy on disturbed sleep, disturbed sleep on fatigue, and fatigue on PCS ($-.283 \times .435 \times -.574 = .071$); and 3) self-efficacy on fatigue, and fatigue on PCS ($-.264 \times -.574 = .152$). The total effect of self-efficacy on PCS is the direct effect and the indirect or mediating effects together (.177), which is, as it should be, equal to the standardized correlation coefficient for the relation between self-efficacy and PCS. However, disturbed sleep itself has no mediating effect on PCS ($-.283 \times -$

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.114 = .032 and not significant). The significant mediating effect goes through fatigue ($-.283 \times .435 \times -.574 = .071$) with a major effect of fatigue on PCS ($-.574$).

Second, an explanation and presentation of results from the analysis of the path model for MCS (Figure 2) is provided. In addition to the direct effect of self-efficacy on MCS, which is low and not significant ($-.026$), there are three paths: 1) self-efficacy on disturbed sleep, and disturbed sleep on MCS ($-.283 \times -.056 = .015$); 2) self-efficacy on disturbed sleep, disturbed sleep on fatigue, and fatigue on MCS ($-.283 \times 0.435 \times -.659 = .081$); and 3) self-efficacy on fatigue, and fatigue on MCS ($-.264 \times -.659 = .174$). The total effect of self-efficacy on MCS is 0.246 , equal to the standardized correlation coefficient for the relation between self-efficacy and PCS. Like the model above, disturbed sleep itself has no mediating effect on MCS ($.015$, not significant). The significant mediating effect of disturbed sleep goes through fatigue ($-.283 \times .435 \times -.659 = .081$) with a major effect of fatigue on MCS ($-.659$).

Discussion

In the present study, we found that general self-efficacy measured four months after MI was positively related to physical and mental HRQoL two years after MI. Other studies have found similar relationships between self-efficacy and quality of life in persons dealing with cardiac illness (Joeke et al., 2007; Boersma et al., 2006). Thus it appears that persons scoring high on self-efficacy scales experience better HRQoL. In our study, this relationship was stronger for MCS than for PCS. Our hypotheses were nearly confirmed; besides the fact that self-efficacy could predict HRQoL, in tests of indirect effects we found that fatigue demonstrated mediating effects between self-efficacy and PCS and MCS, respectively. Moreover, disturbed sleep mediated the effects between self-efficacy and PCS and MCS, respectively, but in a different way. The indirect effects of disturbed sleep went through fatigue. This points to the importance of good sleep quality for coping with fatigue after MI.

It is easy to imagine that there are relationships between fatigue, disturbed sleep, self-efficacy and HRQoL, all variables included in the present path models. Nevertheless, the challenge lies in understanding how these relationships should be understood and in knowing how preventive efforts and plans aimed at strengthen health status after MI should be designed. Because self-efficacy may be a modifiable personality characteristic, an intervention programme could be designed to improve a patient's self-efficacy, hopefully leading to positive health effects (Lorig & Holman, 2003). Moreover, studies have demonstrated that self-efficacy is associated with health behaviour (Carlson et al., 2001) and plays an important role in cardiac rehabilitation (Berkhuysen, Nieuwlandb, Buunkd, Sandermane & Rispen, 1999). Our results do not neglect the importance of such findings, but there are other implications present as well. The finding that the effects of self-efficacy on HRQoL were mediated by disturbed sleep and fatigue may imply that a patient's HRQoL, when affected by severe illness consequences, e.g., fatigue, may also reflect the fact that the patient is experiencing low self-efficacy. This is supported by Sarkar et al. (2009), who found that poorer cardiac functioning in patients with coronary heart disease was associated with a lower degree of self-efficacy.

Our results have certain clinical implications. An intervention focused on increasing self-efficacy in MI patients scoring low on this variable would be valuable in strengthening HRQoL, and this applies especially to MCS. If it is not possible to work with self-efficacy support, health care professionals could focus on disturbed sleep in patients with post-MI fatigue. In other words, when a patient suffers from fatigue, health care professionals could begin the rehabilitation process by teaching the patient to rest, relax and heal and by giving advice on coping strategies, including sleep hygiene principles. It seems more appropriate to start with a healing process than to plan too rapidly for the patient to return to being as active and productive as possible.

In coronary care, identifying a patient's specific needs could be advantageous given the great differences in illness consequences following MI. Actually, individualized care plans are justified. Throughout the world, a person-centred approach has become more common in attempts to ensure high quality in the care provided by doctors (Mead & Bowers, 2000) and nurses (McCormack & McCance, 2006). Therefore, it is important to consider the personal self-agency/self-efficacy resources. Moreover, owing to the incomprehensible nature of post-MI fatigue, many persons fumble when trying to cope with it (Alsén et al., 2008), and these persons need more knowledge about fatigue and coping with fatigue. In addition, identifying a person's needs and self-care strategies in relation to impaired sleep could be worthwhile (Johansson et al., 2007). To sum up, a person-centred approach to caring for patients suffering from fatigue after MI could include implementation of plans aimed at actively strengthening self-efficacy and supporting self-care strategies to enhance sleep quality and recuperation. These efforts may result in improved patient outcomes, e.g., better HRQoL.

One limitation of the present study is that we used the concept of *general self-efficacy* and we did not relate it to a specific behaviour and circumstance with which the efficacy measurement was associated. An understanding of the effectiveness of specific self-efficacy is likely to lead to better and more detailed nursing support (Lau-Walker & Thompson, 2009). In the clinic, it is important to identify patients who experience tiredness or fatigue in order to prevent the progression of worsening fatigue or exhaustion (Olson, 2007). Therefore, if we are to develop self-care strategies for managing symptoms of tiredness and fatigue and to build up a conceptual model, further research should focus on specific self-efficacy in relation to post-MI tiredness and fatigue.

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Table 1. Means (SD) for measured variables and gender comparisons by *t*-tests (*N*=145).

Variable	Total <i>n</i> =	Women <i>n</i> =	Men <i>n</i> = 60	<i>p</i> -value
Fatigue	9.80 (4.56)	11.14 (4.83)	9.24 (4.33)	.021
Disturbed sleep	11.51 (5.48)	13.33 (6.22)	10.76 (4.99)	.010
GSE	30.54. (4.96)	29.07 (4.51)	31.16 (5.03)	.020
PCS	45.19 (10.46)	41.95 (11.43)	46.55 (9.76)	.015
MCS	47.03 (12.53)	45.00 (13.11)	47.89 (12.24)	.207

Table 2. Correlations between variables ($N=145$).

	Age	Fatigue	Disturbed sleep	GSE	PCS
Age					
Fatigue	.148				
Disturbed sleep	.063	.510***			
GSE	-.092	-.384***	-.287**		
PCS	-.229**	-.602***	-.384***	.177*	
MCS	-.047	-.678***	-.383***	.246**	.283**

Note: GSE; General self-efficacy, PCS; Physical Component score, MCS; Mental component score. * $P<.05$ ** $P<.01$ *** $P<.001$

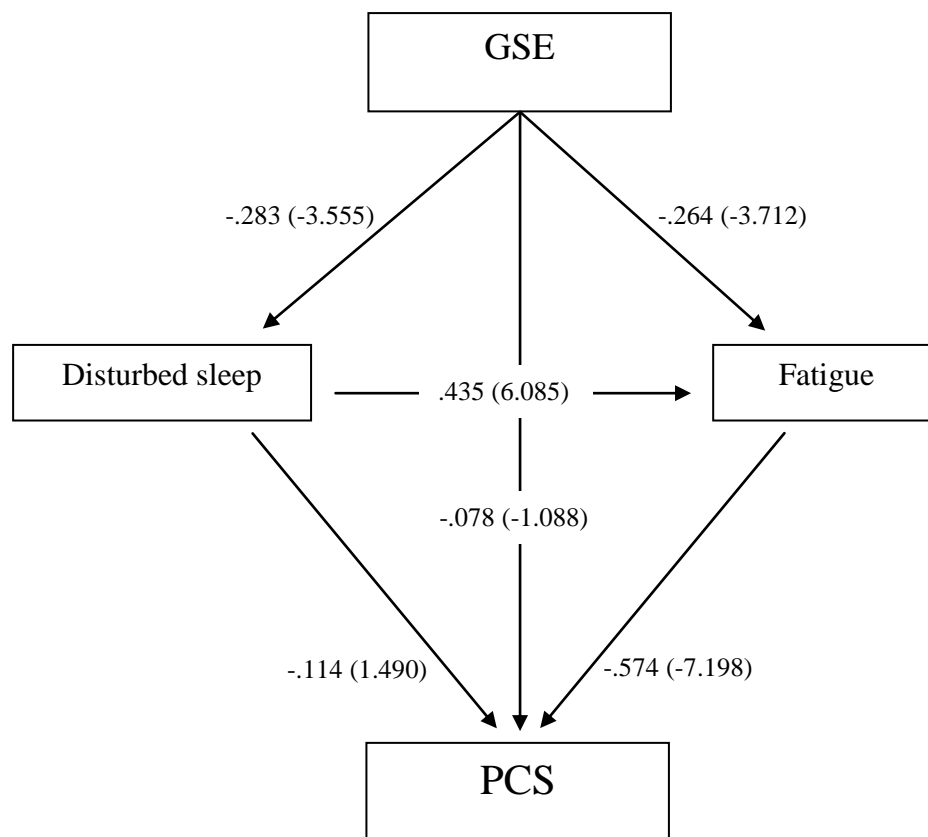


Figure 1. Path model with direct and mediated effects on physical health (PCS) showing correlation coefficients (T-values).

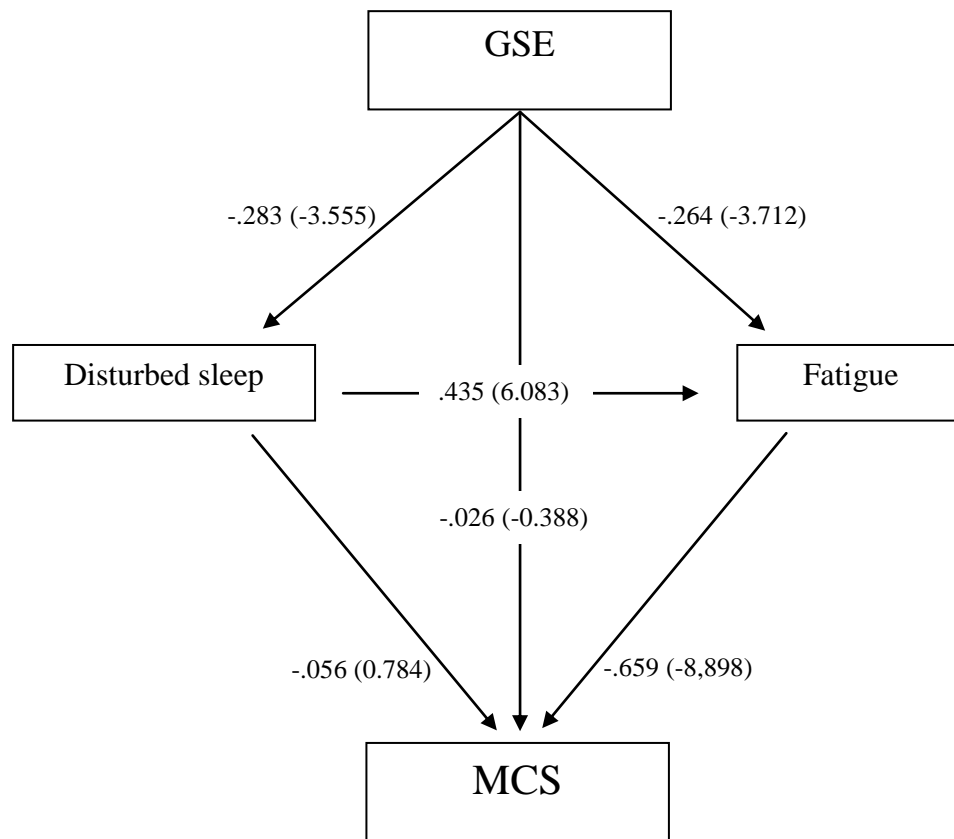


Figure 2. Path model with direct and mediated effects on mental health (MCS) showing correlation coefficients (T-values).