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Sociodemographic, disease status, and illness perceptions predictors of global self-ratings of health and quality of life among those with coronary heart disease – one year follow-up study

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ABSTRACT

This one-year follow-up study (n = 3130 at baseline, n = 2745 at follow-up, aged 45–74 years) examined the relationship of patients' perceptions of coronary heart disease (CHD) and illness-related factors with global health status and global quality of life (QOL) ratings. The independent variables were CHD history (myocardial infarction, revascularisation), CHD severity (use of nitrates, CHD risk factors and co-morbidities) and illness perceptions. In multivariate regression analysis, CHD history and severity explained 13% of variance in global health status and 8% in global QOL ratings at the baseline. Illness perceptions increased the share of explained variance by 18% and 16% respectively. In the follow-up, illness perceptions explained a significant but modest share of variance in change in health status and QOL when baseline health status and QOL and CHD severity were adjusted for more symptoms being attributed to CHD, severe perceived consequences of CHD, as well as a weak belief in the controllability of CHD were related to poor global health status and QOL ratings. In structural path models associations of CHD severity factors were mediated by illness perceptions. The association of disease severity with dependent variables was weaker after controlling for illness perceptions. Cognitive representations of CHD contribute to both global health status and QOL ratings and they also mediate the associations between CHD severity and well-being. No gender differences were found in associations of illness perceptions with health status or QOL ratings.

INTRODUCTION

Coronary Heart Disease (CHD) is one of the most common causes of premature death among both men and women in western societies. In chronic illnesses, which often involve complicated treatment regimens with lifestyle adjustments and daily medication, one of the challenges is to find a balance between the demands and restrictions posed by the illness and it's treatment on one hand and the various challenges and demands

of every day life on the other hand. For example following lifestyle restriction may be difficult to adjust with the demands of the working life. In recent years, the outcomes of illness processes have been increasingly assessed from the patients' perspective in terms of quality of life (QOL). QOL is a broad multidimensional concept in which the focus is on the individual's subjective experience. Domains such as emotional health, physical health, social networks, material resources and work or productive activity have been proposed as components of QOL. According to Leventhal and Colman [1], QOL judgement is a process in which the individual assesses his or her personal experience in various life-domains and then integrates these into one overall judgement.

CHD affects various domains of QOL [2, 3] and the effects are more severe in younger patients [3, 4]. The major complication of CHD, myocardial infarction (MI), undermines QOL and functioning [5, 6], causes uncertainty and worry [7] and requires readjustment from the patient and his or her social environment [8]. The survival rates of MI have increased due to more effective treatments and secondary prevention, and therefore more patients will live their lives with the consequences of MI. Another common manifestation of CHD, angina pectoris (AP), also has negative impact on QOL in terms of both physical functioning and emotional health [9, 10]. Presence of common epidemiological risk factors of CHD, such as diabetes [11] may further impair QOL among persons with CHD. Treatment of CHD by revascularisation (coronary artery bypass grafting (CABG) or percutaneous transluminal coronary angioplasty (PTCA)), however, clearly has beneficial QOL effects: Brorson et al. [12] reported improvements in physical functioning, pain, quality of sleep, emotional health and general health perceptions after CABG and PTCA.

CHD has typically been considered to be a male disease [13] even though it is a major cause of death and disability among women as well. Gender differences have been reported in the clinical manifestation of CHD, women presenting more often with AP while MI is more common among men [14]. Furthermore, gender inequalities have been reported in the treatment of CHD with women receiving less CHD-related surgical operations than men [15]. Women also seem to be sensitive to different kind of risk factors compared to men [16], with psychosocial factors, such as work climate or burnout, being of more importance among women. Furthermore, women seem to adjust and cope less effectively than men after MI since they tend to report more impaired QOL and more psychological morbidity (see Brezinka and Kittel [17] for review).

From the point of view of the counselling and rehabilitation of patients with CHD, knowledge about the processes which facilitate adjustment and QOL in living with heart disease is important. Individual differences in adjusting to a chronic illness can't solely be explained by disease severity, psychosocial processes and recourses are important too. According to the Leventhal et al.'s Self- Regulation Model (SRM) [18], people develop personal representations about the nature of the illness to understand the health threats and use these to regulate both their behavioural and emotional reactions to the illness. Five central components of these implicit theories are (1) the experienced symptoms which are attributed to the illness (*identity*), (2) beliefs about causes of illness (*cause*), (3) beliefs about the curability or controllability of the illness (*cure/control*), (4) perceived consequences of the illness in the person's everyday life (*consequences*), (5) expectancies about duration of the illness (*time-line*). These representations of illness affect the salience, importance and meaning of the domains involved in making the QOL judgements (1).

In CHD, illness perceptions have mostly been studied as predictors of rehabilitation attendance and return to work. Better attendance to rehabilitation has been related to a stronger belief in the controllability of heart disease [19–21], less perceived symptoms associated with heart disease [21], and attribution of own heart disease to life style factors [20]. A slower return to work and resumption of social and domestic duties has been related to more negative perceived consequences of MI [19]. Figueiras and Weinman [22] reported that similarity between patient's and spouse's illness perceptions was related to recovery from a heart attack and changes in health behaviours.

The aim of the present study is to examine how illness perceptions together with disease severity and history and sociodemographic factors are related to self-rated global health status and global QOL among persons with CHD, as well as to examine whether illness perceptions mediate the relationships between CHD-related factors and global health status and QOL self-ratings. Due to the reported gender differences in presentation and outcomes of CHD, we were also interested in whether these associations differed by gender.

METHODS

The sample

In Finland all those fulfilling certain diagnostic criteria of CHD are entitled to elevated reimbursement for the costs of medication for CHD. The eligibility for the special reimbursement right requires a medical certificate by the attending doctor, usually an internist or a cardiologist, on following criteria: (1) diagnosed chronic angina pectoris symptoms responding to nitrates in the presence of unequivocal ECG changes (on exercise or at rest) or (2) diagnosed acute myocardial infarction, or (3) revascularisation operation or (4) coronary heart disease diagnosed in angiography. The certificates are reviewed and approved by a specialist physician at the Social Insurance Institution which also maintains a register of all those who are eligible. From this register 5009 Finnish-speaking people, aged 45–74 years in January 2001 and who had received the right to medication reimbursement due to CHD (nitrates or secondary prevention medicines, such as statines) during 1994–1995, were drawn for the study sample. In age groups younger than this the prevalence of CHD had been very low. Older persons might have had difficulties to understand and to fill in the questionnaire, therefore to guarantee a reasonable response rate we used 74 as the upper age limit. To guarantee a sufficient number of women in the sample, stratification by gender (50% each) was followed by random sampling within each gender group. Altogether 3539 questionnaires were returned, of which 409 were rejected due to incomplete data (missing values exceeding 20%), leaving 3130 people in the study sample at baseline (62.5% of the original sample). Seven persons had died between the day the sample was drawn and mailing of the questionnaire (mortality register information). We received approximately 200 calls from the persons who got the questionnaire but were not willing to participate, and the most common reason mentioned for non-participation was poor health status or hospitalization. Yet in some cases the person was just un-willing to participate and give consent to use his/her information for study purposes. The follow-up questionnaire was sent to respondents (n = 3082, 48 persons died during the follow-up period) one year later. A total of 2650 questionnaires were returned, giving a response rate of 84% (53% of the original sample).

For analysis of attrition, census based data on gender, age, and education was individually linked to the original sample (5009) in Statistics Finland using the unique personal identification codes, which were removed from the data before handing them to the research team. This allowed us to directly compare the respondents and non-respondents in terms of age, education and gender. Non-respondents were ($p<0.001$) older, more frequently women and less well educated than the participants. The non-respondents in follow-up survey differed from respondents in being less educated ($p<0.001$). The participants were asked for a written consent to combine their questionnaire data with information about their use of hospital services derived from the Hospital Discharge Register; 92% of respondents consented. The study protocol was approved by the Research Ethics Committee of the National Research and Development Centre for Welfare and Health.

Measures

Dependent variables

Global health status rating was measured by the European standard single item question for self-rated health status: ‘‘Is your health at present?’’ (1) very good, (2) good, (3) moderate, (4) poor, (5) very poor. The European version was chosen because it was expected to differentiate more effectively in a sample of patients with a chronic illness than the US version, which has more positive response alternatives and only one alternative for poor health status. For the analysis, the coding was reversed so that higher scores indicated good health. QOL was measured by a visual analogue scale (VAS). Respondents were asked to rate their overall quality of life on a 100 mm scale (0–100), where 0 indicates worst possible QOL and 100 best possible QOL. Validity and reliability have been reported for both global measures. Content reliability of self-rated global health status is supported by it’s close associations with chronic conditions and their functional consequences [23] while evidence of predictive validity is given by studies showing that self-rated global health status is an independent predictor of mortality even when other risk factors are accounted for [24]. Test–retest reliability has also been reported for it the kappa coefficient being 0.70 [25], which indicates good reliability [26]. For global self-rating of QOL, Boer et al. [27] reported validity in terms of it’s associations with established health-related QOL measures (MOS-20 and Rotterdam Symptoms Check List) and good test–re-test reliability ($r = 0.87$). Global health status and global QOL are distinct constructs, the

physical dimensions of health being more important for global self-rated health status and emotional dimensions for global QOL rating [28, 29].

Independent variables

Sociodemographic background was measured by age, gender (0 = female, 1 = male) and education. In Finland every permanent resident is given a personal identity number, which is composed of the date of birth and a personal identification code which is an odd number for men and even number for women. Information about age and gender was based on this identity number. Information about education was based on the self-reported level of basic education and of vocational training. To provide a measure of total education, the levels given in the two responses were converted into years and then summed to give a total observed score ranging from 8 to 17 years.

CHD-related factors: Information on previous myocardial infarction (MI) (0 = no, 1 = yes) and coronary revascularisation (CABG or PTCA, 0 = no, 1 = yes) was derived from the Hospital Discharge Register for those who had given their consent to combine register-based data with their self-report data (92%). For those who refused their consent, self-report information regarding the occurrence of MI or revascularisation was used. Since those undergoing PTCA may have milder diseases status which could potentially complicate the interpretation of the results, we did a preliminary analysis using PTCA and CABG as distinct variables. However, the association of these variables with dependent variables were in the same direction and using them separately did not lead to any additional increases in explained variance. To achieve more power and a simpler final model we combined these variables for the analysis.

Since we did not have access to physiological indicators of CHD severity, we therefore utilized the use of short-term nitrates at least once a week as a proxy measure of disease severity (5 = daily, 4 = few times a week, 3 = few times a month, 2 = less often, 1 = never). Short-term nitrates are prescribed for symptoms of angina and can therefore be seen as an indicator of the frequency of angina. In addition, the respondents were asked about the presence of CHD-related co-morbidities (blood pressure, cardiac failure, high serum cholesterol, arrhythmia, diabetes, ischaemic attack). Two variables were constructed for additional indicators of disease severity. Heart failure or arrythmia may be seen as consequences of CHD, therefore if either of these was mentioned the respondent was considered to have CHD-related co-morbidities (1 = yes, 0 = no). More cautious term co-morbidity is used here instead of complications, since it is possible that these two conditions exist as independent conditions unrelated to CHD. Presence of physiological risk factors was coded (1 = yes, 0 = no) if the respondent mentioned having high blood pressure, high cholesterol, or diabetes or being a current smoker.

Illness perceptions were assessed by the Illness Perceptions Questionnaire [30]. The scales used in the present study were illness identity (12 items, alpha coefficient $\alpha = 0.83$) cure/control (6 items, $\alpha = 0.52$), consequences (5 items, $\alpha = 0.69$) and time-line (3 items, $\alpha = 0.70$). The alpha coefficient of the cure/control scale was relatively low, as has also been found in other studies [31]. Since excluding any subset of items did not significantly improve the alpha coefficient and the preliminary analysis showed that the six-item scale produced the most predictive correlations, all the items were retained in this scale in spite of the low internal consistency.

For the illness identity items, the response scale ranged from 0 (= never) to 3 (= all the time). On other items, the response scale ranged from 1 (strongly disagree) to 5 (strongly agree). High scores on these IPQ-scales indicate a higher number of symptoms attributed to CHD (identity), strong belief in the controllability of CHD (cure/ control), severe perceived consequences of CHD and long expected duration of CHD (time-line).

To measure the ‘‘causes’’ dimension of illness perceptions, we used a scale adapted from the IPQ-R [32] supplemented by 8 additional items related to CHD risk. Based on preliminary explorative factor analysis [33] and a further confirmatory factor analysis for the present study in which items loading strongly on several factors were excluded (see Appendix) three separate sum scores were computed for the present study: attribution to stress factors (4 items, *alpha* = 0.76), CHD risk factors (5 items *alpha* = 0.72) and internal factors (3 items, *alpha* = 0.70).

Statistical analysis

Univariate baseline associations of global health status and QOL ratings with independent variables were examined by Pearson correlation coefficients in continuous variables and by an analysis of variance in categorical variables. The non-linearity of the relationship between age and global health status and QOL

was examined by regressing the dependent variables for age and square of age simultaneously. When the ''square of age'' term was statistically significant, the relationship of age and dependent variables was examined in more detail by comparing global health status and QOL in the 5-year age groups.

Series of multivariate regression analyses were used to examine the independent associations of sociodemographic factors, CHD-related factors, and illness perceptions with global self-rated health status or QOL. Analyzing all the individual gender interactions in relationships between independent and dependent variables would have yielded 36 interaction terms and the possibility of significant interaction terms produced by chance would have been high, particularly in the absence of pre-formulated hypotheses about the nature of the interactions. Therefore, to assess gender interactions, the Chow test statistics[1] was computed [34] in the multivariate analysis. Chow test is commonly used to test the structural changes in model parameters and it can be used to examine if the parameters of the model are the same in different time-points or in different sub samples [35].

Mediation effect of CHD illness perceptions and attributions in the relationship between CHD severity and global health status and QOL self-ratings was examined first in multivariate regression analyses. We applied the rules of Baron and Kenny [36], according to whom to show that a variable mediates the relationship between two other variables, all three variables must correlate significantly with each other and the relationship between the independent variable (CHD severity indicators) and dependent variable (global health status and QOL self-ratings) should be reduced when the effect of the mediator (illness perceptions) is adjusted for. In partial mediation the independent variable may show a significant but lower main effect when the moderator is adjusted for, in complete mediation there is not main effect of the independent variable when the moderator is adjusted for. Therefore three models for each independent variable were computed. First (model 1), sociodemographic factors were entered in the model followed by CHD-related factors (model 2) and illness perceptions (model 3). This allowed us to examine whether including CHD illness perceptions and attributions increases the share of explained variance of the model and whether the main effects of CHD severity indicators would be reduced when illness perception and attributions are accounted for. In the follow-up analysis the same procedure was followed using follow-up global health status and QOL ratings as dependent variables and adjusting for baseline values of these variables.

Finally, to examine in more detail the paths through which the illness perceptions possibly mediate the relationships between CHD severity and global health status and QOL, structural equation modelling (SEM) was applied to perform a path analysis. The theoretical model appears in Figure 1. This proposed model tested included three exogenous variable for CHD severity: CHD comorbidity, CHD risk factors and use of nitrates. The preliminary analysis showed that fitting a latent factor measurement model for these CHD severity indicators was unsuccessful due to low intercorrelations of the indicators. Therefore CHD severity indicators were used as separate independent variables in the proposed model. The mediators were two latent factors: ''Attributions'' which was composed of three observed variables (attribution to stress, risk factors and internal factors), and ''Illness Perceptions'' which was composed of four observed variables (identity, consequences, cure/control and time-line). The dependent variables were self-rated global health status and global QOL in baseline and follow-up. Both direct effects of exogenous variables and indirect effects mediated by illness perceptions and attributions were tested. Partial covariance matrix (adjusted for sociodemographic factors, MI and revascularisation) was used to perform structural modeling.

The analyses were performed using the SAS (version 9.1) and SPSS (version 12.0.2) statistical packages. AMOS 4.01 was used to perform SEM to perform confirmatory factor analyses and structural equation modelling.

RESULTS

Table 1 presents the characteristics of the sample. Approximately a third of respondents had suffered MI, 36% had undergone revascularisation and less than 20% used short-term nitrates on a weekly basis. Female

[1] The Chow test is used to assess whether estimating parameters separately for sub samples significantly increases amount of the explained variance compared to use of pooled sample. Based on the residual sum of the squares of the models computed for sub samples (such as males and females) and for the pooled sample, the Chow test statistic tests the null hypothesis that the parameter estimates of the models in the sub sample are the same (H0: b1=b2). controlling for the number of possible interaction terms. For the null hypothesis, the Chow test-statistic (F = [(RSSR)SSR1)SSR2)/k]/[(SSR1 + SSR2)/ (n)2k)], where RSSR is the sum of squared residuals from the pooled sample, SSR1 and SSR2 the corresponding sums in the two sub samples, and k the number of parameters in the equation) has an F-distribution with k and (n)2k) degrees of freedom. Where the F-value was greater than the critical value for F(k, n)2k) at 99% risk level, the significant gender interaction terms were examined individually.

respondents were somewhat older and they had less years of education than men. Furthermore, women had suffered MI and undergone revascularisation less often but they used short-term nitrates more often compared to men. Women also reported lower QOL, but no significant gender difference emerged in reported global health status.

[TABLE 1]

Univariate associations

In the univariate analysis, age was significantly related to self-rated global health status and QOL. However there was a significant interaction between gender and square of age for global health status rating ($p<0.002$), which indicated that the shape of the association between age and global health status rating was different among men and women. Among women, age showed a significant inverse U-shape association with global health status ($t_{age} = 3.75$, $p<0.001$; $t_{age\ square} = -3.95$, $p<0.001$), health status being highest among 60–69-year-old women. Among men, older respondents tended to report somewhat better health status, but the relationship was only modestly significant ($p = 0.011$). Age showed a significant inverse U-shape association with global QOL rating among both genders ($t_{age} = 3.90$, $p<0.001$; $t_{age\ square} = -3.99$, $p<0.001$), selfrated QOL being highest among the 60–69 year olds. Education correlated modestly with selfrated health status ($r = 0.11$, $p<0.001$) and QOL ($r = 0.15$, $p<0.001$), those with higher education reporting better health status and QOL.

Table 2 shows the univariate relationships of global health status QOL ratings with CHDrelated factors and illness perceptions. Better health status and QOL were reported by those with no CHD-related co-morbidities and those using nitrates less frequently. In addition, those with no CHD risk factors and those who had undergone revascularisation reported better health status. Global health status and QOL ratings correlated significantly with all IPQ-scales, particularly with ‘‘identity’’, ‘‘consequences’’ and ‘‘cure/control’’ scales. Better global health status and QOL were reported by those who reported fewer symptoms associated with CHD, those who perceived less severe consequences of CHD, and those who regarded CHD as a controllable illness. Strong attribution to any of the causes was modestly related to poor self-rated health status and OQL.

[TABLE 2]

Multivariate regression analyses

The F-value for the Chow test for gender differences in the model of global health status SRH was 2.37, which exceeds the critical value ($F(16) = 2.04$, $p<0.01$), therefore significant gender interaction terms were first included in the preliminary full model. Only the interaction between gender and the square of age was modestly significant and it was therefore included in the subsequent analysis. The nature of the interaction was similar, though more modest in magnitude ($p<0.034$) as in the univariate analysis: among women age showed an inverse U-shape association with global health status rating, while among men age was linearly associated with health status, older men reporting better health status. The Chow test did not indicate significant gender differences in the model of global QOL rating.

Table 3 presents the results of the hierarchic multivariate analysis with the baseline data. After adjusting for sociodemographic factors, CHD related factors explained 13% of variance in global health status and 8% in global QOL rating. Poorer health status and QOL were reported particularly by those using short term nitrates and those having CHD related co-morbidities or CHD risk factors. Illness perceptions increased the share of explained variance in the dependent variables by 18% and 16%, respectively. More symptoms associated with CHD (i.e. strong illness identity), more severe perceived consequences of CHD and a weaker belief in the controllability of CHD were related to poorer global health status and QOL ratings. Attribution of CHD to stress factors was modestly related to better global health status rating.

[TABLE 3]

The Chow tests for follow-up global self-rated health status ($F = 1.72$) and QOL ($F = 1.11$) were not significant in the follow-up setting, therefore the gender interactions were not examined in further detail. Preliminary analysis also failed to indicate any curvilinear relationship between age and health status and QOL ratings in the follow-up, therefore the ‘‘square of age’’ term was not included in the follow-up models.

Table 4 presents the hierarchic multivariate regression models for follow-up global health status and QOL ratings controlling for baseline health status/QOL values. No major differences in follow-up health status or QOL ratings emerged according to sociodemographic factors. Baseline CHD-related factors increased the

share of explained variance by 2% in global health status rating. Those using nitrates and those having CHD-related co-morbidities reported poorer global health status. Illness perceptions increased the share of explained variance by a further 4%. More symptoms associated with CHD (i.e. strong illness identity), more severe perceived consequences of CHD, a weaker belief in the controllability of CHD were related to poor global health status rating. CHD-related factors increased the explained variance in global QOL rating by 1% and illness perceptions by further 2%. Severe perceived consequences of CHD and a weak belief in the controllability of CHD were related to poor follow-up global QOL rating.

[TABLE 4]

Structural equation model

The fit indexes for the proposed model for mediation effects (see Figure 1) with all direct and indirect effects of independent and mediator variables on global health status and QOL ratings showed acceptable but modest fit of the model to the data (Chi square = 389.5, df = 50, $p<0.0001$, Goodness of Fit Index (GFI) =0.970, Adjusted Goodness of Fit Index (AGFI) = 0.937, Root Mean Square Error of Approximation (RMSEA) = 0.06, Akaike Information Criterion (AIC) = 499.5). Modifying this model by removing the non-significant paths and one indicator (time-line) from the ‘‘Illness perceptions’’ latent factor due to a low factor loading (0.22) did not change the fit of the model (Chisq = 359.6, df = 54, $p<0.0001$, GFI = 0.970, AGFI = 950, RMSEA = 0.06, AIC = 433.6). In the revised model there was one path leading from CHD severity indicators (risk factors) to the latent factor ‘‘Attributions’’ ($\beta= 0.21$, $p<0.0001$), and ‘‘Attributions’’ was connected by one weak, though significant, path to dependent variables (follow-up QOL, $\beta = -0.08$, $p<0.001$). Removing the latent ‘‘Attributions’’ factor from the model clearly improved the fit (Chisq = 63.6, df = 29, $p<0.0001$, GFI = 0.993, AGFI = 986, RMSEA = 0.028, AIC = 121.6). This third model (Figure 2) supports the mediating role of illness perceptions in the relationship of CHD severity and global health status and QOL ratings. Only one direct path from CHD severity indicators to dependent variables with modest strength remained in the model (from use of nitrates to baseline global QOL).

DISCUSSION

This study examined self-rated global health status and QOL among patients with CHD in relation to sociodemographic, illness-related factors and cognitive representations of CHD. The results indicate that individual’s CHD-related illness perceptions are strongly related to both concurrent global health status and global QOL ratings. Illness perceptions also predicted changes in global health status and QOL in the follow-up, when baseline status was accounted for, though the incremental explained variance was relatively modest. Particularly those who associated more symptoms with their CHD, perceived serious consequences of CHD, and regarded CHD as an uncontrollable illness reported poorer health status and QOL. In addition, though indicators of CHD severity were clearly related to self-rated global health status and QOL, their association was partly mediated through cognitive factors. However, factors related to illness history, (e.g. previous MI and revascularisation), were relatively unrelated to global health status and QOL ratings.

This study was conducted among coronary heart disease patients in a stable phase of treatment, some years after the diagnosis. The Drug Reimbursement Right Register provides the most reliable available representative population-based sampling base for studies focusing on people with drug-treated CHD, and it covers various manifestations of CHD. All patients are identified in ambulatory settings, and assessed independently by two doctors at least one of which is a specialist in cardiology, therefore the risk of false positive cases is minimal. However, since entitlement for reimbursement requires diagnosis based on objectively defined criteria, the sample does not represent the mildest forms of CHD, not fulfilling the criteria for reimbursement. The response rate of the study was rather similar to recent population based questionnaire studies in Finland [37]. The large sample size allowed us to use multivariate analysis and to adjust for various determinants of illness perceptions simultaneously. On the other hand, the large sample size also poses problems: even very weak associations between study variables tend to be statistically significant, several confounding factors not accounted for in the questionnaire may affect the results due to the heterogeneity of the sample and in larger samples the effects found tend to be weaker [38]. The one-year follow-up period in the study was relatively short for significant changes to take place, particularly in the absence of any intervention, and therefore the amount of explained variance in changes is small and mostly accounted for by the baseline status. During the follow-up period some of the respondent may have undergone revascularisation and stopped using medication, which could potentially lead to conservative

estimates of relationships between use of nitrates and global health status and QOL self-ratings. However, since the follow-up period was short, it is unlikely that a high proportion of the respondent would have undergone surgical operation, therefore we do not think this could severely affect the results. Women in this study suffered from more severe illness in terms of symptoms as well as in terms of angina pectoris, which may have contributed to the lower response rate among women. The age limits of the sample (45–74 years) limits the generalization of the results to younger and older age groups. Finally, we did not have a multidimensional QOL in the study, which complicates the interpretation of the results. It is possible that the global measures of health status and QOL ovelap, particularly if the respondents make their overall QOL judgements strongly based on their physical health. However, previous research suggest that this would not be the case and that global health status and global QOL are distinct constructs, health status reflecting physical dimension of health while emotional health and mood is a more important determinant of global QOL assessment [29]. Also our present results support the view that even though the two construct are related, health status does not solely explain the variation in QOL assessment.

In addition to showing the role of illness cognitions in the global health status and QOL of patients with CHD, this study also revealed some noteworthy associations between Sociodemographic and CHD-related factors and health status and QOL ratings. Age differences were found both in global health status and QOL, but the relationships were not linear and differed between men and women. QOL was best among both genders in the mid-age-groups (55–64) and lowest among younger and older respondents. Best health status among men was reported by the oldest respondents (>65 years), while among women, age showed a similar inverse U-shape relationship with global health status as with global QOL. These gender differences were not explained by severity of illness or illness perceptions.

The explanations to these age differences in global health status ratings may reflect social comparison processes which have been related to self-evaluations of health [39]. Though several studies have shown that self-rated global health status is a multidimensional construct that reflects symptoms, morbidity and functioning [40, 41], comparisons with peers of the same age and gender are also reflected in self-assessments [39, 42]. Association between self-assessments of health and chronic conditions or functional limitations decreases with advancing age [43, 44]. If younger respondents with diagnosed CHD use their same-age peers as reference points, poor health perceptions could be expected. In older age groups, the same age reference group suffers to a greater extent from chronic morbidity; therefore their perceptions of their own health in comparison to the health of others should be more positive. Because the life expectancy of men is lower, the same age comparison targets are more often deceased among older men. This may further amplify the effect of social comparison processes leading to positive health assessment. Furthermore, the positive health assessments among older men could be explained by the survivor hypothesis [45]. Since MI is the more common manifestation of CHD among men, the older men in the present sample may be the survivors who have had less severe illness and therefore a better health status. Treatment of CHD is more intensive among men [15, 46], which may also be reflected as better perceived health status among older men.

Studies on age differences in mental health have reported lower prevalence of depressive disorders in the older age groups compared to younger adults [47, 48], and similar results have been reported regarding depressive symptoms [49, 50]. Accordingly, Nickel et al. [51] showed that depressive symptoms were less common in older heart patients. In line with these results and as well as with results from global QOL studies in general population [28] QOL in the present study was higher among younger respondents than among those from 60 to 79 years old. However, those in the oldest age group (70+) reported similar levels of global QOL as the younger groups.

Previous reports have shown impaired QOL and health status among sufferers of myocardial infarction (MI) compared with the general population [4, 52]. In the present sample, a history of MI was not related to adjustment, but angina pectoris, in terms of frequent use of short-term nitrates, was clearly related to poor global health status and QOL ratings, as has also been found in other studies [6, 9]. Though experience of MI causes worry and undermines QOL, the present results suggest that for adjustment with CHD, the other common manifestation of CHD, angina is an important factor.

Illness perceptions have previously been shown to be related to attendance at cardiac rehabilitation [19, 21, 53] and return to work after MI [19], as well as to recovery from MI and behavioural adjustment [22]. The present study shows that illness perceptions are also related to global health status and QOL ratings among people with various manifestations of CHD. These results are in line with previous research, which shows that illness perceptions are important determinants of adjustment, functioning and emotional health in

various chronic illnesses [54–59]. Many of the previous studies, however, have been conducted with cross-sectional designs or have employed small or selected samples and have not controlled for the effect of disease severity. The present study shows the importance of illness perceptions for adjustment in a large sample of patients with CHD, while controlling for Sociodemographic factors as well as factors reflecting CHD severity and history. Illness perceptions also predicted global health status and QOL ratings in the one-year follow-up and they explained a higher share of variance in change than CHD severity and history, even when the latter factors were controlled for. Illness identity, (i.e. number of symptoms that the person associates with their CHD), perceived negative consequences of CHD in day-to- day life, and a weak belief in the controllability of CHD were the most important illness perceptions, as has also been found in previous studies on other chronic illnesses [54–57]. The results of the study also suggest that illness perceptions are important in that they mediate the effects of disease severity on global health status and QOL.

Although illness attributions have been related to adjustment in other chronic illnesses [54, 56, 57], in the present study the perceived causes of CHD were only weakly and inconsistently related to global health status and QOL ratings. Even though initial correlations suggested modest associations between poor health status and QOL and attribution to any set of causes, in multivariate analysis most of these associations disappeared, apart from the modest association of attribution to stress factors and better self-rated global QOL in the follow-up analysis.

Illness perceptions showed a very similar pattern of associations with both global health status and global QOL ratings. Illness perceptions were significantly related to QOL even when we controlled for global health status rating in the structural equation model. This implies that, in addition to being adaptive from the point of view of health status, illness perceptions also make a more general contribution in patients' lives. Despite poor health, those with adaptive illness perceptions may be more able to organize their lives in a less restrictive way.

Women have been reported to show poorer adjustment with CHD [17]. Accordingly, women reported worse QOL than men in the present study, but this association was not significant when CHD-related factors and illness perceptions were controlled for. Though our previous report from the present data showed gender differences in illness perceptions [33], women perceiving more symptoms of CHD, and more severe consequences of CHD and attributing their illness more often to stress and less often to risk behaviours or internal factors, the present results suggest that illness perceptions have similar relationship to global health status and QOL among men and women.

In conclusion, the present results have practical implications for the rehabilitation and counselling of people with CHD. Although rehabilitation interventions are usually aimed at patients recovering from MI or revascularisation, interventions and support should also be offered for patients suffering from frequent angina and CHD related co-morbidities. In particular, older women seem to be at risk for deteriorated health and therefore in need of patient counselling. Patient's perceptions on the nature of CHD are important factors in adjustment both among men and women and they also mediate the effects of disease severity. Therefore focusing on patients' cognitive representations of CHD should be an important part of rehabilitation and adjustment training interventions for cardiac patients.

TABLES AND FIGURES

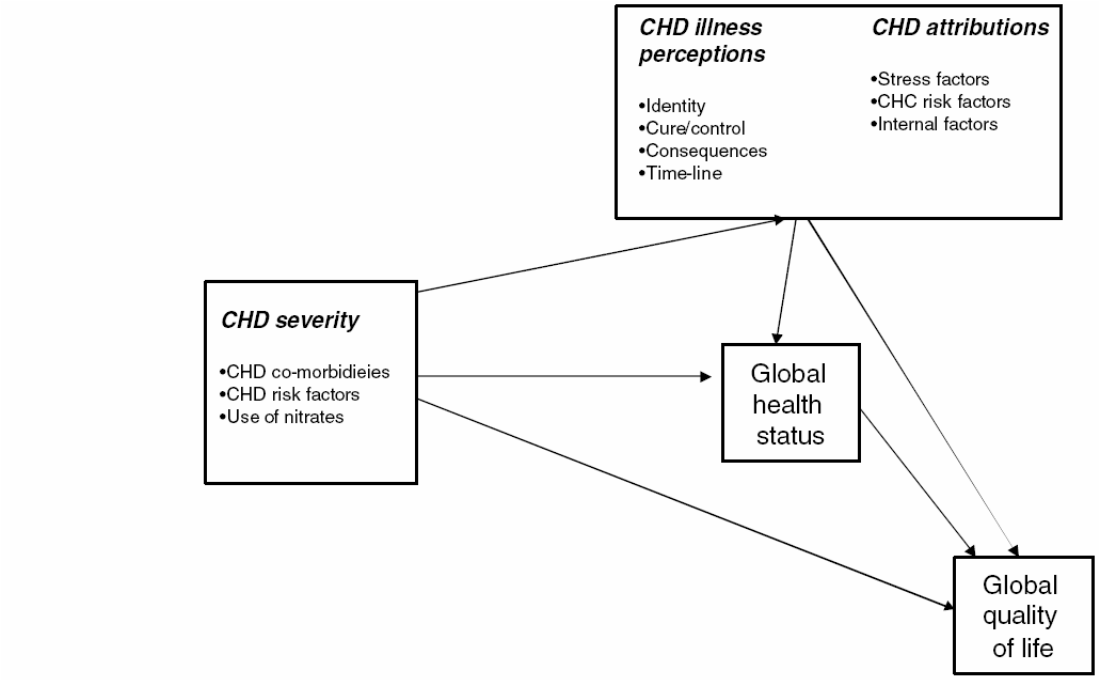

Figure 1. Proposed theoretical path model.

Table 1. Baseline sample characteristics

	Total sample (n = 3130)		Men (n = 1657))		Women (n = 1473)		p^a
Age, mean (SD)	64.38	(7.04)	62.98	(7.40)	65.79	(6.36)	0.000
Years of education, mean (SD)	9.66	(2.08)	9.83	(2.21)	9.49	(1.92)	0.000
Myocardial infarction (%)	34		44		25		0.000
Revascularisation (%),	36		47		26		0.000
Short-term nitrates at least weekly (%)	18		15		22		0.000
CHC risk factors (%)	78		77		80		ns
CHD co-morbidities (%)	40		38		42		ns
Self-rated global health status, mean (SD)	3.08	(0.70)	3.11	(0.72)	3.05	(0.68)	ns
Self-rated global Quality of Life (QOL), mean (SD)	62.88	(18.53)	64.07	(18.44)	61.67	(18.54)	0.000

[a] *p* for gender difference

Table 2. Univariate associations between self-rated global health status and quality of life (QOL) and independent variables in the baseline setting

	Global health status[a]		Global QOL[a]			Global heaöth status[a]			Global QOL[a]		
	r		*r*			Mean		(SD)	Mean		(SD)
Education, years	0.11	***	0.15	***	Myocardial infarction						
Use of nitrates[b]	−0.33	***	−0.26	***	No	3.06		(0.68)	62.54		(18.72)
Identity[c]	−0.43	***	−0.39	***	Yes	3.11		(0.74)	63.60		(18.23)
Consequences[c]	−0.46	***	−0.43	***	Revascularisation						
Cure/control[c]	0.34	***	0.32	***	No	3.05	***	(0.69)	62.68		(18.76)
Time-line[c]	−0.11	***	−0.07	***	Yes	3.14		(0.72)	63.40		(17.99)
Cause/ internal & behavioural factors[c]	−0.09	***	−0.12	***	CHD risk factors						
Cause/ epidemiological risk factors[c]	−0.12	***	−0.11	***	No	3.18	***	(0.72)	63.51		(18.98)
Cause/stress[c]	−0.13	***	−0.17	***	Yes	3.05		(0.69)	62.71		(18.40)
					CHD commorbidities						
					No	3.19	***	(0.67)	65.75	***	(17.68)
					Yes	2.90		(0.70)	58.50		(18.94)

$^{**}p < 0.01$, $^{***}p < 0.001$.
[a]Higher score indicates better health status and QOL.
[b]1 = daily ... 5 = never.
[c]Higher score indicates more perceived CHD symptoms (identity), more severe consequences, stronger belief in cure/control, longer expected duration (time-line) and stronger attribution to the cause.

Table 3. Summary of series of multiple regression analyses for self-rated global health status and quality of life (QOL) in baseline

	Global health status[a](baseline)						ΔR^2	Global QOL[a](baseline)						ΔR^2
	Step 1		Step 2		Step 3			Step 1		Step 2		Step 3		
	β		β		β			β		β		β		
Sociodemographics							0.02							0.03
Gender (0 = women, 1 = men)	−0.27		−0.23		−0.18	*		0.07	***	0.04		0.02		
Age, years	0.39		0.52		0.34			1.31	***	1.35	***	1.23	***	
Age square	−0.44		−0.53		−0.36			−1.29	***	−1.32	***	−1.22	***	
Gender X Age square	0.33	***	0.24		0.18	*		0.14	***	0.11	***	0.06	**	
Education, years	0.10	***	0.06	**	−0.01									
CHD severity & history							0.13							0.08
Myocardial Infarction[b]			0.03		0.02					0.04		0.03		
Revascularisation[b]			0.03		0.06	***				−0.02		0.01		
Nitrates[c]			0.28	***	0.10	***				0.20	***	0.04		
CHD risk factors[b]			−0.11	***	−0.05	**				−0.07	***	−0.02		
CHD co-morbidities[b]			−0.16	***	−0.05	**				−0.15	***	−0.05	**	
Illness perceptions[d]							0.18							0.16
Identity					−0.23	***						−0.23	***	
Consequences					−0.28	***						−0.24	***	
Cure/ control					0.14	***						0.13	***	
Time-line					0.02							0.03		
Cause/ internal & behavioural factors					−0.01							−0.05		
Cause/ epidemiological risk factors					−0.05							−0.03		
Cause/ stress					0.08	***						0.03		
R^2/R^2 adj					0.33/0.33							0.28/0.27		

$^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.
[a]Higher score indicates better global self-rated health status and QOL.
[b]0 = no, 1 = yes.
[c]1 = daily ... 5 = never.
[d]Higher score indicates more perceived CHD symptoms (identity), more severe consequences, stronger belief in cure/control, longer expected duration (time-line) and stronger attribution to particular cause.

Table 4. Summary of series of multiple regression analyses for follow-up in self-rated global health status and quality of life (QOL) in one year follow-up with baseline variable as predictors

	Global health status [a] (follow-up)				ΔR^2	Global QOL [a](follow-up)				ΔR^2
	Step 1	Step 2	Step 3	Step 4		Step 1	Step 2	Step 3		
	β	β	β			β	β	β		
Baseline SRH/QOL	0.59 ***	0.59 ***	0.54 ***	0.45 ***	0.35	0.56 ***	0.55 ***	0.53 ***	0.47 ***	0.31
Sociodemographics										
Gender (0 = female, 1 = male)		0.05 **	0.04	0.04	0.00		0.03	0.03	0.04 *	0.00
Age, years		0.01	0.02	0.01			−0.03	−0.03	−0.04 *	
Education, years		−0.02	−0.03	−0.05 **			0.03	0.02	0.01	
CHD severity & history										
Myocardial Infarction[b]			0.00	0.00	0.02			0.00	0.00	0.01
Revascularisation[b]			−0.01	0.00				−0.01	0.01	
Nitrates[c]			0.10 ***	0.06 **				0.06 **	0.02	
CHD risk factors[b]			−0.04 *	−0.03				−0.07 ***	−0.05 **	
CHD related co-morbidities[b]			−0.08 ***	−0.04 *				−0.02	0.00	
Illness perceptions[d]					0.03					
Identity				−0.10 ***					−0.02	0.02
Consequences				−0.07 **					−0.10 ***	
Cure/ control				0.09 ***					0.08 ***	
Time-line				−0.03					−0.01	
Cause/ internal l factors				−0.01					−0.01	
Cause/ epidemiological risk factors				−0.04					−0.04	
Cause/ stress				0.01					−0.03	
R^2/R^2 adj					0.40/0.39				0.35/0.34	

*$p < 0.05$ **$p < 0.01$; ***$p < 0.001$.
[a]Higher score indicates better global self-rated health status and QOL.
[b]0 = no, 1 = yes.
[c]1 = daily ... 5 = never.
[d]Higher score indicates more perceived CHD symptoms (identity), more severe consequences, stronger belief in cure/control, longer expected duration (time-line) and stronger attribution to particular cause.

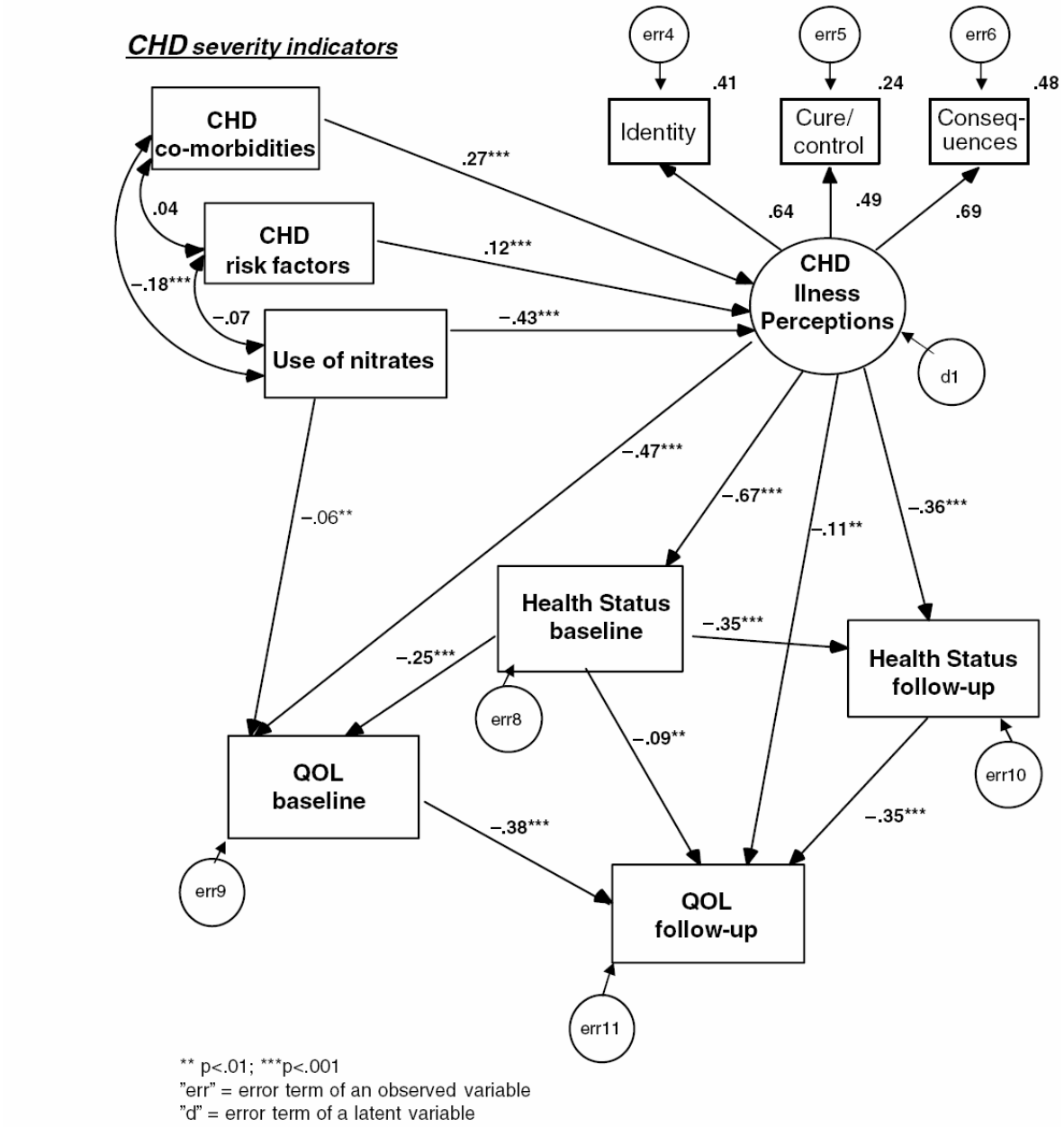

Figure 2. Revised path model.

APPENDIX

Appendix. Confirmatory factor analysis for attribution items

Items	Factors			
	Stress factors	CHD risk factors	Internal factors	Communality
Financial problems	0.76			0.36
Work overload	0.62			0.57
Family problems	0.75			0.62
Stress	0.60			0.58
Alcohol		0.82		0.21
Blood preasure		0.51		0.35
Over weight		0.59		0.26
Diet		0.46		0.66
Smoking		0.74		0.54
Personality			0.60	0.42
Attitude			0.76	0.58
Own behaviour			0.65	0.35
Factor correlations				
Stress factors	1.00			
CHD risk factors	0.45	1.00		
Internal factors	0.61	0.63	1.00	
Chisq = 766.4				
df = 15.0				
$p < 0.001$				
GFI = 0.948				
AGFI = 0.920				
RMSEA = 0.076				

GFI = Goodness of Fit Index, AGFI = Adjusted Goodness of Fit Index, RMSEA = Root Mean Square Error of Approximation

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