

Postprint Version	1.0
Journal website	http://linkinghub.elsevier.com
Pubmed link	http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=16026654&query_hl=1
DOI	10.1016/j.jpsychores.2005.03.001

* Corresponding author. Effectiveness and Equity Research Group, STAKES, PO Box 220, Helsinki 00531, Finland. Tel.: +358 9 39672252; fax: +358 9 39672485.
E-mail address: anna-mari.aalto@stakes.fi (A.-M. Aalto).

ORIGINAL ARTICLES

Illness perceptions in coronary heart disease Sociodemographic, illness-related, and psychosocial correlates

ANNA-MARI AALTO^{A,*}, MONIQUE HEIJMANS^B, JOHN WEINMAN^C, ARJA R. ARO^{D,E}

a Effectiveness and Equity Research group, STAKES, Helsinki, Finland

b NIVEL, Utrecht, The Netherlands

c Unit of Psychology, United Medical and Dental School of Guy's and St Thomas's Hospitals, KCL, London, England

d Department of Public Health, Erasmus Medical Center, Rotterdam, The Netherlands

e Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland

ABSTRACT

Objectives: This study examined illness perceptions (IP) and their correlates in coronary heart disease (CHD). **Methods:** The sample of the questionnaire study ($n = 3130$ at baseline and $n = 2745$ at 1-year follow-up, aged 45–74 years) was drawn from the drug reimbursement register, which covers persons with various drug-treated conditions. Independent variables were CHD severity and history, vicarious experiences, and psychosocial resources. **Results:** Men attributed their CHD more often to risk behaviours and internal factors (own attitude/behaviour), while women perceived stress as the cause of their CHD more often. Women also perceived more symptoms associated with CHD but reported less severe consequences. CHD severity was the most important correlate of IP and also predicted change in IP at the follow-up. Stronger perceived competence was related to weaker illness identity, stronger control/ cure, and less severe consequences. **Conclusions:** Although disease related factors are powerful correlates of CHD-related illness cognitions, also social and psychosocial factors are related to IP.

INTRODUCTION

Coronary heart disease (CHD) is the most common cause of premature death in Western societies and negatively affects the sufferer's well-being [1,2]. In research on adjustment to chronic illness, considerable attention has focused on a person's perceptions regarding the nature of illness.

According to Leventhal et al. [3], people regulate both their behavioural and emotional reactions to illness based on (1) the symptoms which they attribute to the illness (*identity*), (2) beliefs about causes of the illness (*cause*), (3) beliefs about the curability or controllability of the illness (*cure/control*), (4) perceived consequences of the illness in everyday life (*consequences*), and (5) expected duration of

the illness (*time-line*). Strong illness identity, severe perceived consequences, low perceived controllability, and chronic perceived time-line of illness have been shown to be related to poor well-being in various chronic illnesses [4]. Illness perceptions (IP) have also been associated with self-care behaviours [5–7].

Although IP have been studied as adaptive factors in adjustment with various chronic illnesses, relatively little work has systematically explored their determinants in homogenous patient groups. Moreover, although the self-regulatory theory has recognized that IP are influenced by many factors, it has not defined the ways in which these influences occur. This knowledge, however, is important for understanding how IP are developed and how they should be modified and to what patient groups should the interventions be targeted. Leventhal et al. [3] have proposed that IP are influenced by a range of individual, contextual, and cultural factors. From the rather sparse data available, it has been found that the contents of IP are influenced by the personal experience of the illness and its management, and by cultural and social factors such as aspects of self, vicarious experiences of illness in the social environment, social comparison processes, as well as the mass media [3,8,9].

Another factor influencing IP may be generic psychosocial resources, which can be personal, such as perceptions of control or mastery, or external resources, such as social networks and support. General feelings of self-efficacy and competence may modify perceptions of the specific situation, such as the controllability of an illness or its consequence, and personality correlates of IP has been reported [7,10]. Theories of social support suggest that one of the pathways through which social support affects health is by modifying the persons' appraisal of the stressfulness of the situation [11,12], and social support has been related to perceptions on stress [13,14]. A chronic illness can be seen as a stress factor due to its adjustment demands for sufferers; therefore, appraisals of illness may also be influenced by support received from others. Feedback from significant others may also be a source for interpretation of cardiac symptoms. Those seeking out social support have been shown to delay less in seeking treatment for myocardial infarction (MI) symptoms [9]. However, the relationships between generic psychosocial resources and illness-specific perceptions have rarely been studied.

Although CHD has typically been considered a male disease, largely due to research tradition on the Type A behavioural pattern and CHD [15,16], it is the major cause of death among women too. This "male stereotype" of heart disease may have influenced both professional and lay perceptions of the disease. Gender differences have been reported in the clinical presentation of CHD [17], its treatment [18], as well as in outcomes and adjustment after MI [19]. These divergent experiences may have modified the understanding of CHD among men and women resulting in gender differences in IP.

The aims of the present study were to examine the role of a number of factors as cross-sectional and prospective correlates of CHD-related IP. These factors are illness severity and history, experiences of CHD among relatives and friends, and generic psychosocial resources. In the absence of clear theory on determinants of IP, we do not present specific detailed hypothesis on the associations between each independent variable and illness perception variable. However, the general expectation based on previous research is that factors reflecting severe CHD and severe history of CHD would be reflected as more maladaptive IP, such as severe perceived consequences or low perceived controllability of CHD, while the availability of psychosocial resources would be associated with IP in an opposite ways. Because of reported gender differences in the presentation and outcomes of CHD, we were also interested in whether the IP of men and women with CHD would differ and whether the associations of these factors and IP differ by gender.

METHODS

The sample

In Finland, all those fulfilling the diagnostic criteria of CHD are entitled to reimbursement for CHD medication, and the Social Insurance Institution maintains a nationwide register on patients who are entitled to receive a special reimbursement for medicines due to specified chronic diseases, such as CHD, hypertension, diabetes, and asthma. From this register, 5009 Finnish-speaking people with CHD, aged 45 to 74 years in January 2001 and who had received the right to medication reimbursement due to CHD during 1994–1995, were drawn for the study sample. 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). The follow-up questionnaire was sent to respondents ($n=3082$, 48 persons died during the follow-up period) 1 year later in spring 2002. A total of 2650 questionnaires was returned, giving a response rate of 84% (53% of the original sample).

According to the 2000 census information (Statistics Finland), the non-respondents in the baseline survey were ($P<.001$) older, more often women, and less well educated than the participants. The non-respondent in the follow-up survey differed from the follow-up respondents in being less educated ($P<.001$). The participants gave 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

IP were assessed by the Illness Perceptions Questionnaire (IPQ; [20]). In factor analysis (principal component analysis with varimax rotation), a four-factor solution explained 41.6% of variance in IPQ items. All identity items loaded on the first factor (share of explained variance 16.5%, the factor loadings varying from .28 to .71). The time-line items loaded all on the second factor (share of explained variance 9.2%, loadings varying from .70 to .73). Five of the six cure/control items loaded on the third factor (share of explained variance 8.6%, loadings from .37 to .64), and five of the seven consequences items loaded on the fourth factor (share of explained variance 7.3%, loadings from .34 to .71). Of the remaining items, the sixth cure/control items loaded on consequences factor ($-.44$), one control item loaded on the time-line factor (.53), and one consequences item loaded on the control/cure factor ($-.62$). The alpha coefficients for the scales were the following: illness identity (12 items, alpha coefficient $\alpha =.83$), cure/control (6 items, $\alpha =.52$), consequences (5 items, $\alpha =.69$), and time-line (3 items, $\alpha =.70$). The alpha coefficient of the cure/control scale was relatively low, as has been found in other studies [21]. Because 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 despite 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 respectively 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). The response scale for the identity items was different for the other items (four vs. five response alternatives), which may partly account for the fact that the identity items loaded most clearly on one single factor.

To measure the "causes" dimension of IP, we used a scale adapted from the IPQ-R [22] supplemented by eight additional items related to CHD risk factors (Table 1). We examined the dimensions of this modified 25-item CHD attribution scale by factor analysis (principal component analysis with varimax solution). Seven factors with eigenvalue of equal or greater than one explained 60% of the variance in the items (Table 1). The seven factors with alpha coefficients for the corresponding sum scales are "stress" (six items, $\alpha =.80$), "environmental factors" (five items, $\alpha =.69$), "risk behaviours" (three items $\alpha =.75$), "epidemiological risk factors" (four items, $\alpha =.66$), "internal factors" (three items $\alpha =.70$), "life-course" (three items, $\alpha =.56$), and "genes" (one item). The CHD attributions were included only in the baseline questionnaire.

[TABLE 1]

Independent variables

Sociodemographic variables were age, gender (0 =female, 1= male), and education. Information about age and gender was based on the personal identification code (given to every Finnish citizen at birth). Information about education was based on 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 score ranging 8–17 years.

Information on previous MI (0=no, 1=yes) and revascularization (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 was used. The duration of CHD was examined by asking when the CHD had been identified. All respondents had received entitlement for drug reimbursement for CHD during 1994–1995, which means that they had been officially diagnosed with CHD no earlier than 1993. For some respondents, however, CHD may have been suspected for a longer time (19% reported their CHD had begun before 1993). We used this as a measure of perceived duration of CHD, dichotomising the variable using 1992/ 1993 as cut-off point.

Because we did not have access to objective physiological indicators of CHD severity, we therefore used as a proxy measure of disease severity the use of short-term nitrates at least once a week (0=no, 1=yes). Short-term nitrates are prescribed for symptoms of angina pectoris (AP) and can therefore be seen as an indicator of frequency of AP. In addition, the respondents were asked about the presence of CHD-related comorbidities (blood pressure, cardiac failure, high cholesterol, arrhythmia, diabetes, and ischaemic attack). Two variables were constructed for additional indicators of disease severity: The presence of physiological risk factors was coded (1=yes, 0=no) if the respondent mentioned high blood pressure, high cholesterol, or diabetes. Heart failure or arrhythmia may be seen as consequences of CHD, therefore, if either of these was mentioned, the presence of CHD-related comorbidities was coded (1=yes, 0=no).

Vicarious experiences of CHD was measured by asking whether some people in the respondent's social network have CHD. The response alternatives were (1) mother or father, (2) siblings, (3) spouse (4) own child, (5) other relative, (6) friend/coworker, (7) no one, and (8) I do not know. Respondents could select all alternatives applicable for them. Alternatives 7 or 8 were coded as 0, after which a total score was computed with a theoretical range varying from 0 to 6. Missing data were assigned for those not having answered to any alternative and for those having selected one of the alternatives from 1 to 6 and, in addition, either 7 or 8.

Two kinds of generic psychosocial resources were assessed: perceived competence and social support. Perceived competence was measured by the eight-item Perceived Competence scale [23], which measures confidence in one's personal competence in successfully attaining important life goals. The Cronbach's α of the scale in the present sample was .82, and the theoretical range was 8 to 48, with high scores indicating strong perceived competence. Social support was measured by a shortened Finnish version [24] of the MOS Social Support Survey [25]. Twelve items were included for the study: information/ emotional support (eight items) and tangible support (four items). Factor analysis in the present sample indicated one strong factor with an eigenvalue of 7.9, explaining 66% of the variance in the items. The range of factor loadings was .79–.86. Therefore, a total score of social support items was computed with a Cronbach's α of .95 and a theoretical score range 0–48, with higher scores indicating more social support.

Analysis plan

The determinants of IP were examined both crosssectionally (all IP scales) and prospectively ("identity", "cure", "consequences", and "time-line" scales). To examine the predictors of change in IP, change scores were computed by subtracting the baseline value for each illness cognition variable from the follow-up value, a higher score therefore indicating an increase in the illness perception over the year. Change score approach is increasingly recommended in longitudinal studies because the two measurements (T1 and T2) are not independent from each other [26]. Change score method reduces the autocorrelation between two measurement points.

Multivariate hierarchic regression analyses were computed for each IP scale to examine the relationships between dependent and independent variables. First, the sociodemographic distribution of IP was examined by including age sex and education, as well as gender interaction terms in the model as independent variables.

In the final regression models, all the other potential correlates were added in the model in hierarchical order. The order was based on temporal (before vs. simultaneously with the survey), personal (direct vs. socially mediated experience), and conceptual (CHD specific vs. generic factors)

distance between independent and dependent variables. Following this logic, sociodemographic variables (and significant gender interaction terms) were adjusted first (Level 1) because these factors have not been affected by the onset of CHD. Next, CHD history (Level 2), measured by register information prior to the survey, was entered before CHD severity (Level 3), which was measured in the survey (*temporal distance*). Next, vicarious experiences (Level 4) was entered into the model after CHD history and severity because direct personal experience is considered to be of stronger potential influence than socially mediated experiences ([27]; *personal distance*). Generic psychosocial resources were entered after CHD-specific factors (Level 5) because they are conceptually more distant to illness beliefs than illness-related factors (*conceptual distance*). Finally, interaction terms of gender and independent variables were entered in the model (Level 6, stepwise procedure). In the follow-up models, the baseline illness cognition was first adjusted for and then the same order of hierarchy was followed as in the baseline models.

Due to the large sample size, a *P* value less than .01 was used as the criterion for significant associations. To correct for the nonresponse bias, the sample was weighted in the analysis to correspond to the original sample with regard to age, gender, and educational level.

RESULTS

Cross-sectional results

Women in the sample were older and less educated than the men were, and they reported more frequent weekly use of short-term nitrates, but they had suffered MI and undergone revascularization less often than men did (Table 2). Furthermore, women reported more often family history of CHD.

[TABLE 2 & 3]

Table 3 shows the means and standard deviations of IPQ subscales and the share of respondents scoring above the midpoint of the scale. Compared with men, women regarded their illness as less controllable and perceived more CHD-related symptoms (identity). When individual identity items were examined, women reported all symptoms significantly more frequently apart from loss of weight. Women also thought more often than men did that their CHD was caused by stress or genes, while men mentioned more often that their illness was due to risk behaviours, internal factors, or epidemiological risk factors.

After adjusting for age and education (Table 4), the gender differences remained significant apart from the “cure/ control “ and “cause/ genes” scale. In addition, men also perceived more serious consequences of CHD than women did. Older respondents perceived less symptoms of CHD (identity) and reported shorter expected CHD duration (timeline). There was a significant interaction between gender and age in the model for “consequences”: Younger men were more likely to report severe consequences CHD ($P < .001$), but among women, age was not related to perceived consequences of CHD. Furthermore, older respondents attributed their CHD less often to stress or risk behaviours and more often to life-course factors. Older respondents were also less likely to attribute their illness to genetic factors among both genders, but this relationship was stronger among men ($P < .001$). Low education was associated with more CHD-related symptoms, weaker perceived controllability, more severe perceived consequences as well as with attribution to stress, external factors, epidemiological risk factors, life-course factors, as well as health behaviours.

[TABLE 4]

After controlling for other potential correlates of IP, most of the age and gender differences remained significant (Table 4). Educational differences in perceived CHD-related symptoms (identity), attribution to stress, and life-course factors disappeared in total multivariate analysis.

Indicators of CHD history showed only a few modest associations with IP. Those with more severe CHD, in terms of physiological CHD risk factors, comorbidities, and use of nitrates, perceived more CHD-related symptoms, regarded CHD as less controllable, and reported more severe consequences of CHD.

Vicarious experiences of CHD was most strongly related to more perceived CHD-related symptoms and attribution of own illness to genetic factors. Those with strong psychosocial resources perceived less symptoms of CHD (identity), regarded CHD as more controllable illness, and reported less severe consequences of CHD. Furthermore, those with strong perceived competence, in particular, attributed their illness less often to stress, external, internal, and life course factors.

One-year follow-up results

The correlations for baseline and follow-up IP were $r = .69$ for illness identity, $r = .55$ for cure/control, $r = .68$ for consequences, and $r = .48$ (all correlations $< .001$). Significant changes ($P < .001$) in IP during the 1-year follow-up period appeared in illness identity (increased, $t = 5.01$), cure/control (decreased, $t = 12.31$), and consequences (increased, $t = -4.29$).

Table 5 presents the hierarchical multivariate regression analyses for change in IP over the 1-year follow-up period. Baseline IP were the strongest predictors for change in IP during the 1-year follow-up, explaining from 12% to 30% of variance in the change scores. Controlling for the baseline illness perception, women and younger respondents were more likely to associate more symptoms to CHD (increased identity) in the follow-up. Younger respondents also reported increased belief in controllability and increased expectation of long duration of CHD (time-line). Those with more severe CHD and weaker psychosocial resources perceived increased symptoms of CHD and increased perceived consequences of CHD. Furthermore, those with severe CHD reported decreased belief in controllability of CHD, while those with strong perceived competence reported increased belief in controllability.

[TABLE 5]

DISCUSSION

This study investigated CHD-related IP and their predictors in a large, representative sample of people with CHD. Genetic factors were the most common perceived cause of CHD, followed by stress and life-course factors. Gender differences emerged in causal explanations of CHD in particular. No major gender differences in the correlates of IP was found, however. CHD severity was an important correlate of IP and also predicted change in IP at the follow-up. Stronger psychosocial resources were related to weaker illness identity, stronger belief in control/cure, and less severe perceived consequences.

The Drug Reimbursement Register provides a representative population-based sampling base for studies focusing on people with drug-treated chronic illnesses. The response rate of the study was rather similar to recent population based questionnaire studies in Finland [28]. The large sample size allowed us to use multivariate analysis and to adjust for various determinants of IP 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 [29]. The 1-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.

Only a few studies so far have examined gender differences in IP. Gender differences may be an important issue particularly in CHD—the traditional view of CHD as a “male” disease [16] may have modified conceptions of CHD both among professionals and lay people. However, among persons with diagnosed CHD, the personal experiences of the illness and its consequences may have corrected the biased conceptions. Previous studies have reported gender differences in CHD-related attributions [30]. In addition, in the present study, gender differences emerged mainly in CHD attributions, with men attributing their illness more often to internal and behavioural factors, while women saw their illness more often as a result of stress. Women also reported more perceived CHD-related symptoms and more serious consequences of CHD than men do. Gender difference in perceived symptoms could reflect more severe CHD among women, but this disparity remained significant even when factors such as age and CHD severity were controlled for. In addition, women were more likely to report

symptoms relevant in CHD (such as shortness of breath), as well as symptoms not related to CHD (such as headache or joint pain), which may reflect the tendency found in some studies for women to report more symptoms in general [31].

According to self-regulation theory, experiences of illness and its management modify a person's cognitive representations of illness [3,32]. IP differ between diseases [20,33,34], and for a particular disease, they appear to be more sophisticated among people with personal experience of the disease [35]. Accordingly, those with more severe illness in the present study reported stronger illness identity, weaker belief in controllability of CHD, more severe consequences of CHD, and more chronic timeline of CHD. Somewhat surprisingly personal experience of MI was relatively unrelated to IP. Experience of MI causes fears and uncertainty [36] and could therefore be expected to modify also perceptions of heart disease.

Family history of CHD is an important risk factor for the disease [37], and those with such a history perceive themselves more vulnerable to CHD [38–40]. In line with these findings, having relatives and friends with CHD were clearly related to CHD-related IP in the present study, and vicarious experiences showed even clearer associations with IP than personal CHD history.

Also personality factors have been related to IP [7,10]. In the present study, IP were related to both personal and social resources. Persons with strong perceived competence, in particular, perceived less CHD-related symptoms, regarded their illness as more under control, perceived less severe consequences, and were less likely to make strong attributions of CHD. The role of psychosocial resources can be interpreted using a stress-appraisal framework. Those who feel competence and control over their life events may use more effective coping strategies to deal with the challenges posed by a chronic illness and may therefore assess the consequences of illness in day-to-day life as less severe and threatening and perceive more control over their illness. The lack of gender differences in the psychosocial correlates of IP in the present study was somewhat surprising in the light of previous studies showing gender difference in psychosocial resources and their function [41].

The results of the present study provide important indications that although disease-related factors are powerful correlates of CHD-related illness cognitions, also sociodemographic, contextual, and psychosocial factors are related to IP. Despite a body of research showing that IP are related to various kinds of outcomes in chronic illnesses [4] little work has been done to examine the antecedents and determinants of these beliefs. However, this knowledge is important for the theoretical understanding of how patients adapt to illnesses by constructing representations of them. It also has important practical implications for cardiac rehabilitation and patient counselling in terms of helping patients to cope with their illness by modifying and restructuring their personal models of illness. More research is therefore needed on how cultural factors, personality factors, and interventions in health care are reflected in IP. In addition, the actual self-regulatory nature of the processes through which people regulate their IP needs more attention in addition to explorative search for antecedents and determinants of perceptions.

ACKNOWLEDGMENTS

This study was financially supported by the Academy of Finland.

REFERENCES

- [1] Alonso J, Ferrer M, Gandek B, Ware Jr JE, Aaronson NK, Mosconi P, et al. Health-related quality of life associated with chronic conditions in eight countries: results from the International Quality of Life Assessment (IQOLA) Project. *Qual Life Res* 2004;13(2):283– 98.
- [2] Torres M, Caldero'n S, Di'az I, Chaco'n A, Ferna'ndez F, Marti'nez I. Health-related quality of life in coronary heart disease compared to norms in Spanish population. *Qual Life Res* 2004;13:1401– 7.
- [3] Leventhal H, Leventhal EA, Contrada RJ. Self-regulation, health, and behaviour: a perceptual–cognitive approach. *Psychol Health* 1998;13: 717– 33.
- [4] Hagger M, Orbell S. A meta-analytic review of the common-sense model of illness representations. *Psychol Health* 2003;18:141–84.
- [5] Horne R, Weinman J. Self-regulation and self-management in asthma: exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventive medication. *Psychol Health* 2002;17:17– 32.

- [6] Llewellyn CD, Miners AH, Lee CA, Harrington C, Weinman J. The illness perceptions and treatment beliefs of individuals with severe haemophilia and their role in adherence to home treatment. *Psychol Health* 2003;18:185–200.
- [7] Griva K, Myers LB, Newman S. Illness perceptions and self-efficacy beliefs in adolescents and young adults with diabetes mellitus. *Psychol Health* 2000;15:733–50.
- [8] Bandura A. Health promotion from the perspective of social cognitive theory. *Psychol Health* 1998;13:623–49.
- [9] Petrie KJ, Weinman JA. Illness representations and recovery from myocardial infarction. In: Petrie K, Weinman JA, editors. *Perceptions of health and illness*. Harvars Academic Publishers, 1998.
- [10] Heijmans M, De Ridder D. Structure and determinants of illness representations in chronic disease: a comparison of Addison's disease and chronic fatigue syndrome. *J Health Psychol* 1998;3(4):523 – 37.
- [11] Antonucci TC, Depner CE. Social support and informal helping relationships. In: Wills TA, editor. *Basic processes in helping relationships*. New York: Academic Press, 1982. pp. 233– 52.
- [12] Cohen S. Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychol* 1988;7:269 –97.
- [13] Chen W-Q, Wong T-W, Yu T-S, Lin Y-Z, Cooper CL. Determinants of perceived occupational stress among Chinese offshore workers. *Work Stress* 2003;27:287– 305.
- [14] AbuAlRub RF. Job stress, job performance, and social support among hospital nurses. *J Nurs Scholarsh* 2004;36(1);73– 8.
- [15] Riska E. The rise and fall of Type A man. *Soc Sci Med* 2000;51: 1665– 74.
- [16] Lockyer L, Bury M. The construction of a modern epidemic: the implications for women of a gendering of coronary heart disease. *J Adv Nurs* 2001;39(5);432 –40.
- [17] Wenger NK. Clinical characteristics of coronary heart disease in women: emphasis on gender differences. *Cardiovas Res* 2002;53: 558– 67.
- [18] Hetemaa T, Keskimäki I, Manderbacka K, Leyland AH, Koskinen S. How did the recent increase in the supply of coronary operations in Finland affect socioeconomic and gender equity in their use? *J Epidemiol Community Health* 2003;57(3);178– 85.
- [19] Brezinka V, Kittel F. Psychosocial factors of coronary heart disease in women: a review. *Soc Sci Med* 1995;42:1351– 65.
- [20] Weinman J, Petrie KJ, Moss-Morris R, Horne R. The Illness Perception Questionnaire: a new method for assessing the cognitive representations of illness. *Psychol Health* 1996;11:431– 45.
- [21] Scharloo M, Kaptein A, Weinman J, Hazes JM, Willems LNA, Bergman W, et al. Illness perceptions, coping and functioning in patients with rheumatoid arthritis, chronic obstructive pulmonary disease and psoriasis. *J Psychosom Res* 1998;44:537– 85.
- [22] Moss-Morris R, Weinman J, Petrie KJ, Horne R, Cameron LD, Buick D. The revised illness perception questionnaire (IPQ-R). *Psychol Health* 2002;17:1–16.
- [23] Wallston KA. Hocus-pocus, the focus isn't strictly on locus: Rotter's social learning theory modified for health. *Cogn Ther Res* 1992;16: 183– 99.
- [24] Aalto A-M, Ohinmaa A, Aro AR. Social support and quality of life in Finnish general population. In: Rodríguez-Marín J, editor. *Health psychology and Qual Life Res*. Alicante: Health Psychology Department, University of Alicante, 1995. pp. 620– 6.
- [25] Sherbourne CD, Stewart AL. The MOS social support survey. *Soc Sci Med* 1991;32:705– 14.
- [26] Kirkwood BR, Sterne JAC. *Medical statistics*. Malden: Balckwell Science, 2003.
- [27] Bandura A. *Social foundations of thought and action. A social cognitive theory*. New Jersey: Prentice-Hall, 1986.
- [28] Helakorpi S, Patja K, Prättälä R, Aro AR, Uutela A. Suomalaisen aikuisväestön terveyskäyttäytyminen ja terveys, kevät 2002. Helsinki: Kansanterveyslaitoksen julkaisuja B12/2002, 2002.
- [29] Huxley R, Neil A, Collins R. Unraveling the fetal origins hypothesis: is there really an inverse association between birthweight and subsequent blood pressure? *Lancet* 2002;360:656– 9.
- [30] King R. Illness attributions and myocardial infarction: the influence of gender and socio-economic circumstances on illness beliefs. *J Adv Nurs* 2002;37(5);431– 8.
- [31] Lahelma E, Martikainen P, Rahkonen O, Silventoinen K. Gender differences in ill health in Finland: patterns, magnitude and change. *Soc Sci Med* 1999;48:7– 19.
- [32] Leventhal H, Nerenz DR, Steele DJ. Illness representations and coping with health threats. In: Baum A, Taylor SE, Singer JE, editors. *Handbook of psychol health. Social psychological aspects of health*. Hillsdale: Lawrence Erlbaum Associates Publishers, 1984. pp. 219–52.
- [33] Schiaffino KM, Cea CD. Assessing chronic illness representations: the implicit models of illness questionnaire. *J Behav Med* 1995;18(6); 531– 48.

- [34] Schiaffino KM, Shawaryn MA, Blum D. Examining the impact of illness representations on psychological adjustment to chronic illnesses. *Health Psychol* 1998;17:262– 8.
- [35] Paterson J, Moss-Morris R, Butler SJ. The effects of illness experiences and demographic factors on children's illness representations. *Psychol Health* 1999;14:117–29.
- [36] Jensen BO, Peterson K. The illness experiences of patients after a first time myocardial experience. *Patient Educ Couns* 2003;51:123–31.
- [37] Leander K, Hallqvist J, Reuterwall C, Ahlbom A, de Faire U. Family history of coronary heart disease, a strong risk factor for myocardial infarction interacting with other cardiovascular risk factors: results from the Stockholm Heart Epidemiology Program (SHEEP). *Epidemiology* 2001;12:215– 21.
- [38] Hunt K, Davison C, Emslie C, Ford G. Are perceptions of family history of heart disease related to health-related attitudes and behaviour? *Health Educ Res* 2000;15(2);131–43.
- [39] Meischke H, Sellers DE, Robbins ML, Goff DC, Daya MR, Meshack A, et al. Factors that influence personal perceptions of the risk of an acute myocardial infarction. *Behav Med* 2000;26:4– 14.
- [40] Marteau TM, Kinmonth A-L, Thompson SG. Readiness for life-style advice: self-assessment of coronary risk prior to screening in the British family heart study. *Br J Gen Pract* 1995;45:5– 8.
- [41] Denton M, Walters V. Gender differences in structural and behavioral determinants of health: an analysis of the social production of health. *Soc Sci Med* 1999;48(9);1221– 35.

TABLES AND FIGURES

Table 1
Factor analysis for the cause items

	Principal component analysis with seven factor varimax-rotation solution								
	Item mean ^b (S.D.)	Stress	External factors	Health behaviours	Epidemiological risk factors	Internal factors	Life-course	Genes	h^2
Overwork	3.40 (1.15)	.73	.00	.04	.20	-.03	.30	-.14	.69
Family problems	2.95 (1.24)	.70	.27	.12	.01	.23	-.01	.13	.65
Stress	3.71 (1.08)	.70	-.06	-.03	.12	.27	-.14	.03	.60
Financial problems ^a	2.93 (1.22)	.69	.24	.19	.07	.10	.15	.09	.62
Working conditions ^a	3.20 (1.24)	.55	.13	.10	.17	-.24	.51	-.15	.69
My emotional state	2.73 (1.21)	.46	.22	.25	.09	.41	.17	.17	.56
Poor medical care	2.10 (1.05)	.20	.67	-.03	.07	.02	.06	-.08	.50
Germ/virus	2.13 (1.04)	.05	.66	.11	.20	.09	.05	.04	.49
Pollution	2.23 (1.01)	.09	.61	.10	.06	.22	.23	-.16	.52
Other people ^a	2.17 (1.04)	.42	.51	.00	-.04	.32	-.06	.01	.55
Chance, luck	2.22 (1.10)	-.01	.50	-.02	-.08	.04	.19	-.47	.52
Smoking	2.61 (1.55)	.08	-.05	.81	.23	.16	-.02	-.06	.74
Alcohol	2.21 (1.25)	.11	.06	.80	.24	.18	.07	-.02	.75
Accident	1.89 (1.04)	.14	.43	.62	.02	.08	.24	.02	.66
Overweight ^a	3.18 (1.28)	.13	.08	.19	.74	.06	.10	-.01	.62
Diet	3.51 (1.04)	.06	.02	.02	.68	.31	.09	-.03	.60
Blood pressure ^a	3.32 (1.33)	.15	.11	.18	.62	-.02	.09	.21	.50
Diabetes ^a	2.23 (1.24)	.03	.48	.23	.50	-.08	-.08	.15	.57
My own behaviour	2.83 (1.07)	.11	.03	.12	.31	.68	.13	-.29	.68
My mental attitude	2.29 (1.09)	.28	.26	.22	.18	.61	.09	.03	.61
My personality	2.50 (1.06)	.19	.21	.20	-.06	.61	.27	.14	.58
Ageing ^b	3.27 (1.07)	.04	.04	.04	.17	.22	.72	.06	.60
Immunity	2.60 (1.13)	.08	.41	.25	-.02	.27	.52	.05	.57
Childhood circumstances ^a	2.63 (1.15)	.34	.34	.00	.07	.14	.41	.13	.44
Hereditary	4.01 (1.04)	.07	-.06	-.05	.12	.00	.13	.78	.64
Variance (%)		12.25	11.19	8.51	8.32	8.17	6.71	4.63	59.78

Principal component analysis with seven factor varimax-rotation solution.

h^2 = communalities, which indicates the proportion of variance in each variable explained by the factor solution.

^a An additional item to, included for the present study, other items form IPQ.

^b Response scale in each item, from 1 = *disagree completely* to 5 = *agree completely*.

Table 2
Sample characteristics

	Men (n=1568)	Women (n=1562)	Total (N=3129)	P
Age, mean (S.D.)	63.0 (7.4)	65.8 (6.4)	64.4 (7.0)	.000
Years of education, mean (S.D.)	9.8 (2.2)	9.5 (1.9)	9.7 (2.1)	.000
Number of CHD related complications, mean (S.D.)	1.8 (1.2)	1.9 (1.2)	1.9 (1.2)	ns
Use of short-term nitrates weekly (%)	15	22	18	.000
Myocardial infarction	44	25	34	.000
Revascularization	47	26	36	.000
Family history of CHD (%)	73	82	78	.000

Table 3
Means and standard deviations (S.D.) of illness perception scales

	Theoretical range	Men (n=1568)			Women (n=1568)			All (N=3129)			P for gender difference (in mean)
		Mean	S.D.	Percentage (%) above scale midpoint	Mean	S.D.	Percentage (%) above scale midpoint	Mean	S.D.	Percentage (%) above scale midpoint	
Identity	0–12	7.15	4.90	49.22	9.18	5.47	62.88	8.16	5.29	55.08	.0000
Cure/control	6–30	20.90	3.21	77.87	20.37	3.13	73.46	20.64	3.18	72.70	.0000
Consequences	5–25	22.06	4.41	92.61	21.88	4.17	93.01	21.97	4.29	91.90	.2404
Time-line	3–15	12.92	1.84	95.70	12.78	1.89	94.95	12.85	1.86	91.30	.0352
Cause/stress	6–30	18.60	4.83	51.91	19.15	5.22	58.86	18.87	5.03	51.90	.0028
Cause/external	5–25	10.67	3.31	7.59	10.95	3.61	1.58	10.81	3.46	8.80	.0238
Cause/risk behaviours	3–15	7.57	2.95	28.57	5.78	3.15	14.63	6.68	3.18	20.60	.0000
Cause/internal	3–15	7.94	2.38	1.75	7.27	2.64	1.94	7.61	2.53	1.70	.0000
Cause/ epidemiological factors	4–20	12.43	3.28	17.86	11.99	3.53	16.56	12.21	3.41	16.80	.0003
Cause/life course	3–15	8.46	2.32	34.76	8.48	2.56	37.06	8.47	2.44	34.00	.8613
Cause/genes	1–5	3.90	1.07	73.96	4.13	1.00	81.90	4.01	1.04	76.80	.0000

Table 4
Multivariate regression models^a for IP in the baseline setting

	Identity		Cure/control		Consequences		Time-line		Cause/stress factors		Cause/external factors	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	β	β	β	β	β	β	β	β	β	β	β	β
Sociodemographic factors												
Age	-.08***	-.12***	-.07***	-.04	.02	-.02	-.06***	-.06***	-.11***	-.12***	.07**	.06**
Gender ^b	-.20***	-.10***	.04	.00	.53**	.45**	.02	.02	-.07***	-.02	-.01	-.01
Education (years)	-.08***	-.01	.16***	.10***	-.16***	-.07***	.05	.04	-.10***	-.04	-.13***	-.08***
Gender×Age	-		-		-.51***	-.39						
ΔR^2		.05		.04		.03		.01		.02		.03
CHD history												
MI ^c		-.05**		-.02		.03		.02		-.03		.03
Revascularisation ^c		-.04		.00		.09***		.07***		-.01		-.02
Duration (≥ 9 years) ^d		-.09***		.04		-.02		-.02		-.04		-.02
ΔR^2		.03		.00		.01		.01		.01		.00
CHD severity												
CHD risk factors		.06**		.01		.08***		.09***		.03		.01
CHD comorbidities		.19***		-.11***		.14***		.09***		.08***		.06***
Short-term nitrates ^e		.17***		-.14***		.19***		.05		.03		.02
ΔR^2		.09		.05		.09		.02		.01		.01
Vicarious experiences of CHD												
ΔR^2		.18***		-.03		.07***		.11***		.04		-.09***
Psychosocial resources												
Perceived competence		-.18***		.21***		-.31***		.08***		-.21***		-.18***
Social support		-.10***		.11***		-.05		-.01		-.13***		-.08***
ΔR^2		.05		.06		.10		.01		.07		.04
Gender×Revascularisation												
R^2/R^2 adjusted		.25/.24		.15/.15		.23/.23		.06/.05		.11/.11		.09/.08



	Cause/health behaviour		Cause/internal factors		Cause/epidemiological risk factors		Cause/life-course		Cause/genetic factors	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	β	β	β	β	β	β	β	β	β	β
Sociodemographic factors										
Age	-.11***	-.12***	-.05	-.05**	-.06**	-.07**	.09***	.08***	-.08	-.09***
Gender ^b	.27***	.27***	.13***	.15***	.06**	.08***	.02	.07**	.42	.40
Education (years)	-.11***	-.09***	.04	.08***	-.11***	-.08***	-.10***	-.04	.00	.00
Gender×Age									-.56**	-.46**
ΔR^2		.10		.02		.02		.02		.04
CHD history										
MI ^c		.05		.02		-.01		-.05		-.06***
Revascularisation ^c		-.03		-.02		.02		-.09***		.05**
Duration (≥ 9 years) ^d		-.02		.02		-.02		-.01		-.01
ΔR^2		.00		.00		.00		.00		.01
CHD severity										
CHD risk factors		-.01		.01		.22***		.02		.03
CHD comorbidities		.06**		-.01		.07***		.05		-.01
Short-term nitrates ^e		-.02		-.01		.03		.03		.00
ΔR^2		.00		.00		.06		.01		.00
Vicarious experiences of CHD		-.03		.01		.00		.00		.39***
ΔR^2		.00		.00		.00		.00		.15
Psychosocial resources										
Perceived competence		-.11***		-.21***		-.10***		-.24***		-.02
Social support		-.02		-.04		.01		-.05		.03
ΔR^2		.01		.05		.01		.06		.00
Gender×Revascularisation								.10***		
ΔR^2								.00		
R^2/R^2 adjusted		.13/.12		.07/.07		.09/.08		.10/.09		.20/.20

^a Model 1: sociodemographic factors; Model 2: total model.

^b 0=female, 1= male.

^c 0= no, 1=yes.

^d 0=less than 9 years (after 1993), 1=9 years or more (before 1993).

^e 0=less often than weekly; 1=weekly.

** $P < .01$.

*** $P < .001$.

Table 5
Multivariate regression models^a for change in IP during the 1-year follow-up

	Identity		Cure/control		Consequences		Time-line	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	β	β	β	β	β	β	β	β
Baseline IP	-.37***	-.48***	-.52***	-.57***	-.47***	-.53***	-.56***	-.58***
ΔR^2		.12		.26		.21		.30
Sociodemographic factors								
Age	-.04	-.07**	-.09***	-.08***	.01	.00	-.07***	-.07***
Gender ^b	-.12***	-.10***	.01	.00	-.02	-.01	.00	-.01
Education (years)	.01	.04	.04	.02	-.04	-.02	.04	.04
Gender×Age								
ΔR^2		.01		.01		.00		.01
CHD history								
MI ^c		-.01		.01		.02		.04
Revascularisation ^c		-.04		-.01		.03		.05**
Duration (≥ 9 years) ^d		-.02		.05		-.01		.00
ΔR^2		.00		.00		.00		.00
CHD severity								
CHD risk factors		.01		-.01		.01		.04
CHD comorbidities		.09***		-.07***		.09***		.02
Short-term nitrates ^e		.16***		-.03		.04		.03
ΔR^2		.03		.01		.01		.00
Vicarious experiences of CHD								
ΔR^2		.07***		.00		.01		.05**
		.00		.00		.00		.00
Psychosocial resources								
Perceived competence		-.09***		.10***		-.06**		.02
Social support		-.06**		.02		-.06**		.01
ΔR^2		.01		.01		.01		.00
Gender×Revascularisation								
R^2/R^2 adjusted		.19/.18		.29/.28		.23/.23		.32/.32

^a Model 1: baseline illness perception and sociodemographic factors; Model 2: total model.

^b 0=female, 1= male.

^c 0=no, 1=yes.

^d 0=less than 9 years (after 1993); 1=9 years or more (before 1993).

^e 0= less often than weekly, 1=weekly.

** $P < .01$.

*** $P < .001$.