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Predictors of change in self-rated health: a longitudinal analysis in patients with rheumatoid arthritis

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Abstract

Self-rated health is a powerful predictor variable for a number of important health outcomes such as mortality, morbidity or utilisation of healthcare services. Nevertheless, there still remain questions concerning the mechanisms underlying the process of evaluation of health. The aim of this study is to examine the long-term dynamics of relationships between self-rated health and its determinants – pain, disability and psychological well-being. A sample of 160 patients with recent-onset rheumatoid arthritis (mean disease duration 22.2 months) was followed up over a four-year period. To analyse data, one-way ANOVA, correlations and multiple linear regression analysis were employed. The outcomes of the study provide support for the expectation that pain, functional disability and psychological well-being are important determinants of self-rated health. On average, the investigated variables accounted for 43% of the total variance in self-rated health (range: from 36% at the T1-T2 time interval to 49% at the T2-T3 time interval). In addition, the results show that change in psychological well-being is the most important predictor of self-rated health. The findings from the analyses suggest that preventive interventions leading to positive change in psychological well-being may enable patients with rheumatoid arthritis to maintain or improve their health and quality of life.

Introduction

Self-rated health - the personal assessment of one's overall health status, is a significant variable in studies dealing with health outcomes. It often emerges as one of the most important predictor variables, no matter whether the outcome of interest is mortality, morbidity, utilisation of health care services or health protective behaviour (Linn and Linn 1980, Mossey and Shapiro 1982, Idler et al. 1990, Idler and Kasl 1991, Johnson and Wolinsky 1993, Idler and Kasl 1995, Andresen and Lobel 1995). Nevertheless, there still remain questions concerning the mechanisms underlying the process of evaluation of health. Self-rated health appears to be more than a simple reflection of physical health status. It underlies a variety of factors - physiological and psychological, objective and subjective. The way people evaluate their health depends not only on the presence or absence of disease, but also on their functional, social and psychological resources.

Interest in self-rated health has increased significantly since the appearance of the study by Mosey and Shapiro (1982). This study clearly proved that self-rated health is associated with mortality even after statistical adjustment for the influence of various health status and socio-demographic indicators. Later research has demonstrated that individuals who rate their health as "poor" are 2-10 times more likely to die in the next decade than persons who rate their health as "excellent" (Idler et al. 1990, Idler and Kasl 1991, Hays et al. 1996). These findings have evoked questions concerning the possibility of replacing established physicians' assessments with patients' self-ratings in predicting health outcomes. Traditionally, physicians' assessments have been considered to be the best possible measures of health status. They are, however, often difficult to obtain and rather expensive. On the other hand, self-ratings of health have been found to be better at predicting mortality than traditional physician's ratings, and therefore it has been hypothesised that self-ratings might be even more appropriate than physician ratings for evaluating certain aspects of health (Watson and Pennebaker 1989). These considerations initiated a new wave of studies on 'what self-rated health represents', and research has continued to uncover the types of phenomena that may influence health evaluations. Investigators have tried to find an answer to the question: "What causes a person to rate his or her health as good or poor?"

Early research on self-rated health was based on cross-sectional correlations between self-rated health and morbidity or disability (Maddox and Douglass 1973, Linn et al. 1980, Idler et al. 1990, Rakowski and Cryan 1990, Idler and Kasl 1991, Johnson and Wolinsky 1993). This research proved that physical health status contributes greatly to the explanation of health self-assessments, with functional disability especially being identified as

a strong predictor of self-rated health (Johnson and Wolinsky, 1993, Idler and Kasl 1991). However, the findings of these earlier studies also indicate that an individual's self-report of health is not determined exclusively by health status (Levkoff et al. 1987). The search for more explanatory determinants has therefore continued, and such variables as psychological states, personal status characteristics, cognitions or personality traits have been included into the analyses (Krause 1987, Levkoff et al. 1987, Linschoten 1994, Farmer and Ferraro 1997).

In general, of these additional determinants: age, sex, education, income, race, marital status, hospitalisation, cognitive functioning, depression and neuroticism have been shown to be highly correlated with overall health evaluations. Hays et al. (1996) carried out an extensive survey of studies dealing with correlates of self-rated health, and they found quite notable inconsistency in the independent variables used in investigations to predict self-rated health. Variables that had been demonstrated to be most predictive of self-rated health in some studies were not included in others. Nonetheless, they identified three factors that were shown to be most predictive: physical health status (chronic illness, symptoms), disability (functional status) and psycho-physiological symptoms (depression). They further state however that not even these three factors were consistently included in many of the earlier studies. This especially holds true for depression, and taking into consideration the great significance of the association between depression and self-rated health, the completeness of several previous models, in which depression was not included, has to be questioned.

Within the framework of Rheumatoid Arthritis (RA), each of the three groups of variables - physical health status, disability, and psycho-physiological symptoms - is very relevant. RA is a chronic incapacitating disease with no known aetiology or course, and requiring radical treatment. Typical symptoms are pain, fatigue, stiffness and swollen joints (Kelley et al. 1997). Pain, disability and psychological distress are among the most significant concomitants of the disease (Hawley and Wolfe 1991, ACR 1988). Pathological changes in joints leading to their destruction and deformity are accompanied by chronic pain. As a result of the joint destruction or deformity, functional disability, or in other words, difficulties in carrying out activities in daily living arise (Guillemin et al. 1994, Suuremeijer et al. 1994, Kempen et al. 1996). Changes in everyday life in patients with a chronic disease, e.g. problems with self-care, household tasks, occupation and leisure activities, lead inevitably to decrease in psychological well-being. RA-patients in comparison with healthy controls or with patients with other chronic diseases demonstrate poorer psychological well-being, i.e. more depression and anxiety (Smedstad et al. 1996, Revenson and Felton 1989, Abdel Nasser et al; 1998). Earlier studies have confirmed poorer psychological well-being as being strongly associated with poor

self-rated health (O'Connor and Vallerand 1998, Mulsant et al. 1997, Andersen and Lobel 1995, Cockerham et al. 1988).

The aim of this study is to examine the dynamic relationships between self-rated health and its determinants – pain, functional disability and psychological well-being, using a prospective research design. In this study, first, the association between severity of pain and self-rated health is examined, while controlling for socio-demographic and disease characteristics. Next, the independent effect of disability and psychological well-being on self-rated health is evaluated. Finally, the effects of pain, disability and psychological well-being are explored over different time periods, while controlling for initial levels of self-rated health.

Method

Sample and procedure

The EUROpean Research on Incapacitating Diseases and Social Support (EURIDISS) is a multi-centre, multi-disciplinary, longitudinal project focusing on patients with rheumatoid arthritis and their quality of life. The project participants are France, the Netherlands, Norway, Sweden, the United Kingdom and Slovakia. Within the framework of this project 160 recently diagnosed RA-patients from rheumatology outpatient clinics in the eastern part of Slovakia were followed up over a four-year period. The research sample of the present study was selected through a purposive sampling procedure according to the EURIDISS protocol (EURIDISS 1990). The inclusion criteria were the following: age from 20 to 70 years at the onset of the study, diagnosis of RA according to the 1987 ARA criteria, and four years or less delay between entry in the cohort and time of establishing the RA diagnosis. Patients with serious comorbidity, malignant RA with systemic vasculitis or very disabling RA (stage IV of Steinbrocker's classification) were excluded. Written informed consent was acquired from the subjects.

Within the present study the data were collected annually over a four-year period. The data collection consisted of two parts: health status data collection and personal interview. Health status data were collected by the rheumatologist in the rheumatology outpatient department during a medical check-up of about 30 minutes. Approximately 14 days after the medical check-up another appointment with the patient was made in order to collect data from a personal interview. An interview with duration of about one-and-a-half hours was conducted by a trained interviewer in non-hospital surroundings. At each personal interview the patient completed a number of structured scales administered verbally by the interviewer, and also filled in several self-reports.

Measures

Self-rated health

To assess the self-rated health of a patient the Overall Evaluation of Health (OEH) instrument was used. The OEH is a 100 mm visual analogue scale (VAS) on which the patient marks a line at the point that most closely reflects how (s)he feels at present. The patient is asked: "How would you rate your health at the moment? Would you say that it is very poor, that it is excellent, or that it is somewhere in between?" The VAS score ranges from 0 = very poor to 100 = excellent (EURIDISS 1990).

Psychological well-being

The scaled version of the General Health Questionnaire was used as a measure of psychological well-being (Goldberg and Hillier 1979). In the GHQ-28 the patient is asked to compare his/her recent psychological state with his/her usual state. For each item, four answer possibilities are available (Likert scoring, 1-2-3-4). The total score represents the sum of the 28 items (range 28-112). The higher the score, the poorer the psychological well-being of a patient. Cronbach's alpha for this instrument at baseline was 0.92.

Functional disability

The Groningen Activity Restriction Scale (GARS) is a measure of disability, i.e. restrictions in performing everyday activities. The scale comprises 18 items covering both ADL (Activities of Daily Living) and IADL (Instrumental Activities of Daily Living) functions. The ADL activities include abilities to dress, get in and out of bed/chair, wash, use bath and toilet, transfer in the house/outdoor/up and down the stairs, and take care of feet and toe-nails. The IADLs are abilities such as preparing breakfast/lunch/dinner, carrying out light/heavy household work, washing and ironing clothes, making the bed and doing the shopping. The GARS measures whether the patient is able to perform a certain ADL/IADL activity, not if (s)he actually performs it. For each item, four response options are available. The patient can do the activity: 1 (fully independently without any difficulty), 2 (fully independently but with some difficulty), 3 (fully independently but with great difficulty) to 4 (can not do it fully independently, (s)he can only do it with someone's help). The GARS total score is obtained by summing the eighteen item scores (range 18- 72). A higher score indicates more severe disability and more activity restrictions. The psychometric properties of the GARS have been proven to be valid and reliable (Kempen et al. 1996, Doeglas et al. 1995, Suurmeijer et al. 1994). In the present study, i.e. among the Slovak patients, Cronbach's alpha of the GARS was 0.96.

Pain

The Nottingham Health Profile (NHP) pain subscale was used as a self-report measure of pain (Hunt et al. 1981, Hunt et al. 1980). This subscale contains eight statements related to experience of pain during the last four weeks. The patient may circle yes (= 2) or no (= 1) to these statements, depending on whether the statements resemble his/her own condition. The NHP-pain total score is obtained by summing the item scores (range 8-16). The higher the score, the more pain the patient experiences. Among the present patient population Cronbach's alpha at baseline was 0.83.

Total joint pain was based on the rheumatologist's examination of joints for tenderness to pressure using the Ritchie Articular Index (RAI). For each joint the patient's reaction to pressure was registered as follows: 1 (= no pain), 2 (= patient complains of pain), 3 (= patient complains of pain and winces), 4 (= patient complains of pain, winces and withdraws). The RAI total score consists of the sum of the patient's reactions to pressure (range 24-96). Higher scores indicate more pain (Ritchie et al. 1968). Cronbach's alpha for this instrument at baseline was 0.83.

Statistical methods

To examine the associations between self-rated health and its determinants, the following steps were taken. Firstly, mean scores and standard deviations were calculated for all variables at baseline (T1), 12-month (T2), 24-month (T3) and 36-month (T4) follow-ups. Differences in mean scores were statistically tested by means of one-way analysis of variance (ANOVA) with corrections for multiple comparisons by the Tuckey procedure ($p < .05$). Secondly, associations between the variables were tested by means of Pearson correlations (r). Thirdly, hierarchical multiple linear regression analyses were conducted with self-rated health as the outcome variable and psychological well-being, functional disability, pain, disease duration, sex and age as predictors. An index of pain intensity was computed by multiplying the NHP scores and the RAI scores. The relative contribution of each predictor variable to self-rated health can be derived from the beta coefficients (β). The extent to which predictor variables explain the variability of self-rated health can be derived from the total amount of explained variance (R^2 adjusted). To analyse the data statistical procedures available in the SPSS for Windows statistical package (release 10.1.0) were used (Nie et al. 1975).

Results

Summary statistics for variables at baseline and follow-ups

The demographic characteristics of the sample at baseline (T1) are presented in Table 1. The mean age of patients was 48.7 years (range 22-70), and the mean disease duration was 22.2 months (range 0-48). Eighty-four percent of all subjects were women, 78% were married and 13% were living alone. Table 1 further presents the three-year course of the sample with regard to study variables. Between the four measurement points no significant differences are evident in psychological well-being (GHQ) and pain (NHP, RAI). However, significant differences appear in disability (GARS) and in self-rated health (OEH). In more detail, the disability score (GARS) at the T2 measurement point differs significantly from the T4 score, indicating a tendency towards more disability as the disease advances. In the case of self-rated health (OEH) the T1 score differs significantly from the T2 and T3 scores, or in other words, RA patients rated their health as significantly worse at the T1 measurement point than at the later ones.

Table 1 Percentages, means and standard deviations (SD) on study variables at baseline and follow-up

	Range of scores	Baseline (T1)	12 months (T2)	24 months (T3)	36 months (T4)	One-way ANOVA
Number of subjects		160	151	133	124	
Age in years		48.7 (12.0)				
Disease duration in months		22.2 (15.9)				
Female sex		84.4%				
Married		78.1%				
Living alone		13.1%				
OEH	0-100	41.4 (19.1)	47.3 (17.6)	47.4 (19.9)	46.4 (19.8)	1-2,1-3
GHQ	28-112	56.7 (12.2)	54.1 (12.2)	55.3 (12.2)	56.2 (13.7)	ns
GARS	18-72	32.3 (11.1)	32.2 (10.5)	34.6 (11.3)	35.8 (12.7)	2-4
NHP	8-16	12.9 (2.5)	12.5 (2.7)	12.6 (2.5)	12.7 (2.7)	ns
RAI	24-96	37.3 (7.4)	36.5 (8.8)	36.3 (9.3)	35.4 (8.9)	ns

Note 1: Higher scores indicate "worse functioning" except for the OEH (better self-rated health)

Note 2: ns - nonsignificant difference

Note 3: Abbreviations: OEH=Overall Evaluation of Health, GHQ=General Health Questionnaire-28, GARS=Groningen Activity Restriction Scale, NHP=Nottingham Health Profile, RAI=Ritchie Articular Index

Correlation coefficients

Table 2 demonstrates cross-sectional correlations between self-rated health (OEH) and its determinants. As expected, poorer psychological well-being (GHQ) is significantly associated with poorer self-rated health (range from -.44 to -.59; $p \leq .001$). Similarly, more disability (GARS) is significantly associated with poorer self-rated health (range from -.45 to -.57; $p \leq .001$). Also, correlations between pain (NHP x RAI) and self-rated health are rather high (range from -.40 to -.51; $p \leq .001$). The correlations of self-rated health with age and sex are not consistent. Significant correlations emerge at a certain measurement point, but in subsequent years they disappear.

Table 2 Intercorrelations between the study variables

	OEH			
	Baseline (T1)	12 months (T2)	24 months (T3)	36 months (T4)
GHQ	-.44***	-.48***	-.59***	-.57***
GARS	-.48***	-.45***	-.53***	-.57***
Pain	-.49***	-.40***	-.48***	-.51***
Disease duration	.08	-.01	.00	-.11
Gender	-.21*	.02	-.03	-.00
Age	-.15	-.23***	-.21**	-.08

Note 1: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Note 2: For abbreviations see Table 1

Multiple regression analysis

In order to examine the extent to which the independent variables predict change in self-rated health over the 36-month time interval (T4), a hierarchical regression analysis was performed (Table 3). The predictor variables were entered in the equation in the following series of steps: 1-self-rated health at baseline (OEH_{T1}), 2-demographic and disease characteristics (sex, age, disease duration), 3-pain index (NHP, RAI), 4-disability (GARS), 5-psychological well-being (GHQ), 6-interaction terms, particularly 'pain x disability' and 'pain x psychological well-being'. The purpose of including interaction terms last in the equation was to evaluate the potential moderating effect independently of the main effects of pain, disability and psychological well-being. In addition, change scores for pain, disability and psychological well-being were entered into the equation (Step 7). The change scores were computed as follows: $\Delta_{T1-T4} \text{ Pain} = \text{Pain}_{T4} \text{ minus } \text{Pain}_{T1}$. In Table 3 the betas (β), which can be used

for mutual comparisons of variables entered into equation, are presented together with the variance accounted for by each step (R^2 change) as well as the total R^2 (adjusted). Thus, the effects of the other variables at sequentially higher steps represent the contribution of these variables in predicting subsequent self-rated health at T4 (OEH_{T4}) beyond the initial levels of self-rated health (OEH_{T1}).

As evident from Table 3, the initial level of self-rated health (OEH_{T1}) explains 10% of the total variance. The combination of disease duration, sex, age, pain, disability and psychological well-being explains additional 6%. As for the interaction effect of the variables, it appears from the final model that the moderating effect seems to play a minimal role. On the other hand, change scores for pain, disability and psychological well-being contribute significantly to the total variance explained, with an additional 20%. Of these change scores the change in psychological well-being ($_{\Delta T1-T4}GHQ$) is the most important predictor variable. In the final model, 40% of the total variance of self-rated health at T4 (OEH_{T4}) is accounted for.

Table 4 presents a survey of the variables under investigation that significantly predicted self-rated health for any of the six possible time intervals. Firstly, in Table 4 the regressions taking into account the 1-year time intervals are presented (T1-T2, T2-T3, and T3-T4), followed by regressions with 2-year time intervals (T1-T3, T2-T4), and finally regressions with 3-year time intervals.

On average, the studied variables accounted for 44.6% of the total variance in self-rated health (range: from 36% at T1-T2 time interval to 49% at T2-T3 time interval). The levels of self-rated health (OEH) at the prior time interval accounted from 11% (T1-T4) to 35% (T2-T3) of the OEH total variance explained at the subsequent time interval. Nevertheless, the most remarkable result is that change in psychological well-being plays the most significant role in predicting change in self-rated health. At Step 7 it significantly contributes to the total variance explained from 12% (at T1-T2 time interval) to 20% (at T1-T4 time interval). This result is consistent for all time intervals.

Table 3 Hierarchical multiple regression of self-rated health at 36-months follow-up (OEHT_{T4})

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
1 OEHT _{T1}	.33***	.35***	.25*	.19	.17	.15	.16
R²	.11						
(F change)	(12.48***)						
2 Disease duration		-.10	-.11	-.09	-.10	-.11	-.07
Sex		.10	.11	.13	.12	.12	.16
Age		-.03	-.03	.02	.01	.01	.04
R² change		.02					
(F change)		(.68)					
3 Pain _{T1}			-.19	-.01	-.01	-.28	.11
R² change			.03				
(F change)			(2.89)				
4 GARS _{T1}				-.33**	-.31*	-.60	-.46
R² change				.06			
(F change)				(6.82**)			
5 GHQ _{T1}					-.07	.49	-.02
R² change					.00		
(F change)					(.37)		
6 Pain _{T1} x GARS _{T1}						1.43*	.29
Pain _{T1} x GHQ _{T1}						-.62	-.44
GARS _{T1} x GHQ _{T1}						-.75	.00
R² change						.06	
(F change)						(2.56)	
7 Δ _{T1-T4} Pain							-.14
Δ _{T1-T4} GARS							-.12
Δ _{T1-T4} GHQ							-.37***
R² change							.20
(F change)							(11.24***)
Total R²							
(adjusted)	.10	.09	.11	.16	.16	.19	.40

Note 1: Displayed values are betas

Note 2: * p≤ .05, ** p≤ .01, *** p≤ .001

Table 4 All significant variables of the final model (Step 7) assessing self-rated health, for any time interval

	1 year time interval			2 years		3 years
	T1-T2	T2-T3	T3-T4	T1-T3	T2-T4	T1-T4
1 OEH	x	x	x		x	
2 Disease duration						
Sex			x			
Age						
3 Pain						
4 GARS		x				
5 GHQ						
6 Pain x GARS					x	
Pain x GHQ						
GARS x GHQ						
7 Δ Pain						
Δ GARS						
Δ GHQ	x	x	x	x	x	x
Total R² (adjusted)	.36	.49	.44	.41	.46	.40

Note: x indicates a significant effect for that specific time interval

Discussion

This study was conducted with the aim of enhancing knowledge of the long-term dynamics of relationships between self-rated health, psychological well-being, disability and pain in patients with recent-onset rheumatoid arthritis.

Considering the three-year course of the sample with regard to the study variables the levels of psychological well-being were fairly stable over time on a group level. These findings are in line with the study by Smedstad et al. (1997), who found that anxiety and depression show a high level of stability over time in patients with early RA. Similarly, there were no significant differences found in pain between the four measurement points. In contrast, the levels of disability differed significantly between the baseline, the 12-month and the 36-month follow-ups, indicating a tendency towards more disability in RA as the disease advances. On the other hand, RA patients rated their health as significantly worse at

baseline than at later measurement points. Longitudinal studies focusing on changes in self-rated health in RA patients are relatively uncommon, although there are several longitudinal studies focusing on self-rated health in elderly people. Many of these studies report relatively strong stability in self-rated health over time. However, there are also studies that report both declines and improvements in self-rated health. In the Tamparene Longitudinal Study on Ageing in Finland, the follow-up period was 10 years. In this study a significant net change to worse health was found among the younger cohort men and the older cohort women. Even though the changes in self-rated health were relatively minor, two thirds of the participants assessed their health as having become worse at the follow-up point (Jylhä et al. 1992). Declining self-rated health was also reported by Fletcher and Hirdes (1996) in a 7-year follow-up study of Canadians aged over 55 years. In contrast, improvement in self-rated health was found by the Yale Health and Aging Project in New Haven; the oldest persons self-rated their health as better than expected and improved their self-ratings over the 6 year follow-up period (Idler 1993). One possible interpretation of this finding is that the most elderly might be less inclined to base any judgement of their health on their physical functioning. When their functioning deteriorates, they might accept this as a phenomenon of ageing, and less as a phenomenon of deteriorating health (Hoeymans et al. 1997). A similar explanation may hold true for more favourable perceptions of health by RA patients at later measurement points. The theory of psychological adjustment to a chronic disease may provide us with some answers. In patients with early RA the process of coping becomes more efficient over time, resulting in better adjustment to the disease and consequently in a more consistent view of health (Brown et al. 1989, Smedstad et al. 1997, Leinonen et al. 1998). In line with this, it is of some interest that, despite increasing disability in the RA patients in our study, their self-rated health also improves, while the level of psychological well-being remains stable. This provides additional support for the adjustment theory.

The results of correlational analysis support our expectation that more favourable evaluations of health are significantly associated with lower levels of pain, less disability and better psychological well-being. The rather strong correlations between the variables suggest that pain, disability and psychological well-being are important predictors of self-rated health. Other reported correlates of self-rated health, namely sex and age, show somewhat inconsistent results. At baseline, worse self-rated health was moderately associated with female sex, but this finding was not supported by later results. Similarly, only at two measurement points was older age moderately associated with poorer self-rated health. These inconsistent findings are in line with earlier ones (for a review see the study by Moum 1992). In addition, no association was found between self-rated health and disease duration, reflecting the erratic pattern of RA.

Hierarchical regression analysis was employed in order to determine the effect of pain, disability and psychological well-being on predicting change in self-rated health. Potential confounding variables, i.e. age, sex and disease duration, were also entered into the equation. Nevertheless, even if gender and age are important factors producing differences in disease and health status, in the present study they failed to predict changes in self-rated health. It appears from results moreover that the moderating effect seems to play a minimal role in influencing self-perceptions of health. In the final regression analysis two variables were found to be most predictive; prior self-rated health and change in psychological well-being. Not surprisingly, prior self-rated health is among the most predictive variables, since at a certain moment in time health-perceptions are related to both former health-perceptions and future health-perceptions. What is surprising however, is the strong predictive power of change in psychological well-being on subsequent self-rated health. At several time intervals this effect is even stronger than the effect of prior self-rated health. This finding supports the results of previous studies on associations found between self-rated health and psychological well-being (Linschoten van 1994, Farmer and Ferraro 1997, Wilcox et al. 1996). In any case, the present study extends the existing research in this field by broadening knowledge about the mechanism underlying the process of self-evaluations of health in a sample of patients with a chronic disease and by applying change scores in predicting self-rated health. To conclude, self-rated health is a fascinating measure that can be used by health personnel as a screening tool to identify patients who are at increased risk of adverse health outcomes. Poor perception of health may warrant tailored physical or psychological intervention by a health care provider, enabling improvements in the health and quality of life in patients with a chronic disease.

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