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Relationships between self-rated health, functional disability and psychological well-being in rheumatoid arthritis

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Abstract

Objective: The objective of this study is to specify relationships between self-perceived health, functional disability, psychological well-being and disease duration in patients with early rheumatoid arthritis (RA). This issue is interesting since recent studies reveal that subjective evaluations of health appear to be the most powerful predictor of a number of important outcomes such as mortality, morbidity or utilisation of health care services. However, in spite of a growing number of studies on self-perceived health and the above-mentioned variables, the interpretation of these relationships remains unclear. On the other hand, a closer understanding of mechanisms underlying the process of evaluation of health could be useful in clarifying these associations.

Methods: In this study relationships between self-perceived health, disability, psychological well-being and disease duration are evaluated by means of correlation, linear multiple regression and LISREL analyses.

Results: In general the outcomes of the analyses support our expectation that functional disability and psychological well-being are important determinants of self-perceived health. The results of LISREL suggest that the level of psychological well-being significantly influences the impact of disability on self-perceived health. In addition, the outcomes imply interesting associations between self-perceived health and psychological well-being, and support the concept of 'feedback loops' in the disease process.

Conclusion: More insight into the process of evaluation of subjective health may provide us with relevant information about those treatment possibilities that may contribute to the improvement of the patient's quality of life.

Introduction

The idea that self-perceived health could have a unique impact on the future health status of a patient has captivated investigators with an interest in psychosocial factors since the 1980s. During the last decade subjective health evaluations have received increasing attention in assessments of quality of life and in prediction of poor health outcomes, predominantly in the elderly, but also in patients with a chronic disease and in healthy people (Bendtsen et al. 1994, VanderZee et al. 1995, Wilcox et al. 1996, Kempen et al. 1998). Self-perceived health has been found to be an important predictor of morbidity and mortality, even after statistical adjustment for the influence of various health status and sociodemographic indicators (Mosey and Shapiro 1982, Idler et al. 1990, Idler and Kasl 1991, Johnson and Wolinsky 1993, Idler and Kasl 1995, Spiers et al. 1996). Considering self-perceived health and mortality Idler and Benyamini (1997) extensively reviewed the literature with regard to sample size, age range, follow-up period, wording of the question (self-rating item), type of other health status measures considered, other covariates, and findings regarding the independent effect of self-ratings of health on mortality or survival time. Apart from mortality, subjective health has also been found to be associated with more frequent utilisation of health care services, such as physician visits and days hospitalised, as well as increased intake of medication (Linn and Linn 1980). These findings are interesting since they indicate that evaluations of subjective health, often considered too vague or too prone to measurement error, appear to be a strong predictor of the various criteria mentioned earlier. However, despite the growing research in this field the number of studies producing meaningful interpretations of relationships between self-perceived health on the one hand and mortality, morbidity and utilisation of health care services on the other is still modest, and questions remain about these associations. In any case, a closer understanding of the mechanisms underlying the process of evaluation of health could be useful in shedding more light on these questions.

Several recent studies on correlates of self-perceived health demonstrate that changes in perception of health are essentially determined by the degree to which a person's activities of daily living are affected (Idler and Kasl 1991, Linschoten van 1994). This holds true for elderly and healthy people, but even more for people with Rheumatoid Arthritis (RA). RA is a chronic disease with no known aetiology, course or treatment, typically accompanied by pain, fatigue, unpredictability, uncertainty, and inevitable disability. Functional disability may be described as a progressive decline in functional abilities during the course of the disease, or as a restriction in carrying out daily activities (Wolfe et al. 1988, Guillemin et al. 1994, Bos van den 1995). It is also defined as a

form of behaviour depending not only on physical disease, but also on psychological and social factors (Verbrugge and Jette 1994, Bowling et al. 1994, Kempen et al. 1996). Functional disability has consistently been found to be central to the formation of subjective health perceptions in cross-sectional studies on physical health correlates of self-rated health (Idler and Kasl 1991, Idler and Kasl 1995). It has also been found to be a precursor of such variables as hospitalisation, institutionalisation, and death (Verbrugge and Jette 1994). In order to achieve appropriate control of health status, therefore, functional disability measures should be included into analyses on self-perceived health.

RA-patients in comparison with healthy controls or with patients with other chronic diseases demonstrate poorer psychological well-being (Revenson and Felton 1989, Abdel Nasser et al. 1998). Psychological well-being can be described as individual mood in a global sense, and is frequently operationalized as anxiety and depression (Krol et al. 1993). In RA-patients decrease in psychological well-being is strongly associated with uncertainty, threat and ambiguity – the typical concomitants of disease. The unpredictable course, no known cure, the possibility of joint destruction, progression of functional impairment, threat of disablement and loss of independence significantly influence the everyday life of RA-patients (Blalock et al. 1989, Rogers et al. 1992, Pincus and Callahan 1993, Krol et al. 1993, Hawley and Wolfe 1993). Earlier studies have confirmed emotional distress as being strongly associated with poor self-assessed health (Cockerham et al. 1988, Andersen and Lobel 1995, Mulsant et al. 1997, O'Connor and Vallerand 1998).

As to the relationships between disease duration and self-perceived health, disability and psychological well-being, previous research has reported longer disease duration as being associated with greater disease activity, radiographic changes and increased disability, but not with greater emotional distress (Krol et al. 1995, Fex et al. 1998).

Even though we cannot fully identify the determining variables and the underlying mechanisms in the process of health evaluation, it seems meaningful to examine its relationships with functional disability and psychological well-being, since they appear to be important determinants of self-perceived health (Hays et al. 1996). The more attention is paid to the possible interfering role of disability and psychological well-being in the process of subjective health evaluation, the better understanding we can gain of the relationships between self-perceived health on the one hand and morbidity, mortality and health care utilisation on the other.

Based on previous outcomes a Structural Equation Model (SEM) was constructed in order to determine the roles of functional disability, psychological well-being and disease duration in the process of subjective health evaluation. The initial model incorporates two possibilities: (a) it proceeds from disease duration through psychological well-being into disability, leading ultimately to self-perceived health; and (b) from disease

duration through disability into psychological well-being, leading finally to self-perceived health. Although causal sequencing, which is typically considered as chronological, cannot be conclusively demonstrated in cross-sectional analyses, the causal sequencing within the current scheme reflects our judgement as to the sequence of states and conditions in the disease process.

Materials and methods

Sample

One hundred and forty-eight patients of a rheumatology outpatient clinic in the eastern part of Slovakia participated in this study. The study forms part of a large international research project, the European Research on Incapacitating Diseases and Social Support (EURIDISS), focusing on patients with incapacitating disease and their quality of life (EURIDISS 1990). The project with its longitudinal design follows recently diagnosed RA-patients over a four-year period and evaluates the impact of this chronic disease on three main domains of the patients' quality of life: the physical, the psychological and the social domain. The project participants are the Netherlands, France, Norway, Germany, the United Kingdom and Slovakia.

The results of this study are based on this project's first wave data. The subjects of the sample were selected 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, delay between entry in the cohort and time of establishing the RA diagnosis less or equal to four years. 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.

Data collection

The data were collected during a structured interview of about ninety minutes conducted by a trained interviewer in non-hospital surroundings, specifically in a university office. During the interview the patient was asked to answer questions posed by the interviewer, as well as and also to fill in several self-report instruments.

Measures

Self-perceived health

To assess the self-perceived 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).

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 or toilet, transfer in the house /up and down the stairs/outdoors, and take care of feet and toe-nails. The IADLs are the abilities to prepare breakfast/lunch/dinner, to carry out light/heavy household work, wash and iron clothes, make the bed and do shopping. The GARS measures how well the patient is able to perform a certain ADL/IADL activity, regardless of whether (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 (Suurmeijer et al. 1994, Doeglas et al. 1995, Kempen et al 1996). In the present study, i.e. among the Slovak patients, the Cronbach's alpha of the GARS was 0.96.

Psychological well-being

The scaled version of the General Health Questionnaire (GHQ-28) is a frequently-used measure of psychological well-being (Goldberg and Hillier 1979, Goldberg and Williams 1988). In the GHQ-28 the patient compares his recent psychological state with his usual state. Four answer possibilities are available, which are most frequently scored in two ways: Likert scoring (1,2,3,4) or Binary scoring (0,0,1,1) may be used. In this study the Likert scoring was applied. The total score represents the sum of the 28 items and ranges from 28 to 112. The higher the score, the poorer the patient's psychological well-being. The internal consistency of the instrument is satisfactory; among the present patient population the Cronbach's alpha appeared to be 0.92.

Statistical methods

Pearson coefficients of correlation and linear multiple regressions, available in the SPSS/PC+ statistical package, were used to analyse the data (Nie

et al. 1975). The relationships between self-perceived health, disability and psychological well-being were examined using Pearson correlations. The relative importance of disability and psychological well-being for explaining the variance in self-perceived health was investigated with multiple regression analyses. In these analyses self-perceived health was the dependent variable, whereas demographic variables, disease duration, psychological well-being and disability were the independent variables. The interrelationships between self-perceived health, disability, psychological well-being and disease duration were also tested within the linear Structural Equation Model (SEM). The parameters of the SEM were estimated with the LISREL 8.03 analysis (Jöreskog and Sörbom 1993).

Structural equation modeling (SEM) is a very general, predominantly linear cross-sectional statistical modeling technique based on a structure of the covariance matrix of the measures. The LISREL analysis was designed to estimate the unknown coefficients of a set of linear structural equations. Within the LISREL several indices may be used as indicators of goodness of fit of the model. The chi-square measures the distance or discrepancy between the sample covariance matrix and fitted covariance matrix. Small chi-square correspond to good fit of the model, whereas a large chi-square to bad fit. Zero chi-square corresponds to a perfect fit. RMR is another measure of overall fit. In detail, it is a measure of the average of the fitted residuals and it may be used to compare the fit of two different models for the same data. Similarly to the chi-square, small RMR correspond to good fit of the model and a large RMR to bad fit. The quality of the model may also be expressed by an internal criterion. The *p* (probability) illustrates the significance of the model fit, and values above 0.05 represent an acceptable limit for a good fit of the model (Jöreskog 1977, Bentler 1984, Jöreskog and Sörbom 1993).

Results

Description of the sample

Table 1 illustrates the demographic characteristics of the sample. The average age of patients was 50.2 years (range 22-70), the mean disease duration was 24.2 months (range 0-55) and 84% of all subjects were women. The age and sex characteristics of the sample are typical for studies on RA.

Means and standard deviations

In addition, Table 1 presents means and standard deviations on the OEI, the GHQ-28 and the GARS. In the total sample the results on the OEI indicated an average score of 41.03 (range 0-100). The mean score on the GARS was 32.47 (range 18-64) and the mean score on the GHQ-28 was 56.74 (range 35-98).

Table 1 Demographic characteristics of the sample. Means and standard deviations (SD) on study variables

	Males	Females	Total sample
Number of subjects (%)	24 (16.2)	124 (83.8)	148 (100)
Married, %	95.8	74.2	77.7
Living alone, %	4.2	15.3	13.5
Age in years (SD)	50.2 (13.4)	47.8 (11.7)	48.2 (12.0)
Disease duration in months (SD)	24.2 (17.5)	22.4 (15.8)	22.8 (16.0)
OEH (SD)	49.7 (19.3)	39.4 (18.1)	41.0 (18.7)
GARS (SD)	28.9 (9.1)	33.2 (11.4)	32.5 (11.1)
GHQ-28 (SD)	53.9 (12.4)	57.3 (12.2)	56.7 (12.2)

Abbreviations: OEH=Overall Evaluation of Health, GARS=Groningen Activity Restriction Scale, GHQ-28=General Health Questionnaire-28

Intercorrelations between the study variables

The correlations between the study variables showed that the OEH results were significantly correlated with the GARS as well as with the GHQ-28 (-0.48 and - 0.44, $p \leq .001$, respectively). The GARS and the GHQ-28 were also significantly associated (0.51, $p \leq .001$). As for demographic variables, significant correlation was found between age and the GARS (0.17, $p \leq .05$) as well as between female sex and the OEH (-0.21, $p \leq .05$). Females rated their health significantly lower in comparison with males. The intercorrelations between the rest of the demographic variables and the OEH, the GARS and the GHQ-28 were all under 0.20 and not significant. Likewise the correlations between disease duration and the OEH, the GARS and the GHQ-28. Inspection of bivariate plots revealed that no non-linear associations were present between the variables.

Table 2 Intercorrelations between the study variables

	OEH	GARS	GHQ-28	Disease duration	Gender	Age
OEH	-					
GARS	-.48***	-				
GHQ-28	-.44***	.51***	-			
Disease duration	.08	.16	-.04	-		
Gender	-.21*	.14	.10	-.04	-	
Age	-.15	.17*	.04	-.04	-.07	-

* $p \leq .05$, *** $p \leq .001$

Table 3 Multiple regression analyses: demographic variables, disease duration, psychological well-being and disability on self-rated health

	Adjusted R ²	F-value	β	t	p-value
Regression model 1	.05	2.59*			
Sex			-.24	-2.85	.005
Family status			.04	.42	.672
Living situation			-.07	-.82	.416
Age			-.20	-2.28	.024
Disease duration			-.11	-1.32	.188
Regression model 2	.23	8.19***			
Sex			-.20	-2.64	.009
Family status			.06	.76	.451
Living situation			-.08	-1.02	.309
Age			-.19	-2.40	.018
Disease duration			-.13	-1.72	.088
GHQ-28			-.42	-5.77	.000
Regression model 3	.28	9.05***			
Sex			-.16	-2.24	.027
Family status			.05	.64	.522
Living situation			-.07	-.95	.345
Age			-.14	-1.76	.081
Disease duration			-.07	-.97	.335
GHQ-28			-.28	-3.35	.001
GARS			-.28	-3.31	.001

* p≤ .05, ***p≤ .001

Multiple linear regressions

Multiple regression analyses were performed in order to identify how much variance of the dependent variable (OEH) may be explained by the GARS, the GHQ-28, and the selected disease and demographic variables. Table 3 presents the results of three multiple linear regressions with the OEH as the dependent variable.

Demographic variables (age, sex, living situation, family status) and disease duration entered into the equation within the first analysis explained only 5% of the total variance of the OEH. Repeating the analysis with adding the GHQ-28 explained 18% of the variance of the OEH. Entering the GARS within the final analysis explained an additional 5%.

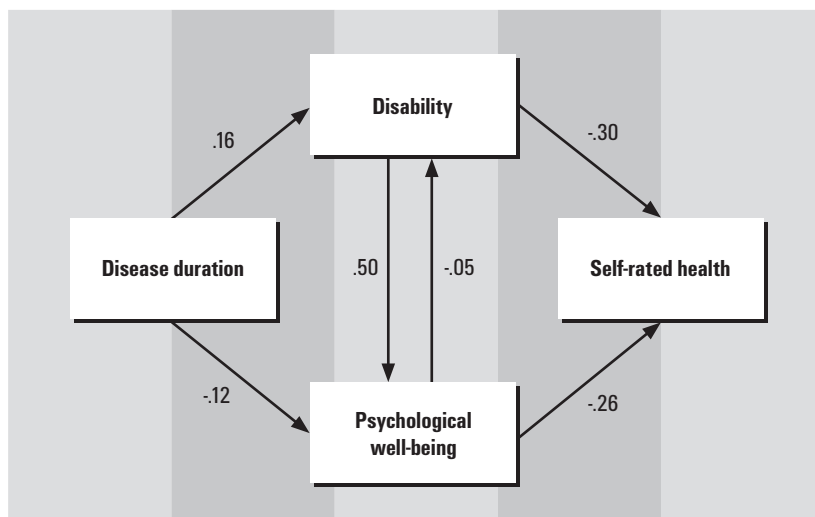
In sum, the total explained variance of the OEH after entering into the equation demographic variables, disease duration, the GHQ-28 and the GARS was 28%. Another regression analysis was also performed, similar to regression model 2, in which instead of entering the GHQ-28 the GARS was entered. Nevertheless, this regression model explained exactly the same total variance of the OEH as regression model 2, i.e. 28% (not presented).

LISREL analysis

The hypothesized relationships between the study variables were placed into a linear structural equation model (presented in Figure 1).

If the relationships between self-perceived health, disability and psychological well-being are as delineated in Model 1, we would expect the model to fit the data reasonably well. However, if the relationships between self-perceived health and the other variables are not as hypothesised, this will be reflected by the need to add or remove paths from the model. Figure 1 presents the standardised path coefficients. Three indices, specifically the chi-square, the Root Mean Square Residual (RMR) and the p-value, were used as indicators of goodness of fit of the model. After performing the LISREL it was found that Model 1 did not fit our data well [chi-square (4) = 14.22, $p = .007$, RMR = .13]. Since the path from psychological well-being to functional disability did not appear

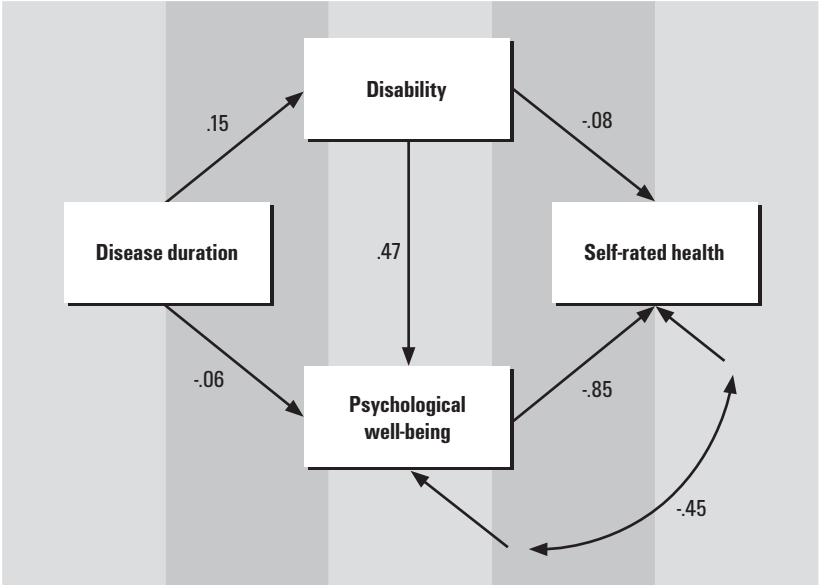
Figure 1 Model 1: Relationships between disease duration, disability, psychological well-being and self-rated health (Initial model)



$p = .007$

to be significant, we omitted this path and performed the analysis after the adjustment of the model. However, the results of the second LISREL analysis, i.e. Model 2 (not presented), proved not to fit the data either [chi-square (5) = 14.31, $p = .014$, RMR = .13]. The indicators of fit prompted us to seek a better solution. The results of the analysis indicated a strong association between self-perceived health and psychological well-being. Finally, adding a correlation path between self-perceived health and psychological well-being (Model 3) improved the model significantly [chi-square (4) = 7.11, $p = .13$, RMR = .09] (Figure 2).

Figure 2 Model 3: Relationships between disease duration, disability, psychological well-being and self-rated health (Final model)



$p = .13$

Discussion

The present study was directed at the evaluation of relationships between self-perceived health, functional disability, psychological well-being and disease duration in patients with early RA. Disability and psychological well-being were expected to be important determinants of self-perceived health. It was supposed that more disability as well as poorer psychological well-being would be associated with poorer self-perceived health. The results of correlation and multiple regression analyses confirm

the importance of two variables, specifically functional disability and psychological well-being, for better understanding of subjective health evaluations. The correlation between the GARS and the OEH suggests that greater activity restriction is associated with lower self-perceived health. This finding is in line with existing studies on functional disability and self-perceived health (Johnson and Wolinsky 1993, Idler and Kasl 1995, Wilcox et al. 1996, Kempen et al. 1998). In addition, the correlation between the GHQ-28 and the OEH supports our expectations and demonstrates that poorer psychological well-being is associated with poorer self-perceived health, also consistent with findings in other studies (Cockerham et al. 1988, Andersen and Lobel 1995, Mulsant et al. 1997, O'Connor and Vallerand 1998). As for demographic variables and disease duration, there were some variations in self-perceived health between males and females. Women were more pessimistic about their health than men. The association of poorer self-perceived health with female gender seems to be contrary to the findings of previous investigators (Mossey and Shapiro 1982, Hays et al. 1996). However, our findings are in accordance with those of Spiers et al. (1996), who report women perceiving their health as 'less than good' more frequently than men.

The results of the multiple regression analyses reveal that two variables, disability and psychological well-being, explain slightly less than 25% of the variance in self-perceived health. The results also reveal that sex significantly contributes to the total explained variance of self-perceived health, even when controlling for disability and psychological well-being. Age also contributed significantly to the total explained variance in self-perceived health, although this effect disappeared when controlling for disability.

In order to examine the hypothesised associations between self-perceived health, disability, psychological well-being and disease duration, all the variables were placed in the linear structural equation model. The initial SEM model may be delineated as follows: it proceeds (a) from disease duration through psychological well-being into disability leading finally to self-perceived health, and (b) from disease duration through disability into psychological well-being leading finally to self-perceived health. After performing the LISREL it was found that the initial model did not fit our data well, and the indicators of fit led us to seek a better solution. The path from psychological well-being to functional disability did not appear to be significant, so we omitted this path. As the next step a correlation path between self-perceived health and psychological well-being was added, since a strong association was found to be present between self-perceived health and psychological well-being. The outcomes of the final LISREL analysis indicate that in RA-patients, longer disease duration is initially associated with increase of disability, followed by a decrease in psychological well-being, and

subsequently by poorer evaluations of subjective health. However, causal interpretations regarding the associations of self-rated health with the variables examined should be made with some caution. This is because causal modeling, which hypothesizes causal relationships among variables and tests the causal model with a linear equation system, while being one of the major applications of structural equation modeling, has several limitations. The analyses are based on cross-sectional data, and therefore causal interpretations regarding associations among the variables cannot be conclusively demonstrated. Nevertheless, what causal modeling does allow us to do is to examine to what extent the data fail to agree with one reasonably viable consequence of the model of causality. If the linear equations system isomorphic to the path diagram does fit the data well, it is encouraging, but it is not proof of the truth of the causal model (Jöreskog 1977, Bentler 1984, Jöreskog and Sörbom 1993).

It is of some interest that in spite of a rather strong correlation between disability and self-perceived health, the results of LISREL did not confirm this association. The LISREL outcomes suggest the important mediating role of psychological well-being in this process. The final model also suggests that a strong association exists between self-perceived health and psychological well-being. The path from psychological well-being to self-perceived health indicates that the level of psychological distress considerably influences subjective health evaluations, insofar as the more distressed patients experience the poorer their health evaluations become. Moreover, there is a reverse association present between the two variables, indicating that there is still a great percentage of patients who evaluate their health rather highly while simultaneously experiencing psychological distress, or vice versa - patients who evaluate their health rather poorly, but their psychological well-being is still high. This necessarily implies that the relationships between different health status variables are complex, and provides support for the idea of 'feedback loops' in the disease process as presented by Verbrugge and Jette (1994). Nevertheless, this strong association between self-perceived health and psychological well-being inspired us to examine three alternative models. Firstly, we estimated the parameters of the model, which differed from our final model only in one point: both paths between self-perceived health and psychological well-being were removed. In the second model we added the path from self-perceived health to psychological well-being, so that psychological well-being was the final dependent variable. In the third model we removed the path from self-perceived health to psychological well-being but added the path from psychological well-being to self-perceived health. In spite of these adaptations, none of the three alternative models reached the acceptable limit for a good fit.

The paths between disease duration and disability or psychological well-being turned out to be not as strong as originally expected. One might

presume that the longer the patient suffers from RA the more severely (s)he becomes disabled. However, our analyses did not demonstrate strong associations between disability and disease duration. This may partly be explained by the rather short disease duration. Only patients suffering from RA for four years or less at the onset of the study were included in the analyses. In RA four years present a rather short interval for significant changes in disability. Moreover, as documented by Guillemin et al. (1994), in RA-patients already within the first two years after diagnosis, disability may be fairly high and stable.

The results of our analyses reveal rather strong interrelatedness of self-perceived health, functional disability and psychological well-being in early RA. They may provide support, therefore, for the idea that positive change in a patient's disability and especially psychological well-being would have a positive effect on his/her self-perceived health and subsequently on morbidity, utilisation of health care services, and in the end on mortality (Idler and Kasl 1991). Nevertheless, these hypotheses are already beyond the scope of the present study. Future research should focus on longitudinal as well as cross-cultural investigations of these separate dimensions of health in order to estimate the stability of these dimensions and the relationships between them over time and in different cultures.

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