

Self-report Functioning According to the ICF Model in Elderly Patients with Rheumatoid Arthritis and in Population Controls Using the Multidimensional Health Assessment Questionnaire

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ABSTRACT. Objective. To assess disability and functioning of elderly patients with rheumatoid arthritis (RA) and population controls by linking the items included in the self-report Multidimensional Health Assessment Questionnaire (MDHAQ) with components of the WHO International Classification of Functioning, Disability and Health (ICF) instrument.

Methods. In total, 1439 patients with RA (mean age 66 yrs, men 29%) and 957 population controls (65 yrs, men 27%) completed a mailed questionnaire. Functioning was recorded by the Finnish version of MDHAQ. Data included comorbidity, subjective health, education level, employment, exercise habits, self-report joint pain/tenderness, and, for patients, the disease duration.

Results. Patients had lower levels of functioning compared to controls in all ICF domains, with the exception that male patients functioned comparably to male controls in the “general tasks and demands” domain. In patients, disease activity, education, exercise frequency, and comorbidities were expectedly associated with lower functioning in the body structure and function component, while male sex and subjectively perceived health were associated with more favorable functioning. In the activity and participation components, disease activity, exercise frequency, and comorbidities were associated with impaired functioning, while better health on self-report was associated with better functioning.

Conclusion. There is an extra burden of disability in elderly patients with RA compared to the reference population. With a large patient and control population sample, our study shows that use of the self-report MDHAQ identifies all 3 main components of the ICF framework, thus covering a wide spectrum of functioning. Elderly patients with RA, in comparison to population controls, encounter more difficulties in daily activities and their social life. (First Release Dec 1 2008; J Rheumatol 2009;36:246–53; doi:10.3899/jrheum.080027)

Key Indexing Terms:

FUNCTIONING POPULATION RHEUMATOID ARTHRITIS
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Large increases in numbers of disabled people are predicted globally. Knowledge of the determinants of disability in morbid conditions like rheumatoid arthritis (RA) is critical

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for reducing the burden of disease. However, no epidemiologic studies have been reported in this field using the World Health Organization's International Classification of Functioning, Disability and Health (ICF)¹. The ICF classification was developed to understand the descriptions and comparisons of health outcomes of different disease conditions as well as in the general population. The functional status information is essential to assess the needs of an individual or a population, and to develop rehabilitation interventions to restore or maintain functional capacity. The main aim of therapy of a specific healthcare service is to facilitate patients to maximize their performances in daily life. Strategies to prevent disability can be more goal-oriented if the determinants of health become more distinct².

According to the ICF classification, disability comprises 3 main components: impairments, activity limitations, and restrictions of participation. The physical consequences of RA are related to the body functions and structures compo-

nent, and the functional consequences to the activity component, while the influence of RA on society relates to the participation component. Each main component consists of various domains and, within each domain, categories that are the units of classification. For example, the component “activity limitations” consists of domains like mobility and self-care; the domain of “mobility” consists of categories like changing and maintaining body position, moving and handling objects, walking and moving, and moving around using transportation^{1,3}. The ICF classification offers a larger framework and perspective than the instruments used previously to explore and identify a wide variety of human functioning, including social functioning. This important aspect of functioning is often passed over by traditional function assessment tools focusing mainly on the impairment and activity perspectives of functioning.

The management of RA is complex and requires participation of a large number of health and social care professionals with numerous areas of expertise. One way to map the rehabilitation needs of patients with RA is to compare the functional capacity of the patients with that of healthy individuals. In this cross-sectional study we compared the functioning of patients with RA, who were identified in the Central Finland RA database, with that of population controls living in the same district. Items of the Multidimensional Health Assessment Questionnaire (MDHAQ) were linked to the ICF components to assess disability and functioning. Using the ICF components we examined the effects of age, perceived subjective health, level of education, frequency of physical exercise, and comorbidities, and for patients only, current disease activity and disease duration.

MATERIALS AND METHODS

Patients with RA. The Central Finland RA Database includes demographic and clinical data of patients with RA who have been seen since the early 1980s in Jyväskylä Central Hospital, the only rheumatology clinic in the district, serving a population of 265,000 (in 2005), 5.1% of the population in Finland. Since 1998, all patients with RA have been monitored annually by mailed questionnaires.

Community control subjects. In 2000, a control group of 2000 people from the general population was established. The sample was drawn from the Finnish Population Registry, with the permission of the Ministry of Social Affairs and Health. The population sample was designed to include more women than men, as the RA database included 70% of women. All subjects in the control group were living in the Central Finland District in 2000.

Study design. An identical self-report questionnaire was mailed to RA patients and to community control subjects in July 2005⁴.

The study was approved by the Ethics Committee of Jyväskylä Central Hospital, and the Population Register Centre of Finland.

Measurements. Functioning was recorded using the Finnish version of the MDHAQ (Finn-MDHAQ)⁵, derived from the original HAQ⁶ and original MDHAQ instruments⁷. MDHAQ consists of 8 questions focusing on activities of daily living; 2 questions concern advanced functions, 2 questions psychological stress, and 1 question the quality of night sleep (Table 1). There were 4 possible responses and corresponding scores for each question: without any difficulty (score = 0), with some difficulty (score = 1), with much difficulty (score = 2), and unable to do (score = 3). The items of the Finn-MDHAQ were linked to the 3 categories (body structures and

function, activity, participation) of functioning included in the ICF by 2 authors (AH and MAK) according to the linking rules reported by Cieza, *et al*⁸.

In the linking process the option of partial overlap between the components of “activities” and “participation” was chosen. Similarly, mobility was left as the common domain in the categories of “activity” and “participation” (1, Annex 3). This was done because the domain of mobility in the ICF is very extensive, including, for example, categories like “changing and maintaining body position” and “moving around using transportation.” The category “moving around using transportation” refers to a function that has clear social effects, in contrast to other categories of mobility.

Pain, fatigue, and global assessment of health were queried on a visual analog scale (VAS), where a score of 0 denoted no pain or stiffness and excellent general health, while a score of 100 indicated worst pain or stiffness and poorest general health. Subjective health was also recorded by an extra question including the response alternatives excellent, good, moderate, and bad.

Self-report of pain and tenderness of specific joints was applied in an RA Disease Activity Index (RADAI) format⁹. The RADAI queries current joint pain/tenderness in fingers, wrists, elbows, shoulders, hips, knees, ankles, and toes, using a 4-point scale from “not tender” (score = 0) to “very tender” (score = 3).

Data were collected on date of birth, height, and weight to calculate the body mass index (weight in kilograms divided by the square of height in meters), years of formal education, employment and marital status, smoking status, and frequency of physical exercise (walking, skiing, bicycling, swimming, jogging, gym, etc.) with the response alternatives 3 or more times weekly; 1–2 times weekly; sometimes: < 1 time weekly; and not at all.

The presence of comorbidities was queried, including hypertension, coronary artery disease, other heart disease, asthma, chronic bronchitis, chronic kidney disease, peptic ulcer, inflammatory bowel disease, diabetes, thyroid disease, cancer, epilepsy, stroke, Parkinson’s disease, psoriasis, ankylosing spondylitis, osteoarthritis, osteoporosis, fibromyalgia, chronic back pain, musculoskeletal trauma, mental illness, and alcoholism. The number of comorbidities was calculated as a plain sum of these conditions.

Categories and domains of disability were calculated as averages of the scores of included questions. Pain and fatigue on a VAS were standardized between 0 and 3 before calculating the domain.

Statistical analysis. Results were expressed as mean or median with standard deviation or interquartile range and 95% confidence intervals. We compared the groups using the t test or Mann-Whitney U test. Measures with a discrete distribution were expressed as counts (%) and analyzed by chi-square test. Differences in functioning between RA patients and controls were determined using bootstrap analysis of covariance (ANCOVA) and multivariate analysis of variance (MANOVA) with Pillai’s trace statistics. MANOVA is a method of comparing means of all variables of interest simultaneously (in our analysis the ICF components with 2 or 3 domains), while maintaining the chosen magnitude of Type I error. Ordered logistic regression analysis was applied to analyze the relationship between ICF components and demographic and clinical characteristics. Variance inflation factors (VIF) were calculated for every covariate to examine the possible multicollinearity of the covariates. Individual values of VIF > 10 or average VIF > 6 may be a cause for concern. Correlation coefficients were calculated by the Spearman method. Internal consistency was estimated by calculating Cronbach’s alpha for the ICF domains.

RESULTS

After one reminder, 3105 of 3839 (80.3%) subjects responded to the questionnaire, including 1705 of 2022 patients with RA and 1400 of 1817 controls. To match the patient and control respondents for age, only the 2395 (62%) subjects who were > 50 years old were included in the analyses (1034 women with RA and 697 female controls, and 405

Table 1. MDHAQ and HAQ items in the components and domains of ICF with individual codes using option of partial overlap between sets of activities and participation domains (Annex 3, alternative 2).

Item/Scale	ICF Code*	Finn-MDHAQ ²⁸	HAQ ^{6,10†}
Body structure and functioning			
A. Mental function			
1. Fatigue	b130	•	
2. Get a good night sleep	b1343	•	
B. Sensory function and pain			
1. Pain	b280	•	•
Activity			
A. General tasks and demands			
1. Deal with the feeling of anxiety or being nervous?	a240	•	
2. Deal with the feeling of depression or feeling blue?	a240	•	
B. Mobility			
1. Stand up from a straight chair?	a4103		•
2. Get in or out of bed?	a4100	•	•
3. Lift a full cup or glass to your mouth?	a4450	•	•
4. Walk outdoors on flat ground?	a450	•	•
5. Climb up five steps?	a4551		•
6. Get on and off the toilet?	a4103		•
7. Reach and get down a 2 kg object from above your head?	a445		•
8. Bend down to pick up clothing from the floor?	a4105	•	•
9. Open previously open jars?	a445		•
10. Open car doors?	a4450		•
11. Turn faucets on and off?	a440	•	•
12. Walk 3 km?	a4501	•	
C. Self-care			
1. Dress yourself, including shoelaces and buttons	a540	•	•
2. Shampoo your hair?	a5100		•
3. Cut your meat?	a550		•
4. Open a new milk carton?	a550		•
5. Wash and dry your entire body?	a510	•	•
Participation			
A. Mobility			
1. Get in and out of a car?	p410	•	•
B. Domestic life			
1. Run errands and shop?	p6200		•
2. Do chores such as vacuuming or yard work?	p6402		•
C. Community, social and civic life			
1. Participate in sports and games as you would like?	p9201	•	

* a: activity, b: body structure and function, p: participation. † One item excluded from the HAQ: "Are you able to take a tub bath".

men with RA and 260 controls). Despite this correction, both women and men with RA in the final study group were older than controls (Table 2). Similarly, RA patients more often were in early retirement due to their disease. Further, the RA patients of both sexes were also less educated, perceived their health as poorer, practiced physical exercise less often, and had more numerous comorbidities than the control subjects.

Figure 1 shows the distributions of domain scores (median with interquartile range) in patients and controls. Scores of 0 (floor effect) varied in RA patients from 9% (body structures and function/mental function) to 54% (activity/general tasks and demands), and in the controls from 20% (body structures and function/mental function) to 79% (participation/mobility).

In multivariate analyses, significantly lower levels of

functioning were found for all the ICF components in patients compared to controls in both men and women — in the body functions component (including simultaneously mental function and sensory function and pain domains), the activity component (general tasks and demands, mobility and self-care domains), and the participation component (mobility and community, social life and civic life domains). In the univariate analysis, RA patients had lower levels of functioning compared to controls in all domains, with the exception that men with RA managed comparably to male controls in "general tasks and demands" (Table 3). As expected, RA patients of both sexes managed less well than controls in all 3 ICF components (Figure 2).

In patients with RA, disease activity, education, exercise frequency, and comorbidities were associated with higher levels of disability in the body structure and function com-

Table 2. Characteristics of respondents in patients with rheumatoid arthritis (RA) and controls.

Characteristic	RA, N = 405	Male Control, N = 260	p	RA, N = 1034	Female Controls, N = 697	p
Age, yrs, mean (SD)	67 (10)	64 (10)	< 0.001	67 (10)	65 (10)	< 0.001
Education, yrs, median (IQR)	8 (7, 11)	9 (8, 13)	0.003	9 (8, 12)	10 (8, 13)	< 0.001
Social status, n (%)			< 0.001			< 0.001
Employed	68 (17)	92 (35)		148 (14)	213 (31)	
Unemployed	10 (2)	15 (6)		38 (4)	36 (5)	
Retired	219 (54)	108 (42)		583 (56)	379 (54)	
Retired because of disease	108 (27)	45 (17)		265 (26)	69 (10)	
Exercise frequency, n (%)			0.001			< 0.001
≥ 3 times a week	148 (37)	116 (45)		390 (38)	333 (48)	
1–2 times a week	123 (30)	85 (33)		302 (29)	234 (34)	
Sometimes or none	59 (15)	41 (16)		122 (12)	64 (9)	
Not because of disease	54 (13)	13 (5)		178 (17)	50 (7)	
Subjective health status, n (%)			< 0.001			< 0.001
Excellent	3 (1)	27 (11)		15 (1)	37 (5)	
Good	88 (22)	97 (38)		187 (18)	250 (37)	
Fair	263 (66)	113 (44)		690 (68)	339 (50)	
Poor	47 (12)	17 (12)		124 (12)	50 (7)	
No. of comorbidities, median (IQR)	3 (2, 4)	2 (0, 3)	< 0.001	3 (2, 5)	2 (1, 4)	< 0.001

SD: standard deviation, IQR: interquartile range.

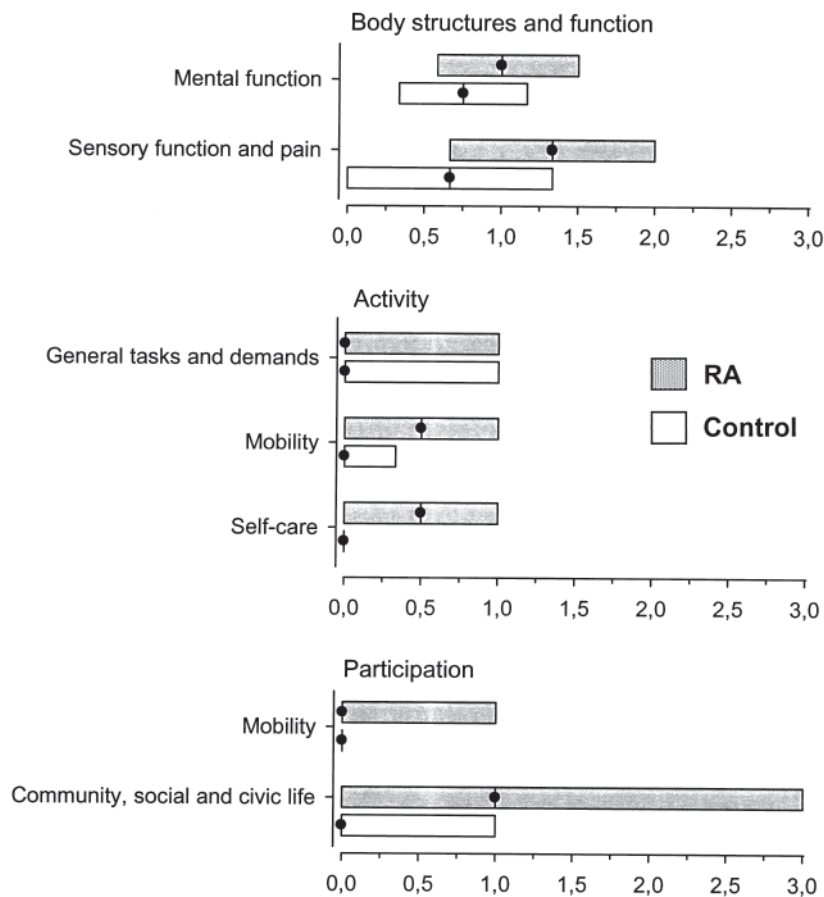


Figure 1. Distributions of domain scores; medians (•) with interquartile range in patients with RA and matched population controls.

Table 3. Components and domains of disability in male and female RA patients and control population.

Component/Domain	RA, mean (SD)	Control, mean (SD)	Univariate* p	Multivariate** p
Male				
Body structure and function				< 0.001
Mental function	0.90 (0.58)	0.73 (0.68)	0.004	
Sensory function and pain	1.11 (0.83)	0.78 (0.85)	< 0.001	
Activity				< 0.001
General tasks and demands	0.42 (0.54)	0.40 (0.55)	0.67	
Mobility	0.55 (0.61)	0.24 (0.45)	< 0.001	
Self-care	0.62 (0.71)	0.21 (0.52)	< 0.001	
Participation				< 0.001
Mobility	0.51 (0.69)	0.23 (0.57)	< 0.001	
Community, social and civic life	1.34 (1.11)	0.59 (0.96)	< 0.001	
Female				
Body structure and function				< 0.001
Mental function	1.10 (0.68)	0.86 (0.69)	< 0.001	
Sensory function and pain	1.34 (0.85)	0.91 (0.89)	< 0.001	
Activity				< 0.001
General tasks and demands	0.47 (0.58)	0.38 (0.54)	0.0014	
Mobility	0.62 (0.64)	0.25 (0.45)	< 0.001	
Self-care	0.61 (0.75)	0.20 (0.51)	< 0.001	
Participation				< 0.001
Mobility	0.66 (0.78)	0.29 (0.63)	< 0.001	
Community, social and civic life	1.49 (1.18)	0.71 (1.02)	< 0.001	

* Age-adjusted bootstrap-type ANCOVA. ** Age-adjusted Pillais-Trace-type bootstrap test performed in 3 domains of the same ICF component simultaneously.

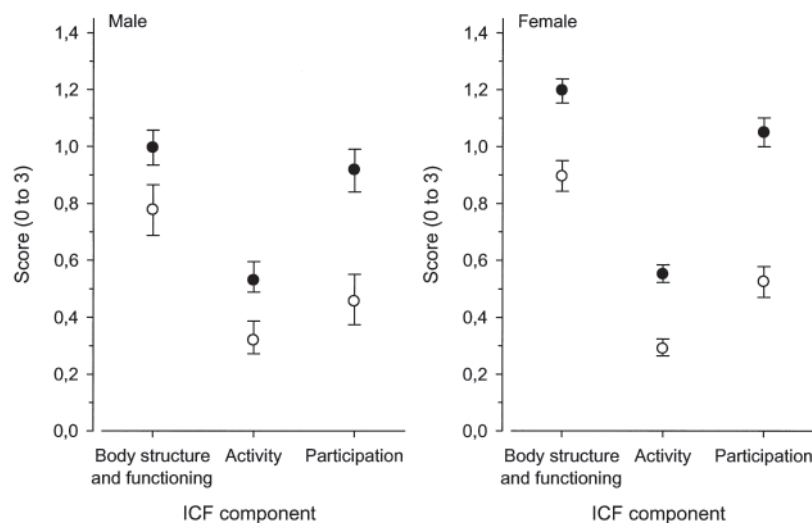


Figure 2. Functioning in men and women with RA (●) and controls (○) in components of the ICF. Circles indicate the mean, and whiskers, 95% confidence interval.

ponent, while male sex and subjectively perceived health were associated with more favorable functioning (Table 4). In the activity and participation components, disease activity, exercise frequency, and presence of comorbidities were related to poorer functioning, while subjectively perceived health was related to superior functioning. Correlation coefficients between the 3 ICF components varied from 0.54 to 0.80 in RA patients (Table 5).

Internal consistency was calculated to analyze whether the items included in the domains assessed the same characteristic (if more than 1 item was included). Cronbach's alpha was 0.62 for mental function, and 0.88 for the general tasks and demands, mobility, and self-care domains.

DISCUSSION

Our results confirm that an extra burden of disability is

Table 4. Ordered regression analysis for disability in patients with RA. (The ICF components were scored 0 = 0, 0.1–1 = 1, 1.1–2 = 2, and 2.1–3 = 3).

Characteristic	Body Structure and Functioning, OR (95% CI)	Activity, OR (95% CI)	Participation, OR (95% CI)
Male sex	0.70 (0.53 to 0.93)	1.22 (0.88 to 1.70)	0.91 (0.70 to 1.19)
Age	0.98 (0.97 to 1.00)	1.01 (0.99 to 1.03)	1.02 (1.00 to 1.04)
Duration of disease	1.00 (0.99 to 1.01)	1.02 (1.01 to 1.04)	1.01 (1.00 to 1.03)
Disease activity (RADAI)	1.17 (1.14 to 1.19)	1.15 (1.12 to 1.17)	1.09 (1.07 to 1.11)
Education, yrs	1.06 (1.02 to 1.10)	0.97 (0.93 to 1.02)	1.02 (0.98 to 1.06)
Exercise			
≥ 3 times a week	1 (indicator)	1 (indicator)	1 (indicator)
≥ 1 times a week	1.01 (0.74 to 1.37)	1.59 (1.13 to 2.22)	1.64 (1.24 to 2.17)
0 no exercise	1.43 (1.01 to 2.03)	2.87 (1.96 to 4.19)	4.69 (3.33 to 6.59)
Subjective health			
Poor	1 (indicator)	1 (indicator)	1 (indicator)
Fairly good	0.26 (0.15 to 0.45)	0.28 (0.17 to 0.47)	0.38 (0.24 to 0.59)
Excellent or good	0.05 (0.03 to 0.10)	0.08 (0.05 to 0.15)	0.11 (0.06 to 0.18)
No. of comorbidities	1.10 (1.03 to 1.18)	1.19 (1.09 to 1.30)	1.20 (1.12 to 1.30)

RADAI: Rheumatoid Arthritis Disease Activity Index.

Table 5. Correlation between body structures and function, activity, and participation components in male and female patients with RA.

	Male		Female	
	Activity	Participation	Activity	Participation
Body structures and function	0.65 (0.59 to 0.71)	0.56 (0.49 to 0.62)	0.63 (0.59 to 0.66)	0.54 (0.49 to 0.58)
Participation	0.80 (0.76 to 0.83)		0.76 (0.73 to 0.78)	

borne by elderly patients with RA compared to the general population^{11,12}. Added to the challenges of advanced public health (due to improved consumer education and progress in medicine and rehabilitative measures) we have an increasing number of aging patients with physical impairment acquired at younger ages. Nevertheless, although an individual may have a physical impairment, this on its own does not constitute disability. However, when a patient with, for example, RA gets older and experiences frailty, perhaps with related comorbidities, the existing gap between the capacities of the individual and the demands of the environment increases. Consequently, the reduced individual competency results in the need to rebalance the equation by modifying the person, the environment, or both¹³. Policymakers may improve the balance, moderating a person-environment mismatch by developing community-related solutions like improvements of housing and transportation. Alternatively, the individual may restore her or his resources in order to enable optimal functioning to satisfy behavioral needs and psychological well-being. For example, an individual with severe RA may not be able to climb stairs in her home. To moderate the effect of this impairment she may start to exercise to increase her performance capacity, or she may relocate to the first floor, with no need to climb stairs. Thus, the pathway of disability should not be viewed as unidirectional but

as bidirectional, highlighting the potential for reversal of the disabling process¹⁴.

Clinically and conceptually, it is not unusual to infer functioning from the diagnosis with which the patient enters the clinic. RA, although a systemic inflammatory disease, is usually considered a musculoskeletal disorder affecting mostly body structures. Kriegsman, *et al*¹⁵ reported that diseases that influence physical functioning through various mechanisms (locomotor symptoms, decreased endurance capacity, mood) may be more detrimental than the others. Our data show that RA patients have impaired functioning compared to population controls. In addition, in RA patients, comorbidities lowered the functioning of all the 3 components of the ICF, thus increasing the frailty of these patients. In most studies of RA, the self-report HAQ has been used in the assessment of functioning, as most clinicians and researchers are familiar with the instrument and feel comfortable with its content. However, according to the linking rules used in the ICF classification⁸, 16 or 17 of the 20 items included in the HAQ belong to the activity component (see Table 1, comparing HAQ and MDHAQ items in the ICF framework). The other items fall within the participation component, while the body function component remains totally uncovered. Thus, use of the HAQ instrument gives a rather narrow perspective on functioning. The use of

the MDHAQ may be a better alternative, as it also includes mental and physical determinants of functioning, thus recording all 3 main components of the ICF. However, the MDHAQ still has a problem with large floor and ceiling effects, similar to the HAQ. It has been suggested that health-related quality of life measurement instruments with floor and ceiling effects within the range of 1%–15% meet the standards of measurement for individual patient application¹⁶. Thus, the results of our study evaluating patients with RA at a group level cannot be directly applied to concerns for individual patients.

Subjective health assessment reflects a person's integrated perception of health that is said to be inaccessible to any external observer¹⁷. Thus, a self-reported single question concerning perceived health status is frequently applied in epidemiological cross-sectional health research^{18,19}. Therefore, as expected, better subjectively perceived health in patients with RA in this study was associated with more favorable functioning in all 3 components of the ICF model. Health monitoring using a simple self-reported health status can ascertain the results achieved by other instruments.

As expected, the RA patients with a higher physical activity level had maintained significantly better functioning. A recent study of 5235 patients with RA from 21 countries confirms our finding, reporting that functional disability in daily activities as measured by the HAQ was associated with physical inactivity²⁰. The relationship was clear in the participation component of the ICF model that identified a patient's ability to participate in sports and games. On the other hand, inclusion of this question in the model may lead to "circular reasoning" in the regression analysis, as the possibility to "Participate in sports and games as you would like?" may influence exercise frequency or vice versa. Studies have unquestionably shown that physically active people outlive those who are inactive^{21–23}. Further, regular physical activity helps to maintain functional independence of older adults and enhances the quality of life for people of all ages^{24,25}. A physically active lifestyle is especially important for people with diseases affecting the musculoskeletal system, like RA²⁶. Our data show that physical activity level also affects the components of activity and participation of functioning, and not only body structures and function (e.g., aerobic fitness, body composition, and muscular strength). In addition, the proportion of retired people was higher in patients with RA than in the controls, showing that RA not only lowers one's functioning, but also increases disability and affects the individual's marketplace value. The cost-benefit relationship between the individual and the society changes. As an (elderly) employee retires due to a disease, she/he increasingly needs healthcare and other services. Consequently, the costs associated with interacting with the (elderly) patient outweigh his or her productivity²⁷.

Healthcare systems should enthusiastically take up the challenge of improving the functioning of elderly citizens,

appreciating the nuances of "the second 50 years." The ICF model is universally endorsed and may provide an important framework for identification of the key factors of functioning at the level of body, person, and society, as well as in the understanding of person-environment contextual factors impeding or enhancing patients' outcomes. However, it is important to bring these theoretical models closer to daily clinical work. Application of the MDHAQ instrument rather than the HAQ has been recommended as a research method for young adult patients with juvenile idiopathic arthritis²⁸. Scores of the MDHAQ, together with the Routine Assessment of Patient Data (RAPID) instrument, were recently recommended to be used also as measures for standard clinical care²⁹. Our results indicate its appropriateness also in elderly patients with RA. Stucki and Cieza have concluded that different health status measures cover different components and with different levels of precision³⁰. However, the use of the ICF as a framework allows us to see which domains are covered and whether it is necessary to complement the study with other measures, although its use in everyday clinical care is too time-consuming and complicated.

Our subjects were > 50 years old and thus generalization of the results to younger working-age patients with RA should be done with caution. We emphasize that the ICF is used as a framework for the analysis; our application is just one of the ways this framework can be used to illuminate the phenomenon.

Our study using a large patient and control population sample shows that the use of the self-report MDHAQ offers a practical tool to assess functioning in clinical practice, as it identifies all 3 main components of the ICF framework. Its application shows the wide spectrum of functioning in which elderly patients with RA meet more difficulties in their daily life compared to a population without RA.

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