

# Construction and psychometric properties of the Belgian Rheumatoid Arthritis Disability Assessment (BRADA) questionnaire: a new tool for the evaluation of activity limitations in patients with rheumatoid arthritis

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## Abstract

### Objectives

To describe the construction and psychometric properties of the Belgian Rheumatoid Arthritis Disability Assessment (BRADA) questionnaire, a self-report tool to evaluate chronic activity limitations in patients with rheumatoid arthritis (RA). The BRADA was developed to assess the eligibility of patients with RA for financial and social support measures.

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### Methods

The BRADA questionnaire evaluates functioning in 6 functional domains (mobility, nutrition, self care, household tasks, awareness of danger and communication) over the past week and the past 3 months. To assess the psychometric properties of the BRADA, patients with moderate to severe RA filled out the BRADA, HAQ-DI and SF-36 questionnaires twice, with a four-week interval. At each visit, the total number of swollen and tender joints, and global disease activity were recorded.

DAS 28 was measured at the first visit. Internal consistency of items per domain was evaluated with Cronbach's alpha method. Intraclass correlation coefficient (ICC) analysis was used to assess test-retest reliability. BRADA scores were compared to HAQ, SF-36 scores and disease activity parameters with Spearman's Rho correlation coefficients to assess construct validity.

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### Results

Experts considered the content and face validity of BRADA to be adequate. Internal consistency was satisfactory for all functional domains ( $\alpha > 0.75$ ), as was the test-retest reliability (ICC 0.78). BRADA scores showed excellent correlation with other validated questionnaires in RA (HAQ-DI, SF-36) and with measures of disease activity (VAS, DAS28) ( $p < 0.001$ ).

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### Conclusions

Its psychometric properties indicate that the BRADA questionnaire is a suitable instrument to evaluate disease-specific activity limitations in patients with RA.

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### Key words

rheumatoid arthritis, patient-reported outcomes, activity limitations, psychometrics, HAQ-DI, ICF core set for RA, SF-36, support measures

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Received on November 20, 2012; accepted  
in revised form on February 5, 2013.

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EXPERIMENTAL RHEUMATOLOGY 2013.

## Introduction

Rheumatoid arthritis (RA) can have a major impact on human functioning and health-related quality of life. Therefore, support measures addressing activity limitations and participation issues are an important complement to the medical treatment. In order to assure equitable allocation of supporting measures, adequate instruments to objectively assess the level and area of activity limitations in patients with RA and to determine the level and type of supporting measures needed are essential.

Most existing instruments to assess functioning are either not disease-specific (e.g. Health Assessment Questionnaire [HAQ], Medical Outcome Study Short Form 36 [SF-36]), are aimed at measuring current impact of disease activity (e.g. visual analogue scale [VAS]) or assess a very limited set of activities (e.g. grip strength, walking time) (1, 2). The Belgian RA Disability Assessment (BRADA) questionnaire, an instrument to measure the ability to perform daily activities in patients with RA in order to assess the need for access to support measures, was developed to fill this gap. This study describes the construction and psychometric properties of the BRADA questionnaire.

The BRADA questionnaire incorporates all domains covered by the HAQ, a validated generic self-report instrument that has proven useful in the context of RA (3, 4), and broadens the scope with additional activities from the likewise validated International Classification of Functioning, Disability and Health (ICF) core set for RA (5–10). Activities assessed in the BRADA questionnaire are grouped into 6 functional domains, corresponding to those used in the medical-social scale of the Belgian Federal Public Service Social Security, a generic not validated scale currently used in Belgium to determine the need for access to a number of supporting measures available for patients with chronic daily activity limitations and loss of autonomy.

The BRADA questionnaire was developed in a translational manner using the ICF core set for RA. As such, the BRADA questionnaire represents one of the first endeavours to implement

the ICF framework and classification of the WHO. By assessing functioning over both the last week and the last 3 months, the BRADA questionnaire allows assessment of chronic baseline level of functioning in patients with RA, thus decreasing the influence of the disease course variability.

## Patients and methods

### Construction of the BRADA questionnaire

To construct the BRADA questionnaire, the Health Assessment Questionnaire Disability Index (HAQ-DI) was extended with elements of the ICF core set for RA. In the BRADA questionnaire, all validated questions of the HAQ are present. Elements from the ICF core set for RA were added for activities not represented in the HAQ.

The BRADA questionnaire (Supplementary file 1) assesses physical functioning and activity limitations in 6 functional domains (mobility, nutrition, self-care, household tasks, awareness of danger, communication) by scoring 6 items per functional domain. The BRADA takes into account functioning over A) the last week and B) the last 3 months. Each item is scored on a 0–3 scale, going from score 0 when the patient is able to perform the activity without any difficulty, over score 1 (some difficulty) and score 2 (much difficulty) to score 3, when the patient is unable to perform the activity.

Because social security is a federal matter in Belgium, the BRADA questionnaire must be available in Dutch as well as in French. The questionnaire was originally developed in Dutch. To create the French version, the Dutch version of the BRADA was translated into French; then the French version was translated back into Dutch. Subsequently, the translations were reviewed by an expert group to confirm the equivalence of both versions. The same procedure was followed to create the English translation of the BRADA questionnaire for the purpose of this paper (Supplementary file 1).

The content validity of the BRADA questionnaire was evaluated by experts. To assess its face validity, three patients were asked for feedback on its

### Competing interests:

F. De Keyser received research support from Roche, UCB, Actelion; served as consultant for MSD/Schering Plough, Abbott, UCB, Roche, GSK; X. Janssens and S. Decuman have declared no competing interests.

content after filling out the BRADA questionnaire.

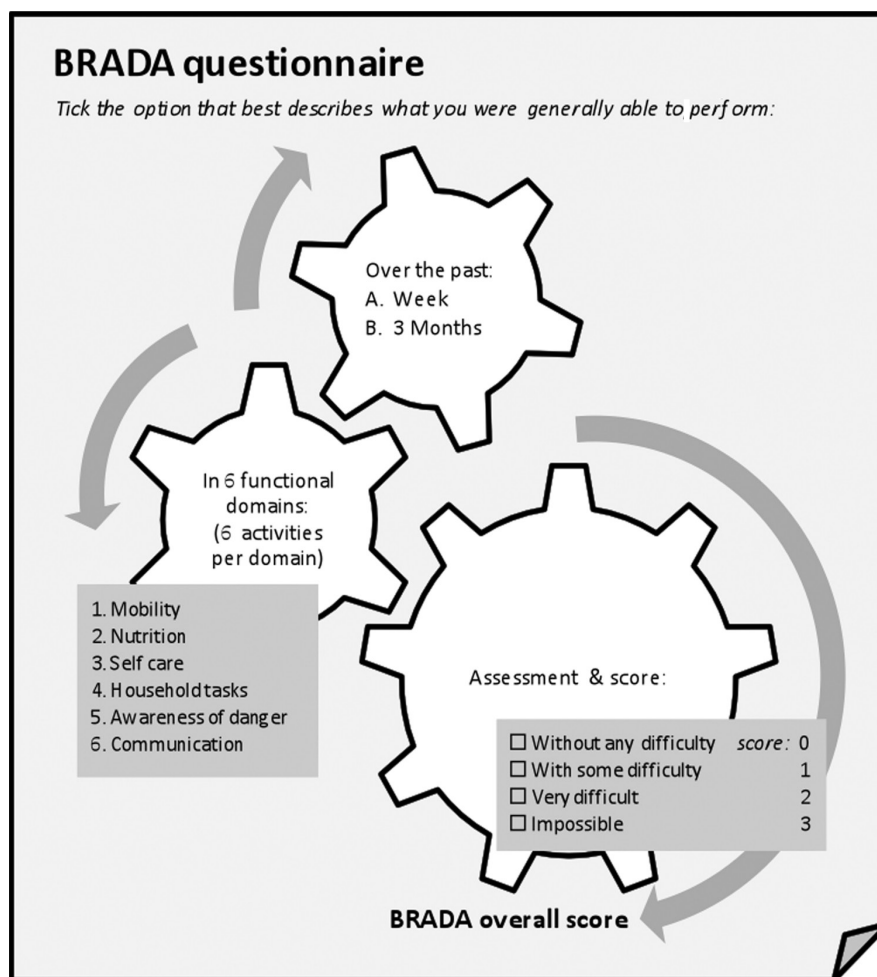
To determine the optimal computation, overall BRADA scores were computed using the sum, average or maximum of the items scores per functional domain, which were then averaged to achieve an overall score of functioning. BRADA scores were calculated separately for the last week and the last three months.

#### *The Health Assessment Questionnaire Disability Index (HAQ-DI)*

The HAQ was one of the first instruments available for measuring patient-reported outcomes and has become one of the most important outcome measures in RA clinical trials. The HAQ was developed three decades ago by Fries and colleagues at Stanford University (11-13). Typically one of the two HAQ versions is used: the Full HAQ or the short 2-page HAQ. The Full HAQ contains five sections which address generic health dimensions: disability, discomfort, drug toxicity, dollar costs of health care utilisation and death. It also includes supplemental items on demographics, lifestyle and health behaviors. The Short HAQ, the most frequently used version, comprises the HAQ disability index (HAQ-DI) and the HAQ's patient global and pain visual analog scales (12). The Short HAQ-DI has proven validity and reliability in patients with RA (3, 4) also as a tool to determine access to benefits and financial support (14, 15) and has been used in this study for the development of the BRADA questionnaire.

#### *The ICF core sets for RA*

The World Health Organisation (WHO) defines functioning as an umbrella term encompassing body function and structure, as well as activity and participation, in the context of personal and environmental factors (16). The ICF is the WHO's framework for measuring health and disability (17). ICF additionally comprises a global language and classification consensus to describe functioning. Nowadays the challenge consists of implementing this classification into multiple sectors besides health including education, in-



**Fig. 1.** Structure of the BRADA questionnaire. Patients are asked to assess their level of functioning over the last week as well as the last 3 months. BRADA questions span 6 functional domains; each functional domain consists of 6 activities, for which the patient indicates whether he/she can perform the activity without any difficulty, with some difficulty, with much difficulty or whether he/she is unable to perform the activity. The patients assessments are converted to scores on a 0-3 scale, which are then used to compute the overall BRADA score.

surance, labour, disability policy and statistics. In the clinical context, the main challenge is the length of the classification (over 1400 categories). Therefore ICF core sets have been developed for a range of chronic health conditions, including RA (18-20). The brief ICF core set can be used as a minimal standard for the reporting of functioning and health in clinical studies and clinical encounters. The Comprehensive ICF core set serves as standard for multiprofessional, comprehensive assessment. Currently the ICF core set for RA has been validated from different perspectives (5-10).

#### *The Belgian Social Security System medical-social scale*

Supporting measures for patients with

activity limitations available in the Belgian Social Security System include financial benefits (integration allowance, allowance for help to the aged), disease cost reduction measures (premium for people with chronic diseases), tax benefits (tax deductions, road tax and VAT exemption for motor vehicles), reduced rates for utilities (gas, electricity, telephone), and measures promoting mobility (parking card, free coach transport card).

The access to these support measures is currently evaluated by a medical-social scale of the Belgian Federal Public Service Social Security. This scale assesses activity limitations in daily life by scoring 6 functional domains: mobility, nutrition (eat and prepare food independently), self care (hygiene and

dressing), home and household tasks, awareness of danger (ability to live without supervision, to be aware of and avoid danger) and communication (including social participation). Scores per domain depend on whether a person can perform the activities concerned without any difficulty (score 0), with some difficulty (score 1), with many difficulties (score 2), or the person is unable to perform the activity (score 3), added to a maximum score of eighteen.

#### *Patients and study set-up*

To assess the psychometric properties of the BRADA questionnaire, data collected at the screening and baseline visits from patients with RA included in a multicentre interventional study (ML22613, NCT00938444) were used. Inclusion criteria for this study were: moderate to severe RA with documented inadequate response to minimally two DMARDs, including oral or intramuscular methotrexate for a minimum duration of 3 months at a dose of 15 mg/week or higher. Screening and baseline visits used to evaluate the BRADA questionnaire occurred prior to the study intervention and a four-week time interval existed between both visits. At each visit, patients were asked to fill out the BRADA, HAQ-DI and SF-36 questionnaires. All questionnaires were available in Dutch and French; participants filled out the questionnaire in their native language. At each visit, the total number of swollen and tender joints was evaluated and VAS of global disease activity was recorded. Additionally, erythrocyte sedimentation rate (ESR) and DAS28 were measured at screening.

All patients gave written informed consent and the study was approved by the ethical committees of the participating clinical centres.

#### *Statistical analyses*

Patient characteristics and demographics are represented as mean  $\pm$  standard deviation for normally distributed parameters, and as median and range for not normally distributed variables. Frequencies of categorical variables are represented as percentages. Normal distribution was tested with the Kolmo-

gorov-Smirnov test. A paired *t*-test was used to compare VAS values between both visits.

The internal consistency of questionnaire items per functional domain was evaluated with Cronbach's alpha method. Alpha is an estimate of and the lower bound to the proportion of test variance attributable to common factors among the items (21). Alpha values above 0.70 indicate good internal consistency (22). The Cronbach's alpha statistic "if item deleted" was computed to assess the contribution of individual items to the overall alpha for the functional domain in order to assess redundancy in the items composing a functional domain.

The test-retest reliability of the BRADA questionnaire was assessed by calculating intraclass correlation coefficients (ICC) between both assessments (screening vs. baseline visit) for the different BRADA overall score computations.

To assess convergent construct validity of the BRADA questionnaire, BRADA scores were compared with the validated HAQ-DI and Medical Outcome Study Short Form 36 (SF-36) scores assessed at the same time points and with VAS of global disease activity, ESR and DAS28 using Spearman's Rho correlation analysis.

Statistical analyses were performed using SPSS for Windows (ver. 14.0). Statistical significance was presumed at *p*-values <0.05.

## **Results**

### *Construction of the BRADA questionnaire*

Table I maps the elements of the BRADA questionnaire to their counterparts in the HAQ and/or ICF core set for RA. A number of daily activities, mainly about communication and social interaction but also about mobility, preparing or eating food, personal hygiene, housekeeping and living without supervision, missing in the HAQ-DI were incorporated from the ICF core set for RA, namely: writing (code d170), hand and arm use (d445), using communication devices and techniques (code d360), maintaining a body position (code d415), changing basic posi-

tion (code d410), moving around in different locations (code d460), walking (code d450), driving (code d475), using transportation (code d470), looking after one's health (code d570), caring for body parts (code d520), preparing meals (code d630) and recreation and leisure (code d920). As the BRADA questionnaire is intended to be used as a medico-social scale to evaluate the activity limitations and loss of autonomy some items from the comprehensive and brief core set for RA were not withheld: assisting others (code d660), family relationships (code d760), intimate relationships (code d770), remunerative employment (code d850), work and employment, other specified and unspecified (code d859), community life (code d910) and moving around using equipment (code d465). BRADA assesses functioning over the past week as well as over the past 3 months as the main goal for developing the BRADA questionnaire was to provide an instrument able to assess the chronic activity limitations of patients with RA.

### *Study population*

The study population is described in Table II. The BRADA questionnaire was filled out at two time points by 67 patients with moderate to severe RA (DAS28 5.7 $\pm$ 1.0). The patient population consisted of 72.7% females, with age 55.7 $\pm$ 11.6 years and median disease duration of 7.5 years (range 1-42 years). VAS values did not differ significantly between both time points (VAS was 72.1 and 70.5 for screening and baseline visits, respectively, with a mean difference 1.607, 95% CI: -1.1 to 4.3, *p*=0.236), indicating that disease activity in the study population did not undergo a significant change in the four-week interval between both evaluations.

### *Psychometric properties of the BRADA questionnaire.*

#### *Content and face validity*

The BRADA questionnaire was developed by extending the HAQ-DI with items of the ICF core set for RA. The researchers consider the questionnaire therefore as sufficiently representative

**Table I.** Mapping of BRADA questionnaire items to the HAQ-DI (24) and ICF core set for RA (16). HAQ-DI items are numbered as specified in the official HAQ instructions guide (24).

HAQ	ICF core set for RA	BRADA
<i>Function 1: Abilities with regard to mobility (Mobility)</i>		
8. Walk outdoors on flat ground	d450 Walking	Walk outside on a flat terrain
–	d460 Moving around in different locations	Walk outside on undulating terrain
9. Climb up five steps	d455 Moving around	Walk up five steps
19. Get in and out of a car	d470 Using transportation	Get in and out of a car, including opening and closing the door of a car
15. Open car doors		Riding a bicycle
–	d475 Driving	Use public transportation (train, streetcar/tram or bus)
–	d470 Using Transportation	
<i>Function 2: Abilities with regard to preparing or eating food (Nutrition)</i>		
5. Cut your own meat	d550 Eating	Cut meat
6. Lift a full cup or glass to your mouth	d560 Drinking	Take a full cup of coffee or a full glass to your lips
7. Open a new milk carton	d445 Hand and arm use	Open a carton of milk or fruitjuice
–	d630 Preparing meals	Prepare meals
18. Run errands and shop	d620 Acquisition of goods and services	Do groceries and go shopping
16. Open previously opened jars	d440 Fine hand use	Unscrew the lid of a jar, if it has been opened before
<i>Function 3: Abilities with regard to personal hygiene and to (un)dressing (Self-care)</i>		
1. Dress yourself, including shoelaces and buttons	d540 Dressing and d440 fine hand use	Get dressed, including tying shoelaces and buttoning clothes?
2. Shampoo your hair	d510 Washing oneself	Wash your own hair?
11. Take a tub bath	d510 Washing oneself	Get in and out of a bath tub?
10. Wash and dry your body?	d510 Washing oneself	Wash and dry your own body?
–	d520 Caring for body parts	Shave or apply makeup at a washbasin?
12. Get on and off the toilet	d410 Changing basic body position	Get on and off the toilet seat?
<i>Function 4: Abilities with regard to doing chores around the house and housekeeping (Household tasks)</i>		
14. Bend down to pick up clothing from the floor	d430 Lifting and carrying objects	Bend over to pick up clothes from the floor
13. Reach and get down a 5 pound object (such as a bag of sugar) from above your head	d449 Carrying, moving and handling objects, other specified and unspecified	Reach for and bring down an item weighing 1 kg, such as a pack of sugar, situated just above your head
20. Do chores such as vacuuming or yardwork	d640 Doing housework	Do homekeeping chores such as vacuuming or gardening
17. Turn faucets on and off	d445 Hand and arm use	Open and close a tap
–	d445 Hand and arm use	Wring a floor mop
–	d445 Hand and arm use	Make the bed
<i>Function 5: Abilities with regard to living without supervision, being conscious of danger and being able to consciously avoid danger (Awareness of danger)</i>		
4. Get in and out of bed	d410 Changing basic body position	Get in and out of bed
3. Stand up from a straight chair	d410 Changing basic body position	Get up from a straight chair
–	d415 Maintaining a body position	Stand-up for 15 minutes
–	d450 Walking	Move about your own house
–	d570 Looking after one's health	Get your medication out of the package and take it
–	d410 Changing basic body position	Get up after a fall
<i>Function 6: Abilities with regard to communication and social interaction (Communication)</i>		
–	d360 Using communication devices and techniques	Use a telephone
–	d360 Using communication devices and techniques	Use a computer
–	d170 Writing	Write a letter
–	d460 Moving around in different locations	Go to public buildings
–	d920 Recreation and leisure	Participate in a one-day outing
–	d475 Driving	Drive a car

**Table II.** Study population characteristics at inclusion. Values are expressed as mean  $\pm$  standard deviation or percentage.

Disease duration is expressed as median (range).

Population characteristics	
No. of patients	67
Age (yr)	55.7 $\pm$ 11.6
Gender ratio (% female)	72.7
On DMARD(s) (%)	68.7
On corticosteroids (%)	50.8
Disease history	
Disease duration (yr)	7.5 (1-42)
Previous use of biologicals:	
Mean no. of biologicals	1 $\pm$ 1.2
Etanercept (%)	22.7
Adalimumab (%)	34.3
Infliximab (%)	32.8
Rituximab (%)	16.4
Abatacept (%)	6.3
Current disease	
VAS	72.05 $\pm$ 19.9
DAS 28	5.7 $\pm$ 1
No. of swollen joints	13.5 $\pm$ 8.2
No. of tender joints	11.3 $\pm$ 6.5
ESR (mm/hr)	34.5 $\pm$ 24.4

DAS 28: disease activity score using 28 joint count; DMARDs: disease-modifying anti-rheumatic drugs; ESR: erythrocyte sedimentation rate; VAS: visual analogue scale.

and complete to evaluate activity limitations in patients with RA. Three RA patients were asked to fill out the BRADA questionnaire and when interviewed about the experience, they did not report any problems or difficulties with the questionnaire.

### Reliability

**Internal consistency.** Cronbach's alpha test statistic for the six items composing every functional domain of the BRADA questionnaire shows that internal consistency is satisfactory for all domains (alpha  $>$ 0.70). However the domains one, three and six contained items that do not contribute to the overall alpha (Table III).

**Test-retest reliability.** The repeatability of the BRADA questionnaire was evaluated with ICC analysis for different computations of the overall BRADA score. Functional domain scores were computed with the sum, average or maximum of the item scores per functional domain. These functional domain scores were then averaged to compute the overall BRADA score (Table IV).

**Table III.** Internal consistency of BRADA items analysed by Cronbach's alpha method. Cronbach's alpha test statistic ( $\alpha$ ) for the 6 items composing every functional domain of the BRADA questionnaire shows that internal consistency is satisfactory for all functional domains. However, functions 1, 3 and 6 contained one or more items that did not contribute to the overall alpha of the functional domain.

Function	Description	Cronbach's alpha		Not contributing to alpha
		1 week	3 months	
1	Mobility	0.91	0.88	bicycle, car
2	Nutrition	0.92	0.91	–
3	Self care	0.93	0.92	bath
4	Household tasks	0.9	0.89	–
5	Awareness of danger	0.9	0.9	–
6	Communication	0.87	0.84	telephone

**Table IV.** The test-retest reliability of the BRADA questionnaire was assessed by calculating intraclass correlation coefficients (ICC) between both assessment timepoints for different BRADA overall score computations. ICC values  $>$ 0.75 indicate acceptable test-retest reliability (indicated in bold). BRADA scores per functional domain were computed by using either the sum, maximum or average score for the 6 items in every functional domain. Overall BRADA scores were then calculated by averaging the 6 functional domain scores. Test-retest reliability was adequate for the computations using sum and average of functional domain scores. In view of the comparable ICC values, summing the domain items was selected as the method of choice to compute the overall BRADA score also because of its ease of use.

Functional domain scores	Overall score	ICC	
		Over the last week	Over the last 3 months
Sum	Average of domain scores	<b>0.78</b>	<b>0.78</b>
Maximum	Average of domain scores	0.64	0.66
Average	Average of domain scores	<b>0.77</b>	<b>0.79</b>

**Table V.** Correlation of BRADA scores with validated questionnaires (HAQ-DI, SF-36) and measures of disease activity (VAS, DAS28). Spearman's Rho correlation coefficients were calculated for BRADA results over the last week for 3 different BRADA overall score computations, in which respectively the sum, maximum and average of the items per functional domain were averaged for all functional domains to obtain the final BRADA score. All correlations were significant with  $p <$  0.001. All BRADA scoring systems evaluated correlated significantly with scores for other questionnaires and with the disease activity parameters. As expected, the closest correlations were observed with the HAQ, which provided the basis for the construction of the BRADA questionnaire.

BRADA computation	HAQ	SF-36	VAS	DAS28
Sum/average	0.94	-0.59	0.52	0.26
Max/average	0.92	-0.59	0.51	0.33
Average/average	0.94	-0.60	0.53	0.28

ICC values for overall score computations using sum or average of functional domain items yielded good test-retest reliability (ICC  $>$ 0.75), whereas scores using the maximum score per functional domain yielded considerably lower ICC values. Taking into account the ICC values and the usability of the questionnaire, the average of the summed item scores per functional domain was selected as the method of choice to compute BRADA scores in

future studies. The BRADA questionnaire thus yields a score from 0 to 18 for both the one week and 3 month assessments.

### Convergent construct validity: correlation with validated instruments and disease activity parameters

Table V shows Spearman Rho values testing the correlation of the BRADA questionnaire scores with validated questionnaires assessing functioning

(HAQ-DI and SF-36) and with measures of disease activity (VAS, DAS28). All correlations were significant with  $p < 0.001$ . As expected the closest correlation was observed with the HAQ, which provided the basis for the construction of the BRADA questionnaire. Correlations with the SF-36 are negative as functional limitations give rise to lower SF-36 scores but higher BRADA scores.

### Discussion

Rheumatoid arthritis-related impairments in joint structure and function, may cause limitations of physical activities and restrictions in familial, social and professional participation. To minimise the impact of RA on the patients' health-related quality of life, support measures (*e.g.* income replacement, financial and tax benefits) are an important supplement to the medical treatment of RA.

As the disease course is heterogeneous and activity limitations in patients with RA tend to be progressive, it is essential to have adequate instruments to accurately measure the degree of disability or activity limitation, in order to ensure equitable access to financial and social support measures.

Most existing instruments to assess functioning either lack disease specificity, are designed to measure current impact of disease activity or assess a very narrow scope of activities or functions. The BRADA questionnaire was developed precisely to overcome the limitations of the existing instruments for assessing functional impairment in patients with RA.

To ensure a sufficiently broad scope, BRADA was based on the HAQ-DI, an extensively validated questionnaire that can be considered the gold standard for the evaluation of functional limitations in RA patients (3, 4). The BRADA questionnaire consists of 36 items. Since a number of functions or activities are not covered by the HAQ-DI, a number of elements taken from the ICF core set for RA were also incorporated into the BRADA questionnaire to increase its comprehensiveness and disease-specificity. The ICF core set for RA has been validated with pa-

tients and clinicians, occupational and physical therapists (5–10). Using the ICF core set for RA to develop, on a translational manner, a new questionnaire, such as the BRADA questionnaire is one of the first endeavours to implement the ICF framework and classification of the WHO to assess activity limitations in daily life.

In the BRADA questionnaire, patients are asked to assess their level of functioning over the last week as well as over the last 3 months in order to assess the basal level of functioning over a longer period of time, to minimise the influence of the variable course of the RA, characterised by intermittent inflammatory flares on the evaluation. Adding ICF elements to build a more comprehensive instrument have made the BRADA questionnaire longer than the HAQ, which may raise the bar for its use in daily practice. However, structuring the questionnaire into functional domains covering a set of related activities may allow more focused use of the BRADA questionnaire, *e.g.* just for the functional domains in which patients show function limitations. Assessment of chronic, stable function limitations in patients with RA is the main application for which the BRADA questionnaire was designed. To assess current RA disease activity a variety of self-report tools are already available, and their responsiveness was recently found to be comparable to traditional composite indices of disease activity such as DAS28 (23).

Experts found the face and content validity of the BRADA to be satisfactory. Reliability testing revealed good internal consistency of the composing elements for all functional domains, although the ability to ride a bicycle, drive a car, take a bath or use a telephone did not significantly contribute to alpha. The test-retest reliability of the BRADA questionnaire also proved to be adequate. Unsurprisingly, BRADA scores correlated significantly with the HAQ-DI results. They additionally showed a significant inverse correlation with SF-36 scores.

In the current study, the BRADA questionnaire was tested in patients with moderate to severe RA. Subsequent

studies will also evaluate the psychometric properties of the BRADA questionnaire in the general population of patients with RA and investigate the responsiveness of BRADA scores to treatment changes.

Additional studies are planned to investigate whether the BRADA questionnaire can predict the need for access to social and financial supporting measures, and whether its predictive value is superior compared to that of the HAQ for this purpose.

### Acknowledgements

The authors thank all patients, nurses, and rheumatologists of the BRADA I study group who participated in the study. Veerle Persy, MD, PhD (Hugin Mugin Research) is gratefully acknowledged for data management services and medical writing assistance.

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## Supplementary file 1

## BRADA questionnaire

## Belgian Rheumatoid Arthritis Disability Assessment

## Instructions:

With this questionnaire, we hope to learn how illness affects your ability to function independently in your daily life. You should not take into account any assistance that you may receive from third parties or through aids. We wish to learn what you can do, without assistance from third parties or through aids.

Tick the option that best describes what you were generally able to perform

A / in the past week

B / in the past three months

*Function 1: Abilities with regard to mobility*

Tick the option that best describes what you were generally able to perform

	A / in the past week				B / in the past three months			
	Without any difficulty	With some difficulty	Very difficult	Impossible	Without any difficulty	With some difficulty	Very difficult	Impossible
Can you:								
1.1 Walk outside on a flat terrain?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Walk outside on undulating terrain?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Walk up five steps?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Get in and out of a car, including opening and closing the door of a car?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 Riding a bicycle?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6 Use public transportation? (train, streetcar/tram or bus)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Function 2: Abilities with regard to preparing or eating food*

## Can you:

2.1 Cut meat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Take a full cup of coffee or a full glass to your lips?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Open a carton of milk or fruitjuice?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Prepare meals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Do groceries and go shopping?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 Unscrew the lid of a jar, if it has been opened before?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Function 3: Abilities with regard to personal hygiene and to (un)dressing*

## Can you:

3.1 Get dressed, including tying shoelaces and buttoning clothes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Wash your own hair?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 Get in and out of a bath tub?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4 Wash and dry your own body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5 Shave or apply makeup at a washbasin?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6 Get on and off the toilet seat?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Function 4: Abilities with regard to doing chores around the house and housekeeping

Tick the option that best describes what you were generally able to perform

	A / in the past week				B / in the past three months			
	Without any difficulty	With some difficulty	Very difficult	Impossible	Without any difficulty	With some difficulty	Very difficult	Impossible
Can you:								
4.1 Bend over to pick up clothes from the floor?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 Reach for and bring down an item weighing 1 kg, such as a pack of sugar, situated just above your head?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 Do homekeeping chores such as vacuuming or gardening?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4 Open and close a tap?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5 Wring a floor mop?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6 Make the bed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Function 5: Abilities with regard to living without supervision, being conscious of danger and being able to consciously avoid danger

Can you:								
5.1 Get in and out of bed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2 Get up from a straight chair?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3 Stand-up for 15 minutes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.4 Move about your own house?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.5 Get your medication out of the package and take it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.6 Get up after a fall?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Function 6: Abilities with regard to communication and social interaction

Can you:								
6.1 Use a telephone?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2 Use a computer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3 Write a letter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4 Go to public buildings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.5 Participate in a one-day outing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.6 Drive a car?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

References

- LILLEGRAVEN S, KVIEN TK: Measuring disability and quality of life in established rheumatoid arthritis. *Best Pract Res Clin Rheumatol* 2007; 21: 827-40.
- WOLFE F: The determination and measurement of functional disability in rheumatoid arthritis. *Arthritis Res* 2002; 4 (Suppl. 2):S11-5.
- LINDE L, SØRENSEN J, OSTERGAARD M, HØRSLEV-PETERSEN K, HETLAND ML: Health-related quality of life: validity, reliability, and responsiveness of SF-36, 15D, EQ-5D [corrected] RAQoL, and HAQ in patients with rheumatoid arthritis. *J Rheumatol* 2008; 35: 1528-37.
- SOKKA T, KAUTIAINEN H, HANNONEN P, PINCUS T: Changes in Health Assessment Questionnaire disability scores over five years in patients with rheumatoid arthritis compared with the general population. *Arthritis Rheum* 2006; 54: 3113-8.
- UHLIG T, MOE R, REINSBERG S, KVIEN TK, CIEZA A, STUCKI G: Responsiveness of the International Classification of Functioning, Disability and Health (ICF) Core Set for rheumatoid arthritis. *Ann Rheum Dis* 2009; 68: 879-84.
- GEBHARDT C, KIRCHBERGER I, STUCKI G, CIEZA A: Validation of the comprehensive ICF Core Set for rheumatoid arthritis: the perspective of physicians. *J Rehabil Med* 2010; 42: 780-8.
- KIRCHBERGER I, GLAESSEL A, STUCKI G, CIEZA A: Validation of the comprehensive international classification of functioning, disability and health core set for rheumatoid arthritis: the perspective of physical therapists. *Phys Ther* 2007; 87: 368-84.
- STAMM TA, CIEZA A, COENEN M *et al.*: Validating the International Classification of Functioning, Disability and Health Comprehensive Core Set for Rheumatoid Arthritis from the patient perspective: a qualitative study. *Arthritis Rheum* 2005; 53: 431-9.
- UHLIG T, LILLEMØ S, MOE RH *et al.*: Reliability of the ICF Core Set for rheumatoid arthritis. *Ann Rheum Dis* 2007; 66: 1078-84.
- COENEN M, CIEZA A, STAMM T A, AMANN E, KOLLERITS B, STUCKI G: Validation of the International Classification of Functioning, Disability and Health (ICF) Core Set for rheumatoid arthritis from the patient perspective using focus groups. *Arthritis Res Ther* 2006; 8: R84.
- BRUCE B, FRIES JF: The Stanford Health Assessment Questionnaire: a review of its history, issues, progress, and documentation. *J Rheumatol* 2003; 30: 167-78.
- BRUCE B, FRIES JF: The Stanford Health Assessment Questionnaire: dimensions and practical applications. *Health Qual Life Outcomes* 2003; 1: 20.
- BRUCE B, FRIES JF: The Health Assessment Questionnaire (HAQ). *Clin Exp Rheumatol*

- 2005; 23 (Suppl. 39): S14-8.
14. LANGLEY C, MEMEL DS, KIRWAN JR *et al.*: Using the Health Assessment Questionnaire and welfare benefits advice to help people disabled through arthritis to access financial support. *Rheumatology* (Oxford) 2004; 43: 863-8.
  15. MEMEL DS, KIRWAN JR, LANGLEY C, HEWLETT S, HEHIR M: Prediction of successful application for disability benefits for people with arthritis using the Health Assessment Questionnaire. *Rheumatology* (Oxford) 2002; 41: 100-2.
  16. WHO | International Classification of Functioning, Disability and Health (ICF) [Internet]. World Health Organization; [cited 2012 Jun 30]. Available from: <http://www.who.int/classifications/icf/en/>
  17. USTÜN TB, CHATTERJI S, BICKENBACH J, KOSTANJSEK N, SCHNEIDER M: The International Classification of Functioning, Disability and Health: a new tool for understanding disability and health. *Disabil Rehabil* 25: 565-71.
  18. STUCKI G, KOSTANJSEK N, USTÜN B, CIEZA A: ICF-based classification and measurement of functioning. *Eur J Phys Rehabil Med* 2008; 44: 315-28.
  19. STUCKI G, CIEZA A, GEYH S *et al.*: ICF Core Sets for rheumatoid arthritis. *J Rehabil Med* 2004; (44 Suppl.): 87-93.
  20. STUCKI G, CIEZA A: The International Classification of Functioning, Disability and Health (ICF) Core Sets for rheumatoid arthritis: a way to specify functioning. *Ann Rheum Dis* 2004; 63 (Suppl. 2): ii40-ii45.
  21. CRONBACH LJ: Coefficient alpha and the internal structure of tests. *Psychometrika* 1951; 16: 297-334.
  22. FITZPATRICK R, DAVEY C, BUXTON MJ, JONES DR: Evaluating patient-based outcome measures for use in clinical trials. *Health Technol Assess* 1998; 2: i-iv, 1-74.
  23. SALAFFI F, CIAPETTI A, GASPARINI S, CAROTTI M, BOMBARDIERI S: The comparative responsiveness of the patient self-report questionnaires and composite disease indices for assessing rheumatoid arthritis activity in routine care. *Clin Exp Rheumatol* 2012; 30: 912-21.
  24. STANFORD UNIVERSITY SCHOOL OF MEDICINE D OF I& R: The Health Assessment Questionnaire (HAQ) and the Improved HAQ (formerly called the PROMIS HAQ) [Internet]. 2009 [cited 2012 Jun 29]. page 1-16. Available from: [http://aramis.stanford.edu/downloads/HAQ\\_Instructions\\_\(ARAMIS\)\\_6-30-09.pdf](http://aramis.stanford.edu/downloads/HAQ_Instructions_(ARAMIS)_6-30-09.pdf).