

Original Article

A Self-Report Thompson Articular Index: What Does it Measure?

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Abstract: The aim of this study was to investigate the reliability and validity of the self-report Thompson articular index (ThAI) in Dutch patients with rheumatoid arthritis (RA). A rheumatologist assessed the ThAI in 43 patients with RA. Patients completed the self-report ThAI and the AIMS-2 questionnaire to assess physical function, pain, mood and level of tension. Blood samples were taken to measure the erythrocyte sedimentation rate (ESR). After 4 weeks, patients were sent a questionnaire for a repeat assessment of the self-report AI. The test-retest reliability of the self-report ThAI was adequate (ICC=0.83). There was low agreement between ThAI scores from patients and AI scores assessed by the rheumatologist (ICC=0.44). Self-report ThAI scores (mean=230.5) were significantly higher than the rheumatologist's scores (mean=110.8). Levels of agreement between patients and rheumatologist for individual joints were disappointing, ranging from 49% to 74% (Cohen's kappa from -0.02 to 0.48). The rheumatologist's ThAI scores correlated significantly with ESR ($r=0.55$) and physical function ($r=0.44$), but not with pain, mood or level of tension. Patients' scores correlated significantly with physical function ($r=0.51$), pain ($r=0.43$), and mood ($r=0.36$) but not with ESR or level of tension. In regression analyses the only significant predictor of the rheumatologist's ThAI scores was ESR, and for patients' scores physical function, thus showing that patients' responses are not confounded by mood or level of tension. In conclusion, the self-report ThAI is a reliable measure, but the validity is questionable because of the non-significant correlation

with ESR and the low level of agreement between patients and rheumatologist. The results indicate that self-reported joint involvement is more closely related to physical function than to arthritic activity.

Keywords: Joint count; Rheumatoid arthritis; Self-report

Introduction

Articular indices or joint counts to assess tenderness and/or swelling of joints are a valuable tool to evaluate disease activity and outcome in patients with rheumatoid arthritis (RA). Lately several different self-report forms of joint counts have been developed [1–6]. Reliable and valid self-report joint counts can be an inexpensive and less time-consuming alternative for joint assessment by a clinician. Potential concerns with a self-reported joint index are that responses on self-report measures may be confounded by the mood of the patients [7,8], and that patients may not be able to accurately report inflammatory joint activity [5].

Stewart et al. [1] have developed a self-report form of the Thompson articular index (ThAI) [9]. In this index, joints are counted only when simultaneously swollen and tender, and scores are weighted according to joint size. Strong correlations were found between scores on the original Thompson index and C-reactive protein (CRP) values, indicating that the Thompson index is a valid measure of disease activity [9]. In this study we have investigated the reliability and validity of the self-report ThAI in Dutch patients with RA.

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Methods

A rheumatologist (J.J.R.) asked 43 consecutive out-patients to participate in this study. Inclusion criteria were a minimum age of 20 years and a diagnosis of RA according to the 1987 American College of Rheumatology (ACR) criteria [10].

Measures

Clinical Data. A rheumatologist (A.M.A.N.) examined all patients and completed the ThAI for each patient. The index form used in this study showed a life-like mannequin, and was modelled after the self-report form of the index as has been used by Stewart et al. [1]. Each joint included in the index is indicated by a circle. The rheumatologist marked on this form which of the following 38 joints were simultaneously swollen and tender to firm pressure: elbows, wrists, metacarpophalangeals (MCP), proximal interphalangeals (PIP), knees, ankles and metatarsophalangeals (MTP). Each joint was weighted according to joint size. The weighting factors used were: elbow 48, wrist 32, MCP 5, PIP 3, knee 95, ankle 32, MTP (big toe) 8, and MTP (other toes) 5. An articular index score was calculated by summing the weighted scores for all joints.

Additional data were collected on American Rheumatism Association (ARA) functional class [11], erythrocyte sedimentation rate (ESR), rheumatoid factor, erosions and medications.

Self-report Data. After the examination by the rheumatologist, patients completed the self-report articular index. The following instructions were printed on the form: 'Please indicate with an "X" on the picture below all joints which are tender and inflamed (swollen) at this moment. Please pay particular attention to the circled joints, but also mark with an "X" any other joint that is tender and inflamed at this moment'.

Patients also completed the Dutch-AIMS-2 questionnaire to assess physical function, pain, mood and level of tension [12]. Physical function is a composite mean score of the six scales of Mobility, Walking and bending, Hand and finger function, Arm function, Self-care, and Household tasks. After 4 weeks, patients were sent a questionnaire for a repeat assessment of the self-report articular index.

Statistics

The test-retest reliability of the self-report ThAI scores was assessed with the intraclass correlation coefficient (ICC) [13]. ICC was also used to compare ThAI scores of patients and rheumatologist. Differences in ThAI scores between patients and rheumatologist were tested with the non-parametric Wilcoxon signed-rank test.

Agreement between rheumatologist and patients for swelling and tenderness for individual joints was assessed with Cohen's kappa. Relationships between

ThAI scores and ESR, physical function, pain, mood and level of tension were assessed with Pearson product moment correlations and with stepwise multiple regression analysis.

Results

The mean age of the 43 patients in this study was 59 years (standard deviation, SD = 12.9), mean disease duration was 17 years (SD = 11.0), and 77% were female. Erosions were found in all patients and rheumatoid factor was positive in 91% of the patients. The mean ESR of the patients was 29.9 mm/h (SD = 19.1). Patients were in ARA functional grades I (2%), II (40%), III (53%) and IV (5%). Non-steroidal anti-inflammatory drugs were used by 79% of the patients and disease-modifying antirheumatic drugs by 81%. Prednisone was used by a minority (23%) of the participants.

A comparison of the test and retest self-report joint scores showed adequate test-retest reliability: the ICC was 0.83.

A comparison of scores from the first self-report joint count and the rheumatologist's joint count yielded an ICC of 0.44, which is not very high.

The self-report joint scores (mean 230.5, SD 175.3, median 195.0) were significantly higher ($Z = 4.45$, $p < 0.001$) than the rheumatologist's scores (mean 110.8; SD 125.2, median 76.0). A comparison of the level of agreement between patient and rheumatologist for individual joints showed Cohen's kappa levels ranging from -0.02 to 0.48 and percentage agreement ranging from 49% to 74%, which is disappointing (Table 1).

Table 1. Agreement between patient and rheumatologist for individual joints

Joint	Kappa	% Agreement	% Disagreement Rated as involved by	
			Patient	Rheumatologist
Elbow	R 0.48***	74	26	0
	L 0.33*	70	21	9
Wrist	R -0.02	49	28	23
	L 0.31*	65	23	12
MCP	R 0.06	51	35	14
	L 0.40**	70	25	5
PIP	R 0.19	63	32	5
	L 0.11	63	32	5
Knee	R 0.24*	65	33	2
	L 0.13	56	42	2
Ankle	R 0.29*	67	26	7
	L 0.32*	67	23	9
Great MTP	R 0.13	74	19	7
	L 0.30*	72	23	5
Small MTP	R 0.18	65	26	9
	L 0.17	63	30	7

R, right; L, left; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2: Pearson product moment correlations between ThAI scores of patients and rheumatologist and ESR, and Dutch-AIMS2 scores for pain, physical function, mood and level of tension

	ThAI score	
	Patient	Rheumatologist
ESR	0.24	0.55***
Pain	0.43**	0.27
Physical function	0.52***	0.44**
Mood	0.36*	0.21
Level of tension	0.16	0.07

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, two-sided.

Table 3. Stepwise multiple regression analyses of patients' self-report ThAI scores and rheumatologist's ThAI scores

Dependent	Predictors	Beta	R^2
Patients' ThAI score	<i>Included</i>		
	Physical function	0.50*	0.25*
	<i>Excluded</i>		
	ESR	-0.11	
	Pain	0.20	
	Mood	0.08	
Rheumatologist's ThAI score	<i>Included</i>		
	ESR	0.55**	0.30**
	<i>Excluded</i>		
	Pain	0.17	
	Physical function	0.19	
	Mood	0.19	
	Level of tension	0.08	

* $p < 0.01$; ** $p < 0.001$.

Compared with the rheumatologist, patients tended to report swelling and tenderness more often for all types of joints.

The rheumatologist's joint scores were significantly correlated with ESR ($r = 0.55$) and physical function ($r = 0.44$), but not with pain, mood or level of tension (Table 2). Patients' scores were significantly correlated with physical function ($r = 0.52$), pain ($r = 0.43$), and mood ($r = 0.36$) but not with ESR or level of tension (Table 2). In regression analyses the only significant predictor of the rheumatologist's joint scores was ESR, and for patients the only significant predictor was physical function (Table 3).

Discussion

The self-report ThAI was shown to be a reliable measure, but the validity of this measure to assess disease activity is questionable because of the non-significant correlation with ESR and the low level of agreement between patients and rheumatologist. The results indicate that a self-reported joint count of

swelling and tenderness is more closely related to perceived physical function, as measured with the Dutch-AIMS2, than to arthritic activity. The regression analysis showed that patients' responses on the self-report joint index are not confounded by mood or level of tension.

Stewart et al. [1], in their study of the self-report ThAI, found higher levels of agreement between patients' joint scores and the rheumatologists' scores (ICC = 0.82). Regarding test-retest reliability and correlations with disease activity they found results comparable to ours. The ICC for test-retest reliability was 0.88, which is comparable to the ICC value of 0.83 for test-retest reliability in our study. They found significant correlations of CRP levels, an indicator of disease activity, with the rheumatologists' joint scores (Pearson $r = 0.53$) but not with the patients' self-report joint scores (Pearson $r = 0.25$). They suggested that it might be that patients tend to include joints that are tender or painful without being inflamed, while inflammatory activity may be more apparent to the rheumatologist. To avoid this type of possible confusion, it may be better to ask patients for separate ratings of swelling and tenderness [1]. The self-report ThAI showed a good sensitivity to therapeutic change due to intra-articular steroid injection [1]. In a second study with the self-report ThAI, they found only weak relationships between changes in scores on this index and changes in mood and anxiety, showing that responses on a self-report articular index were not confounded by the affective state of the patients [7].

Mason et al. [2] evaluated a self-report index of joint tenderness; they did not include swelling. Tenderness was assessed on a graded scale from 0 (no tenderness or pain) to 3 (severe pain/tenderness). They found high levels of agreement between the joint scores of patients and rheumatologists (ICC = 0.81). Patients' joint scores as well as rheumatologists' joint scores showed comparable and high levels of correlations with patients' self-report assessments of pain, disease activity and physical function (Spearman r 's ranging from 0.66 to 0.74). A good sensitivity to change for the self-report index was indicated by a high level of correlation (ICC = 0.83) between changes over a 6-month interval in patients' and rheumatologists' joint scores. They did not analyse the relationships between joint scores and laboratory measures of disease activity such as ESR or CRP, and test-retest reliability.

A high level of agreement (Pearson $r = 0.89$) between joint scores of patients and assessors was also found in another study with the same graded self-report index of joint tenderness [3]. In this study, high correlations were found between both patients' and assessors' joint scores and self-report assessments of pain and learned helplessness (Pearson r 's ranging from 0.50 to 0.73) [3]. Test-retest reliability, relationships with laboratory measures of disease activity and sensitivity to change were not examined.

In The Netherlands, Prevoo et al. [4] asked patients to score separately swelling (not graded) and tenderness

(graded, 0 = no tenderness, 3 = very tender) of joints, and calculated self-report scores of the Ritchie and Thompson articular indices, and total and reduced (28 joints) scores for only swelling or tenderness or the combination of swelling and tenderness. For all types of self-report joint scores they found good test-retest reliability (Pearson r 's ranging from 0.77 to 0.87), but only moderate agreement between patients' and assessors' joint counts (Pearson r 's ranging from 0.47 to 0.65). They did not find significant correlations between both assessors' and patients' scores of tenderness and swelling for groups of joints and ESR (Spearman r 's ranging from 0.01 to 0.21). They did find significant correlations with grip strength, and self-reported pain, general health and physical function, and these correlations did not differ significantly between assessors' and patients' joint scores (Spearman r 's ranging from 0.13 to 0.50). Sensitivity to change was not evaluated.

Hewlett et al. [5] constructed a self-report index including pain, heat, swelling and stiffness in 64 joints. These symptoms were assessed on graded scales from 0 (none) to 3 (severe). From these scores a self-report ThAI score was calculated. Self-report ThAI scores were moderately correlated with the ThAI scores assessed by a clinical research assistant ($r = 0.61$). However, patients' scores were often greater than the research assistant's scores. Neither the patients' ThAI scores nor the assistant's ThAI scores correlated significantly with plasma viscosity, a laboratory indicator of disease activity ($r = 0.04$ and 0.22 , respectively). There were no significant correlations of self-reported pain, heat, swelling or stiffness in separate joints with plasma viscosity (r 's ranging from -0.22 to 0.37). Also, no scores for combinations of joints could be constructed that correlated significantly with plasma viscosity. Hewlett et al. [5] concluded that patients clearly report different grades of pain, heat, swelling or stiffness in multiple joints, but such self-reports cannot be shown to be a reliable indicator of inflammatory activity. They did not examine sensitivity to change, and test-retest reliability.

Stucki et al. [6] evaluated a graded (none, mild, moderate, severe) self-report articular pain index and also an index assessing swelling or tenderness in joints using the same mannequin format as is used for the self-report ThAI. The self-report articular pain index correlated significantly with tender and swollen joint counts by a physician (Spearman's $r = 0.43$ and 0.32 , respectively), CRP ($r = 0.38$), a Modified Disease Activity Score [14] ($r = 0.49$), Mallya disease activity index [15] ($r = 0.48$), muscle strength ($r = -0.38$) and physical function ($r = 0.50$), but not with ESR ($r = 0.04$), haemoglobin ($r = -0.17$) and grip strength ($r = -0.22$). The self-report scores of swelling or tenderness correlated significantly with the physician derived swollen joint count (ICC = 0.44), Mallya disease activity index (Spearman's $r = 0.64$), CRP ($r = 0.45$) and the HAQ score ($r = 0.58$). Although correlations between the patients' self-report joint scores and physician's tender and swollen joint counts are calculated, agreement

between patients and physicians regarding joint scores has not adequately been evaluated in this study. The physician evaluation included counts of swollen and tender joints but did not include a *graded* articular pain index. Furthermore, the physician did not complete the mannequin form to assess tenderness or swelling of joints. Test-retest reliability and sensitivity to change were not examined in this study.

The literature on self-report joint counts is not very consistent. Several different types of joint counts have been studied with different kind of methods. Four studies [2,3,5,6] have not evaluated test-retest reliability; this study and two others [1,4] have evaluated test-retest reliability, and found it to be good. In some studies [1-3] a high agreement between patients' self-report joint scores and physician derived scores was found, while in this study and others [4,5] only a low to moderate agreement was found. In two studies [2,3] the self-report joint scores were not validated against laboratory measures of disease activity. In the other studies laboratory measures of CRP, ESR, plasma viscosity and/or haemoglobin were used. Significant correlations with self-report joint scores were only found for CRP values by Stucki et al. [6], but they did not find significant correlations with ESR or haemoglobin. Sensitivity to change was only investigated in two studies [1,2], and was found to be good.

We can conclude that self-report joint counts are reliable and seem not to be affected by the mood of the patients. Self-report joint counts are not a good alternative for joint examination by a clinician because of the often-found low levels of agreement between patients' self-report joint scores and assessors' joint scores. Furthermore, self-report joint scores show only weak correlations with laboratory measures of disease activity in contrast to clinicians' joint scores. We found that patients' self-report joint scores of swelling and tenderness are most strongly related to self-assessed physical function.

Only two studies [1,2] have evaluated sensitivity to change. Further work needs to be carried out to explore the sensitivity to change of self-report joint scores. The usefulness of self-report joint scores in the assessment of RA patients would be much increased if they were to show a good sensitivity to treatment changes.

We provided patients with short written instructions on how to complete the ThAI, but did not give them any further training in how to complete an articular index, as was also the case in all of the other studies. Physicians, of course, have had considerable training in the completion of articular indices. The usefulness and validity of self-report joint scores might possibly be much improved if one were to train patients sufficiently in evaluating tenderness and swelling in their joints.

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