



# Ankylosing Spondylitis (Axial Spondyloarthritis) (AS)

The Bath Indices

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## An updated synopsis of the Bath Indices – outcome measures for use with Ankylosing Spondylitis patients and their broader application

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# Introduction

This booklet provides a synopsis of the Bath AS Metrology Index (BASMI), the Bath AS Functional Index (BASFI), the Bath AS Disease Activity Index (BASDAI) and the Bath AS Patient Global Score (BAS-G).

The creation of the Bath indices stems from the work of a research team consisting of rheumatologists, physiotherapists, and research associates with a specialist interest in AS at the Royal National Hospital for Rheumatic Diseases (RNHRD). With respect to the functional and disease activity indices, the team obtained input from patients with AS. It was felt that such input heightens the clinical relevance of such measures. All indices produce a score out of 10, giving a clear numerical outcome each time the indices are used, therefore providing an easy way to compare them.

All four indices have been studied for reliability, speed, variability, reproducibility, and sensitivity to change. The studies involved a good sample size of between 163 and 392 subjects, some of whom were in-patients undergoing an intensive course of physiotherapy for 2 to 3 weeks at the RNHRD. Comparables were made with the original metrology assessment of 20 measurements, the Dougados functional index, the previous Bath disease activity index and the Newcastle Entesis Index. The results of this research are summarised in this booklet. For more detail, the reader is encouraged to refer to the original articles that are referenced at the back of this booklet.

The use of the Bath Indices (in particular the BASDAI) is a key feature in the NICE criteria for anti-TNF medications for the treatment of AS in the UK. Also, many elements of the Bath Indices are a predominant feature of the assessment core set for Physiotherapy recommended by the Assessment of SpondyloArthritis International Society (ASAS) (Sieper et al, 2009). Finally, elements of the BASDAI and BAS-G are used within the AS Disease Activity Score (ASDAS) – a composite index used to assess disease activity in AS (a useful tool for clinical trials) (Lukas et al, 2009; Van der Heijde et al, 2009). Therefore, it is important that individuals standardise methods used for calculating these Bath Indices scores. To aid this, a guide in calculating each score is provided in this booklet.

In recent years there has been a move away from the original visual analog scale (VAS) and a numerical rating scale (NRS) has replaced this (Sieper et al, 2009, Wewers and Lowe, 1990). Good agreement has been found between the VAS and NRS and it is reported that patients find the NRS easier and quicker (Akad et al, 2013; Winfield et al, 2012). Within this revision we have included the revised numerical rated outcome

measure although we acknowledge that some centres will have continued to use the original 10-centimetre VAS line. For those using the VAS line method we would still stress that continued photocopying can result in a line longer than the recommended 10-centimetres and therefore care should be taken to ensure that the measurement is accurate.

Historically, NICE guidance (NICE TA143 May 2008) has stated that the commencement of Adalimumab or etanercept treatment in adults with severe AS was based on the criteria of:

- diagnosis based on the Modified New York criteria;
- failure of 2 or more non-steroidal anti-inflammatory drugs (NSAIDs);
- sustained active spinal disease demonstrated by a score of at least 4 on the BASDAI & at least 4 on the spinal pain 10cm visual analog scale (VAS) being demonstrated on 2 occasions at least 12 weeks apart with unchanged treatment.

The current guidance (NICE TA383 Feb 2016) now states:

- “Adalimumab, certolizumab pegol, etanercept, golimumab and infliximab are recommended, within their marketing authorisations, as options for treating severe active ankylosing spondylitis in adults whose disease has responded inadequately to, or who cannot tolerate, non steroidal anti inflammatory drugs.” (Recommendation 1.4)
- “Adalimumab, certolizumab pegol and etanercept are recommended, within their marketing authorisations, as options for treating **severe non radiographic axial spondyloarthritis\*** in adults whose disease has responded inadequately to, or who cannot tolerate, non steroidal anti inflammatory drugs.” (Recommendation 1.2)
- “The response to adalimumab, certolizumab pegol, etanercept, golimumab or infliximab treatment should be assessed 12 weeks after the start of treatment. Treatment should only be continued if there is clear evidence of response, defined as: a reduction in the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) score to 50% of the pre-treatment value or by 2 or more units and a reduction in the spinal pain visual analogue scale (VAS) by 2 cm or more.” (Recommendation 1.4)

- “When using BASDAI and spinal pain VAS scores, healthcare professionals should take into account any physical, sensory or learning disabilities, or communication difficulties that could affect the responses to the questionnaires, and make any adjustments they consider appropriate.” (Recommendation 1.6).

In the British Society of Rheumatology's (BSR) guidelines for axial spondyloarthritis (axSpA) it is advocated that treatment guidelines should apply to the whole spectrum of axSpA – including patients with non-radiographic axSpA (nr-axSpA). Various authors have started to investigate the broader use of the Bath Indices in the wider population such as non-radiographic axial spondyloarthritis (nr-axSpA), axial psoriatic arthritis (axPsA), paediatrics and translations for international use. In considering BASFI and BASDAI, Van Tubergen et al (2015) conclude that both content validity & measurement properties were preserved in the nr-axSpa population. Mease et al (2013) also assessed the content validity of the BASFI & BASDAI in patients with nr-axSpa via a cross-sectional cognitive interview study. The authors concluded that the findings strongly support the relevance of these outcome tools in the nr-axSpa population (Mease et al, 2013). Baraliakos et al (2014) suggest that BASDAI and ASDAS showed a similar magnitude of response on NSAID treatment in both AS and nr-axSpa and Kilic et al (2015) illustrated good correlations of the BASDAI & ASDAS scores with patients and physicians global assessment in both AS & nr-axSpa. Furthermore, Kilic et al (2014 & 2015) also reported good discriminatory ability of the BASDAI in both axPsA and nr-axSpa when patients were assigned into low and high disease activity. Within paediatrics, Grant (2012) suggests that the BASMI may be applicable and both the BASDAI & BASFI have been shown to have excellent intra-rater reliability (Batthish et al, 2012; Wong et al, 2011).

With regards to international application, the Swedish, Iranian, Hindi, Brazilian-Portuguese, Portuguese, Ukrainian, Moroccan, Tunisian, Croatian, Arabic, Korean, Chinese, Greek, Danish and Thai versions of the BASFI & BASDAI have been shown to demonstrate reliability, validity, and sensitivity to change (Cronstedt et al, 1999; Waldner et al, 1999; Kittiyanyanya et al, 2014; Bidad et al, 2012; Dhir et al, 2012; Cusmanich et al, 2012; Pimental-Santos et al, 2012; Nadashkevich et al, 2011; Rostom et al, 2010; Kchir et al, 2009; Grazio et al, 2009; Miedany et al, 2008; Park et al, 2008; Wei et al, 2007; Lin et al, 2011; Chatzitheodorou et al, 2007; Pedersen et al, 2007). The Portuguese version of the BASMI has also been assessed for validity & reliability (Pimentel-Santos et al, 2012). This supports the application of the Bath Indices to the wider international population and such a globally recognised tool is of huge benefit within the international clinical research arena.

Regarding these broader uses of the Bath Indices, it is not the purpose of this publication to provide an extensive review of this literature but to give the reader direction to further reading.

In line with electronic medical records, electronic versions of the indices have also been assessed in various population groups. Cunha-Miranda et al (2015) assessed validity & reliability of the touch-screen Portuguese version of various patient-reported outcomes including the BASDAI & BASFI in patients with Rheumatoid Arthritis and Spondyloarthritis. Celeste Elash et al (2015) compared paper and electronic versions of the BASDAI in patients with Psoriatic Arthritis. Salaffi et al (2013) assessed agreement between electronic and paper versions of the BASDAI & BASFI in patients with axial spondyloarthritis. All these authors reported good agreement between paper & electronic versions. Both Celeste Elash et al (2015) and Salaffi et al (2013) reported the electronic versions as easy, quick & preferred. Salaffi et al (2013) also highlighted that neither the individual's age, computer experience or education level had any significant impact on the results obtained; and Schefte et al (2010) state that the use of touch screens clinically is feasible and patients require no instructions. These papers therefore provide support to the application of electronic versions of the Bath Indices within the clinical setting. For those centres wishing to monitor patients via telephone appointments, Ariza-Ariza et al (2013) found that both telephone and paper versions of the BASDAI & BASFI were highly reliable in both AS and psoriatic arthritis patients.

The Bath Indices are the primary outcome measures described within this document, however since the original introduction of these measures additional outcome measures have been created. Disease specific measures have been introduced which cover further aspects such as quality of life and work issues. For additional information on both the assessment and physiotherapy management of AS and ax SpA we would recommend Module 4 – ‘The treatment of Axial Spondyloarthritis – Best practice for the management of patients’ which is available from the NASS website.

# The Bath AS Metrology Index (BASMI)

In considering metrology, the aim of the research team was

*“to determine the minimum number of clinically appropriate measurements that assess accurately axial status and from these derive a metrology index (BASMI) to define clinically significant changes in spinal movement.”*

(Jenkinson et al, 1994, p1694).

Axial status was regarded as cervical, dorsal and lumbar spine, hips and pelvic soft tissue.

Following a literature review, 5 simple clinical measurements were included in the index:

- 1) Tragus to wall distance
- 2) Lumbar side flexion
- 3) Modified Schober's
- 4) Cervical rotation
- 5) Intermalleolar distance

For cervical rotation, lumbar side flexion and tragus to wall, a mean of the left and right measurements are taken. A guide on how to obtain these measurements is given in Table 1 on the following page. Table 2 (page 6) is used to calculate the BASMI score from these measurements. The higher the BASMI score the more severe the patient's limitation of movement due to their AS.

During the development of the BASMI, the research team established that by applying a similar scoring system to the original 20-measurement metrology index, it was possible to compare the two indices. A statistically significant correlation ( $p < 0.001$ ) between the BASMI and the 20 - measurement index was shown on 2 occasions (Jenkinson et al, 1994). At the same level of significance ( $p < 0.001$ ), the BASMI also proved to be accurate and reproducible for both inter- and intra- observer variability (Jenkinson et al, 1994).

With a sample of 56 patients undergoing 3 weeks inpatient treatment, the sensitivity of the index to change was found to be significant ( $p < 0.01$ ) regardless of the disease severity (Jenkinson et al, 1994). The mean improvement in measurements was 30% in 71% of the patients. Unfortunately this was not compared with the original 20-measurement index.

These results show that the BASMI is comparable with the original 20 measurements. It is accurate and reproducible and it is sensitive to change. The BASMI is also quick and easy – taking only 7 minutes to apply.

Inter and intra – rater reliability has been explored and for repeat assessments of the same participant by the same physiotherapist, differences of BASMI of 1.0 or less are within bounds of error; and likewise, differences of 1.0 or less are within bounds of error if different physiotherapists perform the assessments. Only changes above these limits can be confidently interpreted as true clinical change (Martindale et al, 2012).

Normative values for the BASMI in a UK population have also been determined and have shown that a BASMI score of zero is not normal for a healthy population which has implications for interpretation of baseline scores for newly diagnosed patients (Chilton Mitchell et al 2013). Age related increases in total BASMI scores in healthy individuals both in UK, Dutch and Portuguese populations have also been shown (Chilton Mitchell et al 2013, Ramiro et al, 2014), which raises the issue of taking the influence of age into account and guarding against deterioration being interpreted purely as being associated with the disease process.

The guide for obtaining the individual components for the BASMI, as explained in Table 1, is based on a consensus formulated by AStretch members. We acknowledge that there are a variety of interpretations for obtaining a modified Schober's measurement of lumbar flexion. In 2012, Rezvani et al, examined three methods for measuring lumbar spine flexion in AS (original Schober test OST, modified Schobers index MSI and modified-modified Schobers Test) and compared them to radiographic analysis. The technique described in this booklet is equivalent to the modified Schobers index (MSI) as defined in this paper. They found excellent intrarater reliabilities for all three methods (OST, MSI and MMST). Of the three methods, MMST was found not to reflect lumbar spine angular motion, and although MSI reflected spinal angular movement better than OST there was only a weak correlation with radiographic analysis.

Table 1

# A Guide to Obtaining the BASMI Measurements

(Adapted by AStretch members from Jenkinson et al, 1994)

The following table is a guide for clinicians in how to obtain the five BASMI measurements in a standardised fashion. It is recognised that this represents an 'ideal' scenario that may need adapting depending on the patient's individual posture / circumstances. However,

it is recommended that any changes be carefully documented to ensure measurements are accurate each time the measurements are taken. With all measurements, the patient should be comfortable and suitably undressed.

MEASURE	STARTING POSITION	METHOD	NOTES
<b>Tragus to Wall</b>	Standing bare feet; back to wall; knees straight; scapulae, buttocks, heels against wall; shoulders level; outer edges of feet 30 cm apart & feet parallel. Ensure head in as neutral position (anatomical alignment) as possible.	Patient draws chin in as far as possible (retraction). The examiner has both eyes open and side of face against wall and measures the distance between the tragus of the ear & the wall, using a rigid ruler.	Ensure no cervical extension, rotation, flexion or side flexion occurs. Best to use a wall without a skirting board. Ensure retraction is maintained whilst both sides are measured.
<b>Lumbar Side Flexion</b>	Standing bare feet; back to wall; knees straight; scapulae, buttocks, heels against wall; shoulders level; outer edges of feet 30 cm apart & feet parallel.	Before any movement occurs, keeping arms, wrist & fingers straight and shoulders depressed measure from tip of middle finger to floor. With arms relaxed by the sides, patient reaches towards floor by side flexing and maintaining shoulder depression. Re-measure from tip of middle finger to floor. Difference between 2 measurements represents amount of side flexion. Repeat on other side.	Ensure patient keeps arms, fingers & knees straight and heels on floor. Ensure any forward flexion, extension or rotation of the trunk is avoided. Best to use a wall without a skirting board. May need to accommodate a leg length discrepancy with block under foot. (NB: Ensure all conditions are recorded for accurate measurements)
<b>Lumbar Flexion (modified Schober's)</b>	Standing with outer edges of bare feet 30 cm apart and feet in line. Examiner marks a first point midway between the Dimples of Venus, a second point is marked 10 cm above this & a third 5 cm below the first to give a 15 cm line.	Patient flexes forward from the waist with knees fully extended. The distance between the upper and lower 2 marks is measured. Any increase beyond 15 cm represents the amount of movement achieved.	At the end of the movement, you may choose to allow slight knee flexion to decrease influence of hamstrings. This should be documented.
<b>Cervical Rotation</b>	Patient supine on plinth. Forehead horizontal & head in neutral position. May need to use pillow, books or foam block to achieve this. Carefully document to ensure same set up on future re-assessments.	Use goniometer / inclinometer as per manufacturer's instructions. Patient rotates his/her head as far as possible, keeping shoulders still. Measure both sides.	Ensure no neck flexion/side flexion occurs. If good range of movement may need to lie near edge of bed to allow movement to occur.
<b>Intermalleolar Distance</b>	Patient lies supine on the floor or a wide plinth. Knees in extension.	Keeping knees straight & legs in contact with the resting surface, patient is asked to take legs as far apart as possible. Distance between the medial malleoli is measured.	Measure quickly as movement can be painful. Be ready to measure before asking patient to achieve movement.

# Calculating the scores for each of the BASMI Measurements

Historically there have been 2 tables for calculating the BASMI scores from the measurements obtained. For the purpose of this revised edition, the 2-step table devised in the original documentation for the BASMI (Jenkinson et al, 1994) has been removed. Table 2, below, is an expansion from the original table and is more commonly used in clinical practice and research. Although Nam et al (2014) suggest the 2-step table has similar sensitivity to change as the 10-step version in AS patients treated with TNF-alpha blockers, Van der Heijde et al (2008) conclude that the 10-step version is more superior in

sensitivity and is not interchangeable with the 2-step version. Also, clinically it is felt that the 10-step is more useful in identifying areas that require more focus from an exercise / manual therapy point of view. Table 2 has been recently revised by the Royal National Hospital for Rheumatic Diseases to allow for clearer clarification between each domain where there were previous overlaps of scores. The measurement obtained is found along the appropriate row and the column in which it falls provides the score. For example, a mean cervical rotation measurement of 30 degrees would give a score of 7.

**TABLE 2: CALCULATING THE SCORES FOR EACH OF THE BASMI MEASUREMENTS**

	0	1	2	3	4	5	6	7	8	9	10
<b>Tragus to Wall (cm)</b>	< 10	10 - 12.9	13 - 15.9	16 - 18.9	19 - 21.9	22 - 24.9	25 - 27.9	28 - 30.9	31 - 33.9	34 - 36.9	≥ 37
<b>Lumbar Side Flexion (cm)</b>	≥ 20	18 - 19.9	15.9 - 17.9	13.8 - 15.8	11.7 - 13.7	9.6 - 11.6	7.5 - 9.5	5.4 - 7.4	3.3 - 5.3	1.2 - 3.2	< 1.2
<b>Lumbar Flexion (modified Schober's) (cm)</b>	> 7.0	6.4 - 7.0	5.7 - 6.3	5.0 - 5.6	4.3 - 4.9	3.6 - 4.2	2.9 - 3.5	2.2 - 2.8	1.5 - 2.1	0.8 - 1.4	≤ 0.7
<b>Cervical Rotation (degrees)</b>	≥ 85	76.6 - 84.9	68.1 - 76.5	59.6 - 68	51.1 - 59.5	42.6 - 51	34.1 - 42.5	25.6 - 34	17.1 - 25.5	8.6 - 17	≤ 8.5
<b>Intermalleolar Distance (cm)</b>	≥ 120	110 - 119.9	100 - 109.9	90 - 99.9	80 - 89.9	70 - 79.9	60 - 69.9	50 - 59.9	40 - 49.9	30 - 39.9	< 30

For cervical spine rotation, tragus to wall and lumbar spine flexion, take the mean of the left and right measurements. Add together the scores for each measurement. This will

provide you with a figure out of 50. Divide this by 5 to give you the BASMI score. The higher the BASMI score the more severe the patient's limitation of movement due to their AS.



# The Bath AS Functional Index (BASFI)

The BASFI is a set of 10 questions designed to determine the degree of functional limitation in those with AS. The research team recognised that although treatment is focused on pain control and the improvement of function, the available methods of assessing function were not specific to AS and were inadequately validated. The team also state that:

*“after pain and stiffness, one of the most important complaints of patients with AS is disability.”*

(Calin et al, 1994, 2281)

The 10 questions were chosen with a major input from patients with AS. The first 8 questions consider activities related to functional anatomy. The final 2 questions assess the patient's ability to cope with everyday life.

A 10 cm visual analog scale (VAS) was used to answer the questions. The authors believed that this improved both the sensitivity of the index to change and its capacity to elicit a range of responses across the entire scale (Calin et al, 1994). As previously mentioned, this VAS has now been replaced by a numerical rating scale (NRS) in many centres. The mean of the ten scales gives the BASFI score – a value between 0 and 10.

Using a sample of 47 inpatients and 116 outpatients, the authors compared the BASFI with the Dougados functional index. Results showed that the BASFI scores

illustrated a better distribution -0 to 9.5 compared with 0 to 6.5 for Dougados and that over a 3 week treatment period the BASFI demonstrates a significant improvement whereas the Dougados score were insignificant. (Calin et al, 1994).

When patients were assessed on their actual performance of eight items from the BASFI representing activities of daily life, adequate to excellent test-retest reproducibility was shown (van Weely et al, 2009). A significant association between the BASMI and BASFI has also been demonstrated (Sieper et al, 2009) indicating the importance of spinal mobility on an individual's functional status.

To conclude, the BASFI is quick, easy, reliable and sensitive to change across the whole disease spectrum (Calin et al, 1994).

# The BASFI Score

Please read each question and circle the box you feel is the most appropriate to describe how severe your condition has been in the last week. Please only circle one box for each question. There is no wrong answer.

1. Putting on your socks or tights without help or aids (eg, sock aid).

Score out of 10

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

2. Bending forward from the waist to pick up a pen from the floor without an aid.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

3. Reaching up to a high shelf without help or aids (eg, helping hand).

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

4. Getting up out of an armless dining room chair without using your hands or any other help.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

5. Getting up off the floor without help from lying on your back.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

6. Standing unsupported for 10 min without discomfort.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

7. Climbing 12 to 15 steps without using a handrail or walking aid. One foot at each step.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

8. Looking over your shoulder without turning your body.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

9. Doing physically demanding activities (eg, physiotherapy, exercises, gardening or sports).

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

10. Doing a full day's activities, whether it be at home or at work.

None  0  1  2  3  4  5  6  7  8  9  10 *Impossible*

For clinician use only

BASFI Score

## BASFI Score Calculation

Add all scores from questions 1 -10 and divide by 10.

The higher the BASFI score, the more severe the patient's limitation of function due to their AS.

Adapted from Calin et al. J Rheumatol. 1994 Dec;21(12):2281-5.

# The Bath AS Disease Activity Index (BASDAI)

The research team identified that no gold standard was available for measuring disease activity in AS. The authors acknowledged research, from the RNHRD, that identified fatigue as a major component of AS.

(Garrett et al, 1994)

It was therefore suggested that fatigue should be incorporated into measures of disease activity. The BASDAI was subsequently developed. As with the functional index, the research team included major input from patients with AS, to enhance clinical relevance and disease specificity.

Like the BASFI, the BASDAI consists of 10 cm VAS used to answer 6 questions pertaining to the 5 major symptoms of AS: Fatigue; Spinal pain; Joint pain / swelling; Areas of localized tenderness; Morning stiffness. As previously mentioned, this VAS has now been replaced by a numerical rating scale (NRS) in many centres.

To give each symptom equal weighting, the mean of the two scores relating to morning stiffness is taken. The resulting 0 to 50 score is divided by 5 to give a final 0 – 10 BASDAI score.

When clinically tested, results showed:

- 1) BASDAI to be a quick and simple index (taking between 30 secs and 2 mins to complete).
- 2) BASDAI demonstrated statistically significant ( $p < 0.001$ ) reliability.
- 3) The individual symptoms and the index as a whole demonstrated good score distribution, using 95% of the scale.
- 4) Following a 3 week physiotherapy course, the BASDAI showed a significant ( $p = 0.009$ ) 16.4% score improvement, therefore demonstrating a sensitivity to change.

(Garrett et al, 1994).

By comparison, a previous disease activity index did demonstrate greater sensitivity to change (22.8% improvement being shown) (Garrett et al, 1994).

However, the authors recognised that the previous index had a bias towards pain and included a scale measuring the patient's sense of well being. It is felt that the BASDAI is superior in terms of symptoms considered and their weighting. This may be due to the input from patients with AS when the index was developed. The BASDAI was also found to be superior in all aspects to the Newcastle Enthesis Index (Garrett et al, 1994).

Calin et al (1999) have further assessed the validity of the BASDAI. With a sample size of 473, a double-blind, placebo-controlled study of 6 weeks duration was conducted. Subjects were divided into two groups. One group received a placebo. The other group received an active NSAID. Disease activity was assessed with the BASDAI and by analysing a wide range of individual symptom components. The authors concluded that the BASDAI has excellent content validity.

To conclude, the BASDAI is user friendly, highly reliable, reflects the entire spectrum of the disease and is sensitive to clinical changes (Garrett et al, 1994)

# The BASDAI Score

Please read each question and circle the box you feel is the most appropriate to describe how severe your condition has been in this area. **Each question relates to how you have felt in the past week.** Please only circle one box for each question. There is no wrong answer.

1. How would you describe the overall level of fatigue/tiredness you have experienced? Score out of 10  
None  0  1  2  3  4  5  6  7  8  9  10 *Very severe*

2. How would you describe the overall level of AS neck, back or hip pain you have had?  
None  0  1  2  3  4  5  6  7  8  9  10 *Very severe*

3. How would you describe the overall level of pain/swelling in joints other than the neck, back or hips?  
None  0  1  2  3  4  5  6  7  8  9  10 *Very severe*

4. How would you describe the overall level of discomfort you have had from any tender areas to touch or pressure?  
None  0  1  2  3  4  5  6  7  8  9  10 *Very severe*

5. How would you describe the overall level of morning stiffness you have had from the time you wake up?  
None  0  1  2  3  4  5  6  7  8  9  10 *Very severe*

6. How long does your morning stiffness last from the time you wake up?  
None  0  1  2  3  4  5  6  7  8  9  10 *2 or more hours*   
*1 hour*

*For clinician use only*

*BASDAI Score*

## Calculating the BASDAI

A. Add scores for questions 1 – 4

B. Calculate the mean for questions 5 and 6

C. Add A and B and divide by 5

The higher the BASDAI score, the more severe the patient's disability due to their AS.

1. Adapted from Garrett et al. J Rheumatol 1994 21; 2286-91 2. Sieper, J et al. Ann Rheum Dis.2009,68:ii1-ii44

# The Bath AS Patient Global Score (BAS-G)

The BAS-G is essentially an objective way of asking the question:

*“How have you been over the last x months?”*

(Jones et al, 1996)

Jones et al (1996) argue that the BAS-G reflects the effect of AS on the patient's well being. As previously mentioned this VAS has now been replaced by a numerical rating scale (NRS) in many centres.

The BAS-G consists of two questions which ask patients to indicate, on a 10cm VAS, the effect the disease has had on their well being over the

- last week
- last 6 months.

The mean of the 2 scores gives a BAS-G score of 0 – 10 (refer to page 15). The higher the score, the greater the perceived effect of the disease on the patient's well being. As previously mentioned, this VAS has now been replaced by a numerical rating scale (NRS) in many centres.

With a sample of 177 inpatients and 215 patients reached by a postal survey, the authors found that:

- 1) BAS-G scores covered the whole 0 – 10 scale for both time frames (1 week and 6 months).
- 2) BAS-G correlated well with both BASDAI and BASFI. This suggests that disease activity and functional ability play a major role in patients' well being – more than metrology.

3) Of the 5 BASDAI items, spinal pain followed by fatigue correlated best with BAS-G. This highlights the importance of pain and fatigue to the patient.

4) BAS-G demonstrated statistically significant ( $p < 0.001$ ) sensitivity to change.

(Jones et al, 1996).

The authors acknowledged that BAS-G cannot stand alone, and should be one element of a complete assessment. However, an index of this type provides a numerical value to the patient's sense of well being. This allows for comparison between consultations, especially when patients may not necessarily be seen by the same clinician on each occasion.

The authors conclude that they have formalised and validated a simple, frequently asked question (Jones et al, 1996).

Question 1 of the BAS-G is used to calculate the ASDAS as stated in the introduction.

# The BAS-G Score

Please read the question below and circle the box you feel is most appropriate to describe the effect your disease has had on your well being over the last week. Please only circle one box for each question. There is no wrong answer.

1. Please use the scale below to indicate the effect your disease has had on your well being over the last week.

Score out of 10

None  0  1  2  3  4  5  6  7  8  9  10  Very severe

2. Please use the scale below to indicate the effect your disease has had on your well being over the last six months.

None  0  1  2  3  4  5  6  7  8  9  10  Very severe

*For clinician use only*

*BAS-G Score*

Add scores and divide by 2. This is the BAS-G score. The higher the BAS-G score, the more severe the effect of AS on the patient's life.

# References

- Akad, Kivanc; Solmaz, Dilek; Sari, Ismail; Onen, Fatos; Akkoc, Nurullah; Akar, Servet (2013) Performance of response scales of activity and functional measures of ankylosing spondylitis: numerical rating scale versus visual analog scale. *Rheumatology international*, Oct 2013, vol. 33, no. 10, p. 2617-2623
- Ariza-Ariza, Rafael; Hernández-Cruz, Blanca; Navarro-Compán, Victoria; Leyva Pardo, Christian; Juanola, Xavier; Navarro-Sarabia, Federico (2013) A comparison of telephone and paper self-completed questionnaires of main patient-related outcome measures in patients with ankylosing spondylitis and psoriatic arthritis. *Rheumatology international*, vol. 33, no. 11, p. 2731-2736
- Baraliakos X.; Kiltz U.; Heldmann F.; Appel H.; Dybowski F.; Igelmann M.; Kalthoff L.; Krause D.; Menne H.-J.; Saracbası E.; Schmitz-Bortz E.; Braun J. (2014) Different performance of the major disease activity measures asdas and basdai in patients with axial spondyloarthritis treated with non-steroidal anti-inflammatory agents (NSAIDs)-results from a prospective study *Annals of the Rheumatic Diseases*, June 2014, vol./is. 73(no pagination)
- Batthish M.; Rachlis A.; Wong B.; Stevens S.; Anderson M.; Feldman B.M.; Laxer R.M.; Marcuz J.; Reaume M.; Spiegel L.; Whitney-Mahoney K.; Tse S.M.L. (2012) Intra-rater reliability of the bath ankylosing spondylitis disease activity index (BASDAI) and the bath ankylosing spondylitis functional index (BASFI) in children with spondyloarthritis *Pediatric Rheumatology*, July 2012, vol./is. 10(no pagination), 1546-0096
- Bidad, Katayoon; Fallahi, Sasan; Mahmoudi, Mahdi; Jamshidi, Ahmadrza; Fahadi, Elham; Meysamie, Alipasha; Nicknam, Mohammad Hossein (2012) Evaluation of the Iranian versions of the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), the Bath Ankylosing Spondylitis Functional Index (BASFI) and the Patient Acceptable Symptom State (PASS) in patients with ankylosing spondylitis. *Rheumatology international*, Nov 2012, vol. 32, no. 11, p. 3613-3618
- Calin, A., et al. (1994) A new approach to defining functional ability in ankylosing spondylitis: The development of the Bath Ankylosing Spondylitis Functional Index (BASFI), *Journal of Rheumatology*, Vol 21, 2281-5
- Calin, A., et al. (1999) Defining disease activity in ankylosing spondylitis: is a combination of variables (Bath Ankylosing Spondylitis Disease Activity Index) an appropriate instrument? *Rheumatology (Oxford)*, Vol 38 (9), 878-82.
- Castro, M, Strebings, S, Milosavljevic, S, Bussey, M. Croterion-concurrent validity of spinal mobility tests in ankylosing spondylitis: a systematic review of the literature. *J Rheumatol* (2015): 42(2):243-51
- Celeste Elash C.A.; Tiplady B.; Turner-Bowker D.M.; Cline J.; DeRosa M.; Scanlon M. (2015) Equivalence of paper and electronic administration of patient reported outcomes: A comparison in psoriatic arthritis *Value in Health*, vol./is. 18/7(A342), 1098-3015
- Chatzitheodorou D.; Kabitsis C.; Papadopoulos N.G.; Galanopoulou V. (2007) Evaluation of the Greek version of the Bath Ankylosing Spondylitis Functional Index: Reliability, validity, and factor analysis *Clinical and Experimental Rheumatology*, July 2007, vol./is. 25/4(571-576), 0392-856X
- Chilton-Mitchell, L, Martindale, J, Hart, A, Goodacre, L. Normative values for the Bath Ankylosing Spondylitis Metrology Index in a UK population *Rheumatology* 2013; doi: 10.1093/rheumatology/ket272
- Cronstedt, H., et al. (1999) The Swedish version of the Bath Ankylosing Spondylitis Functional Index. Reliability and validity. *Scand J Rheumatology*, Vol 111 (suppl), 1-9
- Cunha-Miranda, Luís; Santos, Helena; Miguel, Cláudia; Silva, Cândida; Barcelos, Filipe; Borges, Joana; Trinca, Ricardo; Vicente, Vera; Silva, Tiago (2015) Validation of Portuguese-translated computer touch-screen questionnaires in patients with rheumatoid arthritis and spondyloarthritis, compared with paper formats. *Rheumatology international*, vol. 35, no. 12, p. 2029-2035
- Cusmanich, Karla Garcez; Kowalski, Sérgio Candido; Gallinaro, Andréa Lopes; Goldenstein-Schainberg, Claudia; Souza, Lilian Avila Lima E; Gonçalves, Célio Roberto (2012) Cross-cultural adaptation and validation of the Brazilian-Portuguese version of the Bath Ankylosing Spondylitis Functional Index (BASFI). *Revista brasileira de reumatologia*, Oct 2012, vol. 52, no. 5, p. 733-741
- Dhir, Varun; Kulkarni, Sujay; Adgaonkar, Ashish; Dhobe, Poornima; Aggarwal, Amita (2012) Translation, cultural adaptation, and validation of the Bath questionnaires and HAQ-S in Hindi for Indian patients with ankylosing spondylitis. *Clinical rheumatology*, Oct 2012, vol. 31, no. 10, p. 1511-1515
- El Miedany Y.; Youssef S.; Mehanna A.; Shebrya N.; Gamra S.A.; El Gaafary M. (2008) Defining disease status in ankylosing spondylitis: Validation and cross-cultural adaptation of the Arabic Bath Ankylosing Spondylitis Functional Index (BASFI), the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), and the Bath Ankylosing Spondylitis Global score (BASG) *Clinical Rheumatology*, May 2008, vol./is. 27/5(605-612), 0770-3198
- Garret, S., et al. (1994) A new approach to defining disease status in Ankylosing Spondylitis: The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI). *Journal of Rheumatology*, Vol 21, 2286-91
- Grazio S.; Grubisic F.; Nemicic T.; Matijevic V.; Skala H. (2009) The reliability and validity of a Croatian version of bath ankylosing spondylitis functional index and bath ankylosing spondylitis disease activity index in patients with ankylosing spondylitis *Clinical and Experimental Rheumatology*, 2009, vol./is. 27/5(724), 0392-856X
- Grant C. (2012) Bath ankylosing spondylitis metrology index in the paediatric population *Rheumatology (United Kingdom)*, vol./is. 51(viii4-viii5), 1462-0324
- Hamilton, L., N Barkham, A Bhalla, R Brittain, D Cook, G Jones, K Mackay, D Marshall, H Marzo-Ortega, D Murphy, C Riddell, R Sengupta, S Siebert, L Van Rossen, K Gaffney on behalf of the British Society for Rheumatology Standards, Guidelines and Audit Working Group (SAGWG). (2015) BSR Guideline – biologics for the treatment of axial spondyloarthritis (including ankylosing spondylitis). [http://www.rheumatology.org.uk/includes/documents/cm\\_docs/2015/o/open\\_consultation\\_biologics\\_as\\_full\\_gl\\_draft.pdf](http://www.rheumatology.org.uk/includes/documents/cm_docs/2015/o/open_consultation_biologics_as_full_gl_draft.pdf) Version 1.4 Aug 20 2015
- Jenkinson, T. R. et al. (1994) Defining spinal mobility in ankylosing spondylitis (AS): The Bath AS Metrology Index. *Journal of Rheumatology*, Vol 21, 1694-8
- Jones, S.D., A. Steiner, S.L. Garrett & A. Calin. (1996). The Bath Ankylosing Spondylitis Patient Global Score (BAS-G). *British Journal of Rheumatology*, Vol 35, 66 – 71
- Kchir M.M.; Hamdi W.; Kochbati S.; Azzouz D.; Daoud L.; Saadellouki K.; Ghannouchi M.M.; Kaffel D.; Ben Hamida A.; Zouari B. (2009) Validation of the Tunisian versions of Bath Ankylosing Spondylitis Functional Index (BASFI) and Disease Activity Index (BASDAI) *La Tunisie medicale*, August 2009, vol./is. 87/8(527-530), 0041-4131
- Kilic, Erkan; Kilic, Gamze; Akgul, Ozgur; Ozgocmen, Salih (2015) Discriminant validity of the Ankylosing Spondylitis Disease Activity Score (ASDAS) in patients with non-radiographic axial spondyloarthritis and ankylosing spondylitis: a cohort study. *Rheumatology international*, vol. 35, no. 6, p. 981-989
- Kilic G.; Kilic E.; Nas K.; Karkucak M.; Capkin E.; Dagli A.Z.; Cevik R.; Ozgocmen S. (2014) Validity of ASDAS and BASDAI as a measure of disease activity in axial psoriatic arthritis *Clinical and Experimental Rheumatology*, vol./is. 32/5(788), 0392-856X
- Kittiyanyanya C.; Chaiamnuay S.; Asavatanabodee P.; Narongroeknawin P.(2014) Reliability and validity of the Thai version of bath ankylosing spondylitis indices *Journal of the Medical Association of Thailand*, vol./is. 97/4(381-385)
- Lin Z(1), Gu J, He P, Gao J, Zuo X, Ye Z, Shao F, Zhan F, Lin J, Li L, Wei Y, Xu
- M, Liao Z, Lin Q. (2011) Multicenter validation of the value of BASFI and BASDAI in Chinese ankylosing spondylitis and undifferentiated spondyloarthropathy patients. *Rheumatol Int*. 2011 Feb;31(2):233-8. doi: 10.1007/s00296-009-1313-9.
- Lukas, C., Landewe, R., Sieper, J., Dougados, M., Davis, J., Braun, J., van der Linden, S. & van der Heijde, D. (2009) Development of an ASAS-endorsed disease activity score (ASDAS) in patients with ankylosing spondylitis. *Ann Rheum Dis* 68: 18 - 24
- Martindale, J, Sutton, C, Goodacre, L. An exploration of the inter- and intra-rater reliability of the Bath Ankylosing Spondylitis Metrology Index. *Clinical Rheumatology: Volume 31, Issue 11* (2012), Page 1627-1631. DOI: 10.1007/s10067-012-2057-6
- Mease PJ.; Rao S.A.; Joshi A.D.; Clifford S.; Vernon C.; Cifaldi M.A. (2013) Quality of life, physical function and symptoms in non-radiographic axial spondyloarthritis: The patient perspective *Arthritis and Rheumatism*, October 2013, vol./is. 65/(S1053), 0004-3591
- Nadashkevich, Oleg; Masyk, Oleksiy (2011) Translation and validation of the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) and the Bath Ankylosing Spondylitis Functional Index (BASFI) for use in Ukraine. *Clinical rheumatology*, Oct 2011, vol. 30, no. 10, p. 1305-1310
- Nam E.J.; Eun J.S.; Kwon S.H.; Kang Y.M (2014) The clinimetric outcomes of two bath ankylosing spondylitis metrology indices in treatment with TNF- $\alpha$  blockers *Arthritis and Rheumatology*, vol./is. 66/(S260-S261), 2326-5191
- Park H.-J.; Kim S.; Lee J.-E.; Jun J.-B.; Bae S.-C. (2008) The reliability and validity of a Korean translation of the BASDAI in Korean patients with ankylosing spondylitis *Value in Health*, March 2008, vol./is. 11/SUPPL. 1(S99-S104), 1098-3015;1524-4733
- Pedersen O.B.; Hansen G.O.; Svendsen A.J.; Ejstrup L.; Junker P. (2007) Adaptation of the Bath measures on disease activity and function in ankylosing spondylitis into Danish Scandinavian *Journal of Rheumatology*, 2007, vol./is. 36/1(22-27), 0300-9742;1502-7732
- Pimentel-Santos, F M; Pinto, T; Santos, H; Barcelos, A; Cunha, I; Branco, J C; Ferreira, P L (2012) Portuguese version of the bath indexes for ankylosing spondylitis patients: a cross-cultural adaptation and validation. *Clinical rheumatology*, Feb 2012, vol. 31, no. 2, p. 341-346
- Rezvani A(1), Ergin O, Karacan I, Oncu M. (2012) Validity and reliability of the metric measurements in the assessment of lumbar spine motion in patients with ankylosing spondylitis. *Spine* 37 (19);E1189 – E1196
- Rostom S.; Benbouazza K.; Amine B.; Bahiri R.; Yacoub Y.I.; Alla S.A.O.; Abouqal R.; Hajjaj-Hassouni N. (2010) Psychometric evaluation of the Moroccan version of the Bath Ankylosing Spondylitis Functional Index (BASFI) and Bath ankylosing spondylitis Disease Activity Index (BASDAI) for use in patients with ankylosing spondylitis *Clinical Rheumatology*, July 2010, vol./is. 29/7(781-788), 0770-3198
- Rouf, J., Stuck, G., (1999) Comparison of the Dougados Functional Index and the Bath Ankylosing Spondylitis Functional Index. A literature review. *Journal of Rheumatology*, Vol 26 (4), 955-60
- Salaffi F.; Gasparini S.; Ciapetti A.; Gutierrez M.; Grassi W (2013) Usability of an innovative and interactive electronic system for collection of patient-reported data in axial spondyloarthritis: Comparison with the traditional paper-administered format *Rheumatology (United Kingdom)*, vol./is. 52/11(2062-2070),
- Scheffe, David B; Hetland, Merete L (2010) An open-source, self-explanatory touch screen in routine care. Validity of filling in the Bath measures on Ankylosing Spondylitis Disease Activity Index, Function Index, the Health Assessment Questionnaire and Visual Analogue Scales in comparison with paper versions. *Rheumatology (Oxford, England)*, Jan 2010, vol. 49, no. 1, p. 99-104
- Sieper J, M Rudwaleit, X Baraliakos, J Brandt, J Braun, R Burgos-Vargas, M Dougados, K-G Hermann, R Landewe, W Maksymowych and D van der Heijde (2009) The assessment of SpondyloArthritis international Society (ASAS) handbook: a guide to assess spondyloarthritis. *Ann Rheum Dis* (2009): 68 (Suppl 11) :i44. doi:10.1136/ard.2008.104048
- Sieper J.; Singh A.; Freundlich B.; Koenig A.S.; Li W (2009) Axial metrology measurement and functional status in ankylosing spondylitis *Arthritis and Rheumatism*, 2009, vol./is. 60/(1767), 0004-3591
- Van Der Heijde D.; Landewe R.; Feldtkeller E (2008) Proposal of a linear definition of the Bath Ankylosing Spondylitis Metrology Index (BASMI) and comparison with the 2-step and 10-step definitions *Annals of the Rheumatic Diseases*, April 2008, vol./is. 67/4(489-493), 0003-4967
- Van der Heijde, D, Lie, E., Kvien, T.K., Sieper, J., van den Bosch, F, Listing, J., Braun, J. & Landewe, R. (2009) ASDAS, a highly discriminatory ASAS-endorsed disease activity score in patients with ankylosing spondylitis. *Ann Rheum Dis* 68: 1811 – 1818.
- van Tubergen A(1), Black PM(2), Coteur G(3) (2015) Are patient-reported outcome instruments for ankylosing spondylitis fit for purpose for the axial spondyloarthritis patient? A qualitative and psychometric analysis. *Rheumatology (Oxford)*. 2015 Oct;54(10):1842-51. doi:10.1093/rheumatology/kev125.
- van Weely S.F.; van Denderen C.J.; van der Horst-Bruinsma I.E.; Nurmohamed M.T.; Dijkmans B.A.; Dekker J.; Steultjens M.P. (2009) Reproducibility of performance measures of physical function based on the BASFI, in ankylosing spondylitis. *Rheumatology*, Vol 48 (10), 1254-1260
- Waldner, A., et al. (1999) The Swedish version of the Bath Ankylosing Spondylitis Disease Activity Index. Reliability and Validity. *Scand J Rheumatology*, Vol 111 (suppl), 10 – 16
- Wei J.C.-C.; Wong R.-H.; Huang J.-H.; Yu C.-T.; Chou C.-T.; Jan M.-S.; Tsay G.J.; Chou M.-C.; Lee H.-S. (2007) Evaluation of internal consistency and re-test reliability of Bath ankylosing spondylitis indices in a large cohort of adult and juvenile spondylitis patients in Taiwan *Clinical Rheumatology*, October 2007, vol./is. 26/10(1685-1691), 0770-3198
- Wewers, M and Lowe, N. A critical review of visual analogue scales. *Res Nus Health* 1990; 13: 227-36
- Winfield R.A.; Dyke C.; Clemence M.; Mackay K. (2012) Basdai: It is easier and quicker to use numeric rating scales rather than visual analogue scales *Rheumatology (United Kingdom)*, May 2012, vol./is. 51/(iii88), 1462-0324
- Wong B.; Batthish M.; Rachlis A.L.; Stephens S.; Anderson M.; Feldman B.; Laxer R.; Marcuz J.; Reaume M.; Spiegel L.; Whitney K.; Tse S. (2011) Intra-rater reliability of the bath ankylosing spondylitis disease activity index (BASDAI) and the bath ankylosing spondylitis functional index (BASFI) in children with spondyloarthritis *Reumatologia Clinica Suplementos*, January 2011, vol./is. 7/(19), 1886-3604



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