

THE BATH AS METROLOGY INDEX (BASMI)

(Jenkinson et al, 1994)

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) cervical rotation
- 2) tragus to wall distance
- 3) lumbar side flexion
- 4) modified Schober's
- 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 in how to obtain these measurements is given in table one on page 8. There are two tables available for calculating BASMI scores from these measurements; these are explained on pages 9 & 10 of this booklet. The higher the BASMI score the more severe the patient's limitation of movement due to their AS.

By applying a similar scoring system to the original 20-measurement metrology index, the research team was able 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 to apply – taking only 7 minutes.

Table One: 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 enable measurements to be reproducible. With all measurements, the patient should be comfortable and suitably undressed.

Measure	Starting Position	Method	Notes
Lumber Side Flexion	Standing bare feet; back to wall; knees straight; scapulae, buttocks, heels against wall; shoulders level; outer edges of feet 30cm apart & feet parallel.	Before any movement occurs, keeping arms, wrist & fingers straight, measure from tip of middle finger to floor. With palms placed on lateral aspect of thighs, patient reaches towards floor by side flexing. Re-measure from tip of middle finger to floor. Difference between 2 measurements represents amount 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.
Tragus to Wall	Maintain same starting position as above. Ensure head in as neutral position (anatomical alignment) as possible.	Patient draws chin in as far as possible (retraction). With both eyes open and side of face against wall, examiner 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.
Lumbar Flexion (modified Schober's)	Standing with outer edges of bare feet 30cm apart and feet in line. Examiner marks a point midway along a line level with the iliac crests (at the L4/5 junction). A second point is marked 10cm above this & a third 5cm below the first to give a 15cm 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 15cm 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.
Intermalleolar Distance	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.
Cervical Rotation	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 manufacturers 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 ROM may need to lie near edge of bed to allow movement to occur.

Tables two and three: Calculating the scores for each of the BASMI measurements

As previously mentioned, there are two tables available for calculating the BASMI scores from the measurements obtained. The first table shown below (table two) is that used in the original documentation for the BASMI (Jenkinson et al, 1994). The second (table three) has since been developed at Bath and is an expansion on the first. For both tables 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 1 in table two and a score of 7 in table three. Clinicians must be consistent in which table they choose to use – this should be documented.

Table Two

	Mild 0	Moderate 1	Severe 2
Cervical rotation (Mean of L & R)	> 70 degrees	20 –70 degrees	< 20 degrees
Tragus to wall (Mean of L & R)	< 15cm	15 – 30 cm	> 30 cm
Lumbar side flexion (Mean of L & R)	> 10cm	5 – 10 cm	< 5 cm
Lumbar flexion (modified schobers)	> 4 cm	2 – 4 cm	< 2 cm
Intermalleolar distance	> 100cm	70 – 100 cm	< 70 cm

Add the 0, 1, 2 scores for each of the five measurements using the table above (the mean for cervical spine rotation counting as one score and similarly for tragus to wall & lumbar spine side flexion). This will provide you with a figure out of 10. This is the BASMI score. The higher the BASMI score the more severe the patient's limitation of movement due to their AS.

Table Three

	0	1	2	3	4	5	6	7	8	9	10
Tragus to wall (cm)	≤ 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
Lumbar Flexion (cm)	≥ 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
Intermalleolar distance (cm)	≥ 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
Cervical Rotation (degrees)	≥ 85	76.6–85	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
Lumbar Side Flexion (cm)	≥ 20	18–20	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

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.