Brunel Balance Assessment (BBA)

Dr Sarah Tyson,
Research Physiotherapist
University of Salford

First edition - published 2004

ACKNOWLEDGMENTS
Dr Tyson would like to thank Brunel University, Professor De Souza and Trustech for their support in the generation of the Brunel Balance Assessment and their co-operation in the production of this publication.

For further information contact Dr Sarah Tyson
Centre for Research and Human Performance Research, University of Salford,
Allerton Annexe, Frederick Rd Campus, Salford M6 6PU.
Tel 0161 295 7028, e-mail : s,tyson@salford.ac.uk
website http://www.healthcare.salford.ac.uk/crhpr/

CONTENTS

Introduction 3
Development of BBA 3
How the BBA works 3
How to test a patient ....
Case Example using the BBA 4

Brunel Balance Assessment Testing Instructions
Section 1: Sitting
Level 1: Supported sitting 7
Level 2: Static sitting balance 8
Level 3: Dynamic sitting balance 9
Section 2: Standing11
Level 4: Supported standing 10
Level 5: Static standing balance 11
Level 6: Dynamic standing balance 12
Section 3: Stepping
Level 7: Static double stance 13
Level 8: Supported single stance 14
Level 9: Dynamic double stance 15
Level 10: Changing the base of support between double and single stance 17
Level 11: Dynamic single stance 18
Level 12: Changing the base of support 19

Scoring sheet
Brunel Balance Assessment Score Sheet 20

Appendices
Appendix 1: Publications and presentations on the BBA 21
Appendix 2: References 22

INTRODUCTION

Development of the BBA

The Brunel Balance Assessment (BBA) is designed to assess functional balance for people with a wide range of abilities and has been tested specifically for use post-stroke.

There are already many ways of measuring balance, but none are suitable for use in the clinical setting to assess the effects of individual rehabilitation interventions or to measure change over a short term. Ordinal scales such as the Berg Balance or Motor Assessment Scales lack sensitivity[1]. Functional performance tests such as timed walk tests are only suitable for people with a narrow range of abilities[2]. Instrumented measures such as weight distribution or postural sway monitors are expensive, only suitable for a narrow range of abilities and of doubtful reliability and validity[3].

The Brunel Balance Assessment has been designed to fulfil the criteria that make it suitable for using the clinical setting. It is drawn from, and is reflective of, clinical practice[4], reliable, valid and sensitive to change[5,6]. It is also cheap, quick and simple to use, and it allows the tester to have their hands free to assist the patient as necessary. It can be used in the hospital bedside, treatment area or client's home.

How the BBA works

The BBA consists of a hierarchical series of functional performance tests that range from supported sitting balance to advanced stepping tasks. There are **three sections** to the assessment: sitting, standing and stepping.

Each section can be used either individually or together. The sections are divided into several **levels** each of which increase the demand on balance ability, ranging from assisted balance to moving within the base of support, and changes of the base of support.

At each level, the patient receives a score for his/her efforts. This gives an indication on whether the patient is improving within a level, even if he/she is not able to progress to the next level. The score also reflects how well the individual is functioning within that section e.g. sitting, standing or stepping.

How to test a patient

- The patient performs each test in turn until they get to the level that is the limit of their abilities.
- As the items on the scale are hierarchical, testing can start at a level that is reasonable for the subject. For example, if you know the subject can walk then you can assume he can pass all the sitting tests and can start with the standing or stepping tests.
- For each test there is a minimal level of performance required for the patient to 'pass' at that level.
- If the patient has been unable to achieve this minimal level after three attempts then testing should cease.
- When the patient is unable to progress to the next level, the score within the level can be used as a measure of performance.

CASE EXAMPLE USING THE BBA

Patient history

Mrs S is a 79-year-old woman with an eight-week history of right hemiplegia and sensory impairment following a left cerebral infarct.

Motricity index for the right leg was 43/100 indicating that she had movement through part of range but not against gravity in the hip, knee and ankle.

Proprioception in the leg was normal but sensation to light touch was impaired.

She had a Barthel Index was 8/20 indicating severe dependence in activities of daily living (ADL).

Use of the BBA

a) Baseline assessment

Her initial Brunel Balance Assessment Score was 3/12 indicating that she had dynamic sitting balance but was unable to stand (Figure 1). This was tested using the sitting forward reach test, which she passed with a score of 22cm, and this was used as a day-to-day measure of her progress.

b) Assessment at one week

A week later her Brunel Balance Assessment score was still 3 but her dynamic sitting balance had improved as the forward reach score had increased to 42 cm (Figure 2).

c) Assessment at one month

At reassessment a month later the Brunel Balance Assessment score had improved to 5 indicating that she had static standing balance and now the standing arm raise test was used as the day-to-day measure (Figure 3).

Figure 1: Baseline assessment

Level		Score Attempt number: 1		2		3		Pass (Y/N)	Pass criteria (after up to 3 attempts)
1	Supported Sitting - Timed test	40 s		N/A		N/A		Y	Sit supported for 30s
2	Static sitting - Sitting arm raise test	9 lifts		N/A		N/A		Y	3 or more arm lifts in 15s
3	Dynamic sitting - Sitting forward reach test	24 cm	23 cm	N/A	N/A	N/A	N/A	Y	Reach forward more than 7cm (average of 2 readings)
		22 cm		N/A		N/A			
4	Supported standing – Timed test	10s		30s Support required		20s		N	Stand supported for 30s
5	Static standing balance - Standing arm raise test								3 or more arm lifts in 15s
6	Dynamic standing - Standing forward reach test								Reach forward more than 5cm (average of 2 readings)
7	Static double stance - Timed step standing test								Static step standing for 30s
8	Supported single stance - walking <u>with</u> an aid								Walk 5m within 1min (average of 2 readings)
9	Dynamic double stance - Weight shift test								3 or more shifts within 15s
10	Changing base of support - walking <u>without</u> an aid								Walk 5m within 1min (average of 2 readings)
11	Dynamic single stance - Tap test								2 or more taps within 15s
12	Changing the base of support - Step-up test								1 or more step-up(s) within 15s

Figure 2: Assessment at 1 week

Level		Score Attempt number: 1		2		3		Pass (Y/N)	Pass criteria (after up to 3 attempts)
1	Supported Sitting - Timed test	50s		N/A		N/A		Y	Sit supported for 30s
2	Static sitting - Sitting arm raise test	11 lifts		N/A		N/A		Y	3 or more arm lifts in 15s
3	Dynamic sitting - Sitting forward reach test	43 cm	47 cm	N/A	N/A	N/A	N/A	Y	Reach forward more than 7cm (average of 2 readings)
		45 cm		N/A		N/A			
4	Supported standing – Timed test	15s		20s		20s		N	Stand supported for 30s
5	Static standing balance - Standing arm raise test								3 or more arm lifts in 15s
6	Dynamic standing - Standing forward reach test								Reach forward more than 5cm (average of 2 readings)
7	Static double stance - Timed step standing test								Static step standing for 30s
8	Supported single stance - walking <u>with</u> an aid								Walk 5m within 1min (average of 2 readings)
9	Dynamic double stance - Weight shift test								3 or more shifts within 15s
10	Changing base of support - walking <u>without</u> an aid								Walk 5m within 1min (average of 2 readings)
11	Dynamic single stance - Tap test								2 or more taps within 15s
12	Changing the base of support - Step-up test								1 or more step-up(s) within 15s

Figure 3: Assessment at 1 month

Level		Score Attempt number: 1		2		3		Pass (Y/N)	Pass criteria (after up to 3 attempts)
1	Supported Sitting - Timed test	70s		N/A		N/A		Y	Sit supported for 30s
2	Static sitting - Sitting arm raise test	9 lifts		N/A		N/A		Y	3 or more arm lifts in 15s
3	Dynamic sitting - Sitting forward reach test	40 cm	44 cm	N/A	N/A	N/A	N/A	Y	Reach forward more than 7cm (average of 2 readings)
		42 cm		N/A		N/A			
4	Supported standing – Timed test	50s		N/A		N/A		Y	Stand supported for 30s
5	Static standing balance - Standing arm raise test	5 Support required		7		N/A		Y	3 or more arm lifts in 15s
6	Dynamic standing - Standing forward reach test	4 cm	4 cm	4cm	5cm	3cm	5cm	N	Reach forward more than 5cm (average of 2 readings)
		4cm		4.5cm		4cm			
7	Static double stance - Timed step standing test								Static step standing for 30s
8	Supported single stance - walking <u>with</u> an aid								Walk 5m within 1min (average of 2 readings)
9	Dynamic double stance - Weight shift test								3 or more shifts within 15s
10	Changing base of support - walking <u>without</u> an aid								Walk 5m within 1min (average of 2 readings)
11	Dynamic single stance - Tap test								2 or more taps within 15s
12	Changing the base of support - Step-up test								1 or more step-up(s) within 15s

BRUNEL BALANCE ASSESSMENT TESTING INSTRUCTIONS

SECTION 1: SITTING

Level 1: Supported sitting –Timed Test

Summary
In this test, the subject is asked to sit with upper limb support (i.e. taking weight through their arms or holding on) for at least 30 seconds.

Equipment:	Plinth or suitable seating
	Stop watch

Instructions

1. The subject is seated on a firm, level surface without back support and their feet flat on the floor. They can use upper limb support if they wish. Stand beside the subject to give support if necessary.

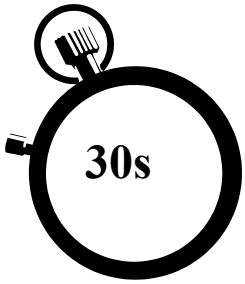
2. Explain the test to the subject:
   "I want to time how long you can sit without me helping you. You can use your arms to support yourself if you wish. When I say GO try to keep your balance for as long as you can or until I say stop."

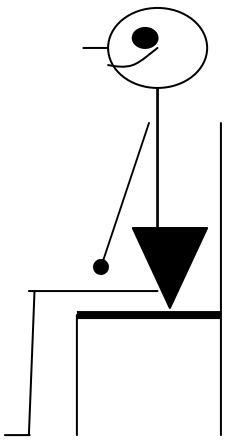
3. Use the stop-watch to time how long they can maintain sitting balance for up to 30 seconds. Call out the time every 10 seconds.

4. Note the time and decide whether to pass or fail:

Pass	Subject keeps his/her balance for **30 seconds or more**, with (upper limb) support but without assistance from the tester
Fail	Subject keeps his/her balance for **less than 30 seconds**, and/or requires assistance from the tester

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.





SECTION 1: SITTING

Level 2: Static sitting balance - Sitting Arm Raise Test

Summary
In this test, the subject is asked to maintain his/her position while raising and lowering his/her **sound** arm (*Arm Raise Test*) for 15 seconds.

Equipment:	Plinth or suitable seating
	Stop watch

Instructions

1. The subject is seated on a firm, level surface without back support, feet flat on the floor and hands resting on lap. Stand beside the subject to give support if necessary.

2. Explain and demonstrate the movement to the subject, get them to practise it and correct as necessary:
   *"I want to see how many times you can lift your **sound** arm up and down in 15 seconds. When I say GO raise and lower your arm as often as you can, until I say stop".*

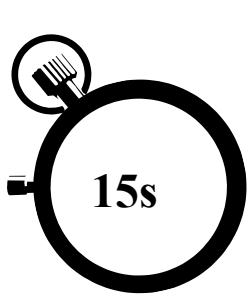
3. Use the stop-watch to time 15 seconds. Count the number of times the subject can raise his/her sound arm **(his/her maximum shoulder flexion)** and return it back to their sound knee.

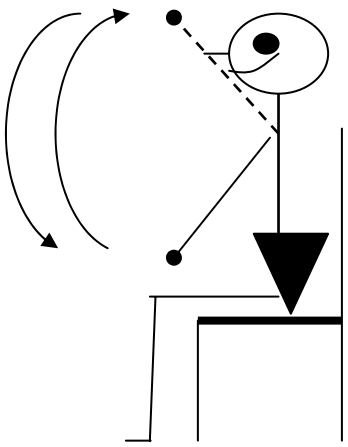
4. Note the score and decide whether to pass or fail:

Pass	Subject performs **3 or more** arm lifts*
Fail	Subject performs **less than 3** arm lifts*

   * A lift does not count if the subject does not achieve full flexion (for him/her), needs to 'touch down' (i.e. places hand somewhere other than the sound knee to keep his/her balance), and/or he/she requires support and/or assistance from the tester.

5. If the subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.





SECTION 1: SITTING

Level 3: Dynamic sitting balance - Sitting Forward Reach Test

Summary
In this test, the subject is asked to move to his/her limits of stability within the base of support while sitting down (*Forward Reach Test*). The distance the subject can reach forward beyond arm's length is measured.

Equipment:	Plinth or suitable seating
	1m ruler on adjustable height stand

Instructions

1. The subject is seated with hips at 90 degrees on a firm, level surface without back support, feet flat on the floor and hands resting on lap. Stand beside the subject to give support if necessary.

2. The height of the ruler is adjusted so that it is at the level of the acromion of the sound shoulder. The subject lifts his/her sound arm to shoulder height with fingers curled into a fist while sitting in a normal, comfortable position. Position the ruler so that the end of the ruler touches the knuckles of the outstretched arm and it continues in a forward direction.

3. The subject reaches forwards as far as possible with their hand level with the ruler. When at maximum reach, the tester reads the position of the knuckle of the middle finger from the ruler.

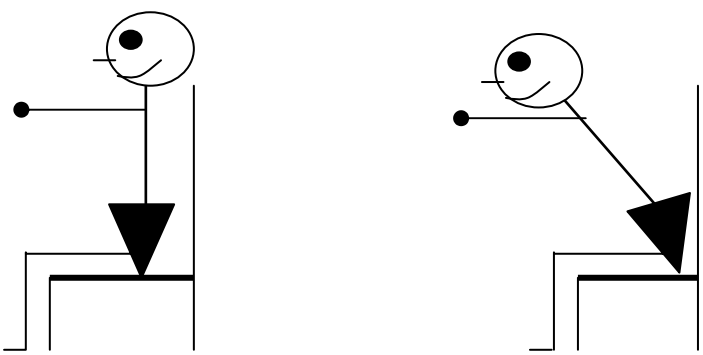
4. Explain and demonstrate the movement to the subject, get them to practice it and correct as necessary:
   "I want you to reach forwards as far as you can, keeping your hand level with the ruler. When you are at full stretch hold the position for a few seconds while I read the ruler then sit back. Keep your feet on the ground, and your bottom on the seat, do not use your weak arm for support.

5. Read and note the position of the knuckle of the middle finger on the ruler.

6. Repeat this test. Note the second value and take an average of the two scores. Decide whether to pass or fail:

Pass	Average value is **7cm or more**, without upper limb support and/or assistance from the tester
Fail	Average value is **less than 7cm**, and/or the subject requires upper limb support and/or assistance from the tester

7. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.



SECTION2: STANDING

Level 4: Supported standing - Timed Test

Summary
In this test, the subject is asked to stand with upper limb support, holding on to furniture or a plinth for at least 30 seconds.

Equipment:	Plinth or suitable furniture for the subject to hold on to
	Stop-watch

Instructions

1. The subject stands on a firm, level surface in normal shoes with feet in a comfortable, level position, and holding on to furniture if necessary. Provide support at waist height in front or to the sound side e.g. a plinth, bedside cupboard or back of a chair. Stand beside the subject to give assistance as necessary.

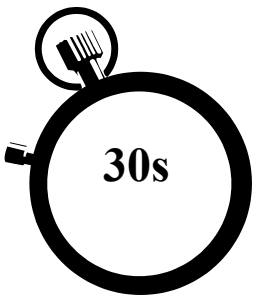
2. Explain the test to the subject:
   "I want to time how long you can stand without me helping you. You can hold on if you wish. When I say GO try to keep your balance for as long as you can or until I say stop."

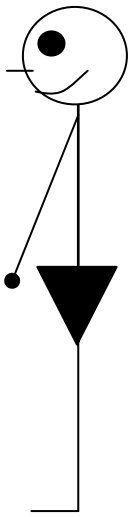
3. Use the stop-watch to time how long the subject can maintain standing balance for up to 30 seconds. Call out the time every 10 seconds.

4. Note the time and decide whether to pass or fail:

Pass	Subject keeps his/her balance for **30 seconds or more**, with or without support and without assistance from the tester
Fail	Subject keeps his/her balance for **less than 30 seconds**, and/or requires assistance from the tester

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.





SECTION 2: STANDING

Level 5: Static standing balance - Standing Arm Raise Test

Summary
In this test, the subject is asked to maintain his/her position within the base of support while raising and lowering his/her **sound** arm (*Arm Raise Test*) for 15 seconds.

Equipment:	Stop-watch

Instructions

1. The subject stands on a firm, level surface with feet level without upper limb support. Stand beside the subject to give support. Explain and demonstrate the movement to the subject, practice and correct as necessary.

2. Explain the test to the subject:
   *"I want to count how many times you can lift your **sound** arm in 15 seconds. When I say GO raise and lower your sound arm as often as you can, until I say stop."*

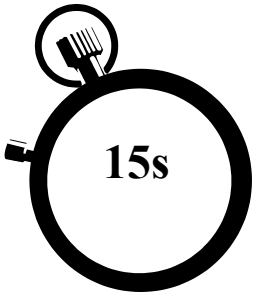
3. Use the stop-watch to time 15 seconds. Count the number of times the subject can raise **(his/her maximum shoulder flexion)** and lower their sound arm (to their side) in this time.

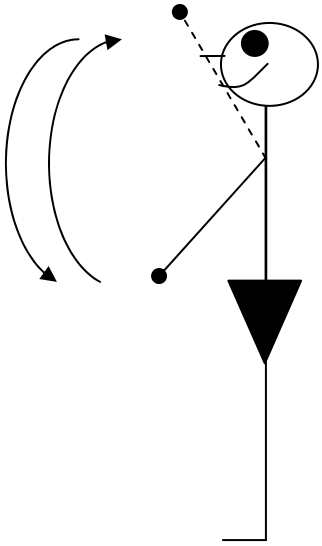
4. Note the score and decide whether to pass or fail:

Pass	Subject performs **3 or more** arm lifts*
Fail	Subject performs **less than 3** arm lifts*

   * A lift does not count if the subject does not achieve full flexion (for him/her), needs to 'touch down' (i.e. places hand somewhere other than the sound knee to keep his/her balance), and/or he/she requires support and/or assistance from the tester.

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.





SECTION 2: STANDING

Level 6: Dynamic Standing balance - Standing Forward Reach Test

Summary
In this test, the subject is asked to move to his/her limits of stability within the base of support while standing (*Forward Reach Test*). The distance the subject can reach forward beyond arm's length is measured.

Equipment:	1m ruler attached to adjustable height stand
	Stop-watch

Instructions

1. The subject stands on a firm, level surface with feet level without upper limb support. Stand beside the subject to give support.

2. The height of the ruler is adjusted so that it is at the level of the acromion of the sound shoulder. The subject lifts his/her **sound** arm to shoulder height with fingers curled into a fist.

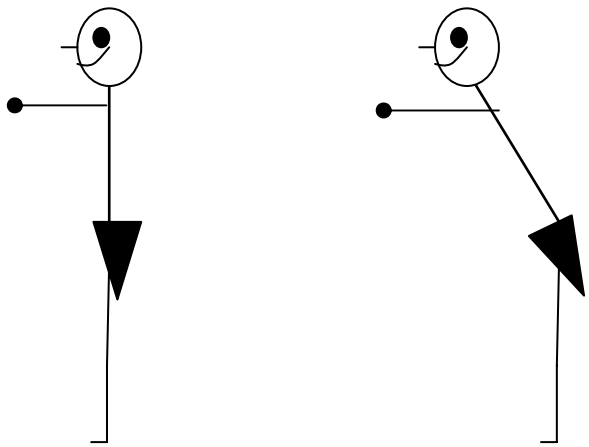
3. Position the ruler so that the knuckles of the outstretched arm are level with the end of the ruler, and the ruler points forwards in front of the subject.

4. The subject reaches forwards as far as possible with their hand level with the ruler. When at maximum reach the tester reads the position of the knuckle of the middle finger from the ruler
.
5. Explain and demonstrate the movement to the subject, get them to practice and correct as necessary:
   "I want you to reach forwards as far as you can with your hand level with the ruler. When at full stretch hold the position for a few seconds while I read the ruler, then return to upright. Keep your heels on the ground and do not use your weak arm for support."
6. Note the ruler reading.

7. Repeat the measurement and take an average of the two scores. Decide whether to pass or fail:

Pass	Average value is **5cm or more**, without upper limb support and/or assistance from the tester
Fail	Average value is **less than 5cm**, and/or the subject requires upper limb support and/or assistance from the tester

8. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.



SECTION 3: STEPPING

Level 7: Static double stance - Timed step-standing test

Summary
In this test, the subject is asked to maintain a step-standing position without upper limb support for at least 30 seconds.

Equipment	Stop-watch

Instructions

1. The subject stands without upper limb support on a firm, level surface in step standing position (sound foot in front of weak foot, with sound heel level or beyond the toes of the weak foot, both knees extended). Stand beside the subject to give support.

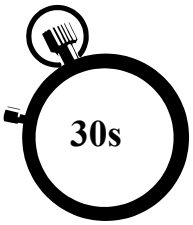
2. Explain the test to the subject, demonstrate and practise as necessary:
   "I want to time how long you can stand without me helping you. Keep your arms by your sides. When I say GO try to keep your balance for as long as you can or until I say stop."

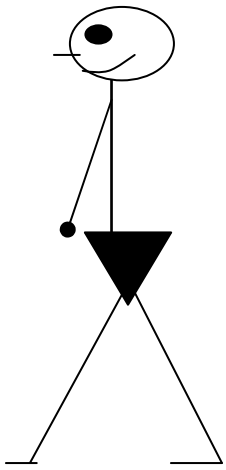
3. Use the stop-watch to time how long they can maintain the step standing position for up to 30 seconds. Call out the time every 10 seconds.

4. Note the time and decide whether to pass or fail:

Pass	Subject keeps his/her balance for **30 seconds or more**, without support and/or assistance from the tester
Fail	Subject keeps his/her balance for **less than 30 seconds**, and/or requires support and/or assistance from the tester

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.





SECTION 3: STEPPING

Level 8: Supported single stance - Walking with an aid

Summary
In this test, the subject is asked to walk without assistance, although he/she may use a walking aid (*5 metres Walk Test with an aid*).

Please note: *If the subject is already able to walk without an aid, pass this level and progress to level 9.*

Equipment	Tape to mark 5m 'walkway' on the floor
	Stop-watch

Instructions

1. A distance of 5 metres is marked on the floor. The subject starts to walk a couple of strides before the 'start line' and does not stop until he/she has crossed the 'finish line'. Stand/walk beside the subject to give support.

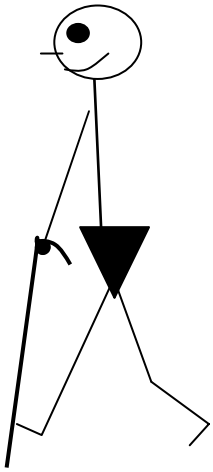
2. Explain and demonstrate the test as necessary:
   "I am going to time how fast you walk. Walk at your natural pace between these two markers. Do not slow down until you have crossed the finish line. Start when I say GO."

3. Use the stop-watch to time how long it takes to walk this distance and note the time.

4. Repeat the test and take an average of the two scores. Decide whether to pass or fail:

Pass	Average value is **1 minute or less**, without physical support from the tester
Fail	Average value is **more than 1 minute**, and/or the subject requires physical support from the tester

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level



.

SECTION 3: STEPPING

Level 9: Dynamic double stance - Weight Shift Test

Summary
In this test, the subject is asked to move within the base of support in a step-standing position repeatedly transferring his/her weight on and off the weak leg (*Weight Shift Test*) for 15 seconds.

Equipment	Two perching stools, Walking frames or chairs
	Stop-watch

Instructions

1. Starting position: The subject stands without upper limb support on a firm, level surface in step-standing position (weak foot in front, with weak heel level or beyond the sound toes). A perching stool or walking frame (or similar) adjusted to hip/tummy height is positioned so that the horizontal bar is over the 5th metatarsal of the weak foot. Another frame or stool is positioned behind the subject at hip/ bottom level, so their bottom touches the stool when their weight is on the sound leg. Stand beside the subject to give support as necessary.
   Movement: The subject transfers his/her weight onto the weak leg so that his/her tummy touches the back of the stool, and then back on to the sound leg so that their bottom touches the other stool. The subject needs to stand upright and keep his/her hips neutral/extended. The sound heel may lift as weight is transferred forwards but it must be on the floor when weight bearing.

2. Explain and demonstrate the test, practise and correct as necessary:
   "I want to count how many times you can transfer your weight from one leg to the other and back again. When I say GO transfer your weight on to the weak leg so that your tummy touches the stool/frame, then back on to the sound leg so that your bottom touches the other stool/frame. Keep your hips and knees straight when your weight is on the leg, but your can bend your sound knee and raise your heel as you bring your weight forwards. Do this as many times as you can until I say stop."

3. Use the stop-watch to time 15 seconds, and count the number of times the subject touches the bar of the frame at the front, i.e. how often they transfer their weight on to the weak foot.

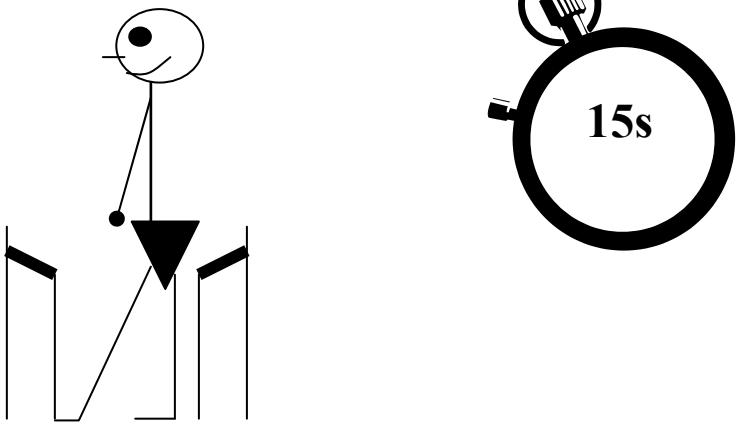
4. Note the score and decide whether to pass or fail:

Pass	Subject performs **3 or more** transfers*
Fail	Subject performs **less than 3** transfers*

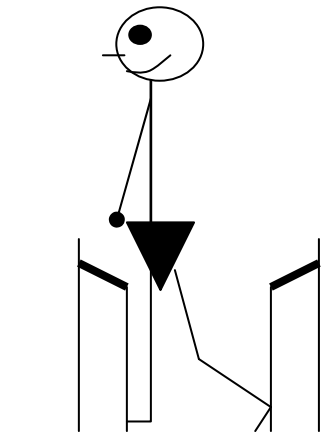
   *A transfer does not count if the subject does not touch the stool/frame at front or back, uses upper limb support, and/or requires support and/or assistance from the tester.

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.

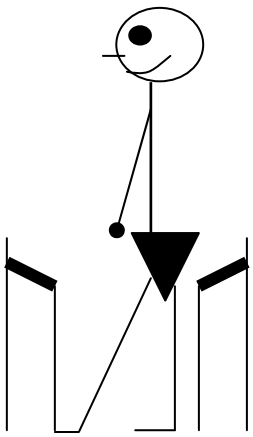
1.



2.



3.



SECTION 3: STEPPING

Level 10: Changing the base of support between double and single stance - Walking without an aid

Summary

In this test, the subject is asked to walk without assistance or a walking aid for 5 metres (*5 metres Walk Test*).

Equipment	Tape to mark 5m 'walkway' on the floor
	Stop-watch

Instructions

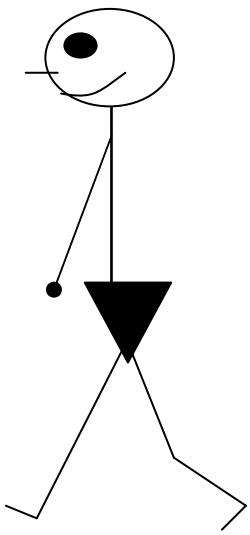
1. A distance of 5 metres is marked on the floor. The subject starts to walk a couple of strides before the 'start line' and does not stop until he/she has crossed the 'finish line'. Stand/walk beside the subject to give support.

2. Explain and demonstrate the test as necessary:
   "I am going to time how fast you walk. Walk at your natural pace between these two markers. Do not slow down until you have crossed the finish line. Start when I say GO."
3. Use the stop-watch to time how long it takes to walk this distance. Note the time.

4. Repeat the test and take an average of the two scores. Decide whether to pass or fail:

Pass	Average value is **1 minute or less**, without physical support from the tester
Fail	Average value is **more than 1 minute**, and/or the subject requires physical support from the tester

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.



SECTION 3: STEPPING

Level 11: Dynamic single stance - Tap Test

Summary

In this test, the subject is asked to maintain single stance on the weak leg while moving the other leg repeatedly placing his/her sound leg on and off a step while standing on the weak leg (*Step-Tap Test*) for 15 seconds.

Equipment	'Step-up' block or step 7.5-10cm high
	Stop-watch

Instructions

1. The subject stands on a firm level surface with feet level. A 7.5-10 cm high block is positioned a hands width (10cm) in front of his/her toes. The subject places his/her sound foot on and off the block as often as possible within 15 seconds (but does not step up). The subject should place his/her whole foot on the block. Stand beside the subject to give support.

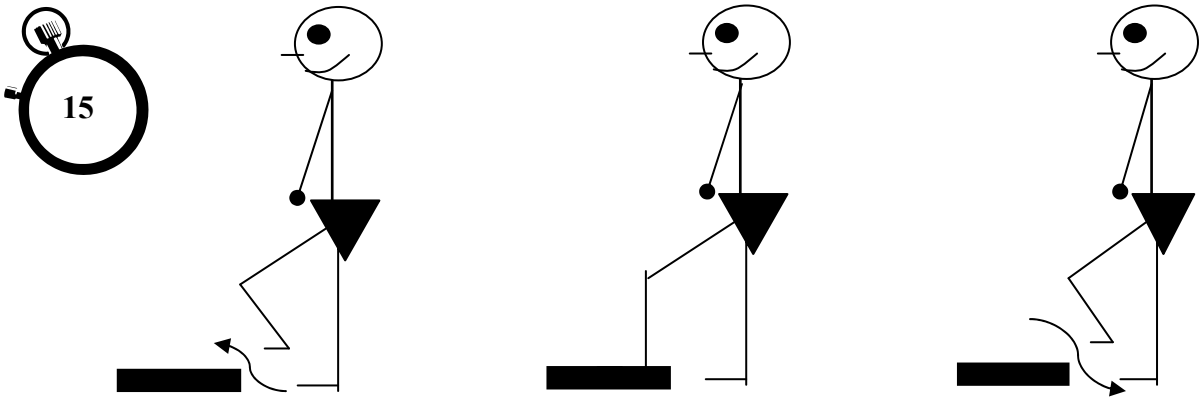
2. Explain and demonstrate the test, practise and correct as necessary:
   "I want to count how many times you can place your sound foot on and off this block, without stepping up onto the block. When I say GO put your sound foot onto the block and then take it off again. Do this as many times as you can until I say stop."
3. Use the stop-watch to time 15 seconds, and count aloud the number of steps the subject performs.

4. Note the score and decide whether to pass or fail:

Pass	Subject performs **2 or more** foot steps*
Fail	Subject performs **less than 2** foot steps*

   * A step does not count if the subject uses upper limb support, and/or requires support and/or assistance from the tester.

5. If subject fails, repeat the test once or twice more. If the subject passes the test by the third attempt, proceed to the next level.



SECTION 3: STEPPING

Level 12: Changing the base of support - Step-up Test

Summary
In this test, the subject is asked to change his/her base of support by stepping up on to and off a block, leading with his/her weak leg (*Step-Up Test*) for 15 seconds.

Equipment	'Step-up' block or step 7.5-10cm high
	Stop-watch

Instructions

1. The subject stands on a firm level surface with feet level. A 7.5-10cm high block is positioned a hands width (10cm) in front of his/her toes. The subject steps up, onto, and off the block leading with their weak leg as often as possible within 15 seconds. A step-up is completed when weak leg is placed on the floor again. Stand beside the subject to give support.

2. Explain and demonstrate the test, practise and correct as necessary:
   "I want you to step up on to the block and then off again, leading with your weak leg. When I say GO do this as often as you can until I say stop."

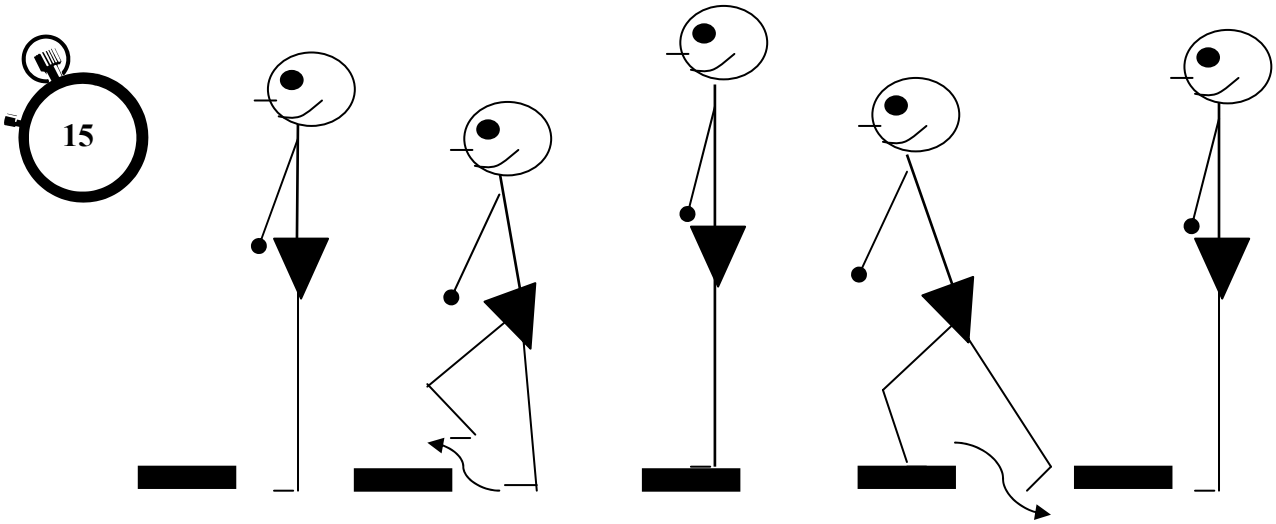
3. Use the stop-watch to time 15 seconds, and count the number of steps-up performed.

4. Note the score and decide whether to pass or fail:

Pass	Subject performs **1 or more** step up and down*
Fail	Subject performs **less than 1** step up and down*

   * A step up and down does not count if the subject uses upper limb support, and/or requires support and/or assistance from the tester.

5. If subject fails, repeat the test once or twice more.



SCORE SHEET

Subject details:
(Place sticker here)

Name of Tester: _____ Date of Test: _____

Level		Score Attempt number: 1	2	3	Pass (Y/N)	Pass criteria (after up to 3 attempts)
1	Supported Sitting - Timed test					Sit supported for 30s
2	Static sitting - Sitting arm raise test					3 or more arm lifts in 15s
3	Dynamic sitting - Sitting forward reach test					Reach forward more than 7cm (average of 2 readings)
4	Supported standing - Timed test					Stand supported for 30s
5	Static standing balance - Standing arm raise test					3 or more arm lifts in 15s
6	Dynamic standing - Standing forward reach test					Reach forward more than 5cm (average of 2 readings)
7	Static double stance - Timed step standing test					Static step standing for 30s
8	Supported single stance - walking <u>with</u> an aid					Walk 5m within 1min (average of 2 readings)
9	Dynamic double stance - Weight shift test					3 or more shifts within 15s
10	Changing base of support - walking <u>without</u> an aid					Walk 5m within 1min (average of 2 readings)
11	Dynamic single stance - Tap test					2 or more taps within 15s
12	Changing the base of support - Step-up test					1 or more step-up(s) within 15s

Use “S” to denote that support/assistance was required from the tester

APPENDIX 1

Publications and presentations on the Brunel Balance Assessment:

Tyson S & DeSouza L (2004). Development of the Brunel Balance Assessment; A new measure of balance disability post-stroke Clinical Rehabilitation 8;7;801-810

Tyson S & DeSouza L (2004). Reliability and Validity of functional balance tests post-stroke. Clinical Rehabilitation (18;7 in press)

Tyson S & Desouza L (2003). Measurement error of sitting balance tests post-stroke. Physiotherapy Research Society, Winter Meeting, Oxford

Tyson S & DeSouza L (2003). The Brunel Balance Assessment: A new measure of balance disability post-stroke. 14th World Congress of Physical Therapy, Barcelona , Spain

Tyson S & DeSouza L (2002). Reliability and Validity of the Brunel Balance Assessment. 13th European Congress of Physical Medicine and Rehabilitation Brighton, UK.

Tyson S & DeSouza L (2002). The Brunel Standing Balance Tests. Physiotherapy Research Society Spring 2002, Keele University, UK.

Tyson SF & DeSouza L. (2002). The sitting balance tests of the Brunel Balance Assessment. Society of Research in Rehabilitation, Winter Meeting University of East London.

Tyson SF & DeSouza L (2001). Development of the Brunel Balance Assessment. Presented at Society of Research in Rehabilitation. Summer meeting, University of Manchester. Proceedings in Clinical Rehabilitation 2002;16, 2;229.

APPENDIX 2

References

1. Tyson S & DeSouza L (2002). Measurement of balance and walking post-stroke: Part 1 Ordinal Scales. Physical Therapy Reviews 2002;7;3;177-85
2. Tyson S & DeSouza L (2002). Measurement of balance and walking post-stroke: Part 2 Functional Performance Tests. Physical Therapy Reviews 2002;7;3;87-91
3. Tyson S & DeSouza L (2003). Measurement of balance post-stroke: Part 3 Instrumented Measurement Tools Physical Therapy Reviews 2002;7;4;231-241
4. Tyson S & Desouza L (2003). A clinical model for the assessment of posture and balance post-stroke. Disability and Rehabilitation 25;3;120-127
5. Tyson S & DeSouza L (2004). Development of the Brunel Balance Assessment; A new measure of balance disability post-stroke Clinical Rehabilitation 8;7;801-810
6. Tyson S & DeSouza L (2004). Reliability and Validity of functional balance tests post-stroke. Clinical Rehabilitation (18;7 in press)