Background on How to Interpret Balance and Fall Risk Assessment Results

(Balance+Plus Fall Assessment Systems)

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Balance+Plus Fall Assessment System is a computerized balance assessment tool that provides an objective, accurate and reliable measure of an individual’s postural sway. Postural Sway is a known indicator of balance ability and is commonly used in fall risk assessment. The BASIC Balance Test (BBT) is the standard testing protocol implemented by the B+P FAS Balance Software. After an individual is tested on the balance platform, there are five results available for interpretation.

1. **The Baseline BBT Result** – This is the most recent Baseline BBT given to this individual. The majority of individuals will only have one Baseline BBT, but there are some occasions where a second or third baseline may be utilized. The Baseline BBT typically ranges from 10cm to 75cm but can be as high as 100+cm and as low as 7cm. If the individual’s Baseline BBT is 30cm or less, their postural sway is essentially equivalent to 80% of young adults and they are unlikely to have balance or fall risk problems. If it is 31cm or above, the individual’s postural sway should be further evaluated using age-based normative data (see #3) and fall risk assessment data (see #4).

2. **The Post-Baseline BBT Result** – This is the most recent BBT result. If this says N/A, then the Baseline BBT is the only result available for this individual. In many cases, there can be multiple post baseline BBT’s – but only the most recent is shown here. The box labeled % Change compares this Post-Baseline BBT to the Baseline BBT. If it is green, the change is positive (less sway). If it is red, the change is negative (more sway).
Post-Baseline BBT’s are utilized to measure ongoing BBT results. This is common in the Health and Wellness industries where specific programs are available to try and improve balance. This is also utilized in return-from-injury measurements where Athletic Trainers or Health Clinicians want to measure postural sway as a component of their treatment program.

With this in mind, if this FAS is being used to track individuals who are looking to measure their results over time, please review the information in the box below. This will provide guidance on how to interpret BBT results and determine when postural sway has truly been improved.

**IMPORTANT - How to know if an individual is really improving their postural sway?**

Balance and postural sway are likely to change on a daily basis due to mood, stress, fatigue, food, medicine and other factors. Research shows that a BBT variance of up to 5 centimeters can occur due to these factors. So, an individual with a Baseline BBT of 44 may retest at 40 or 48 and they haven’t truly improved or declined. Improvements in BBT results should be evaluated as consistently performing at least 5cm better than baseline over time.

See the two examples below:

**Example 1** - A 73-year-old individual with a Baseline BBT of 44 may, over time, get results like 44, 42, 46, 43, 42, 38, 39, 36, 34, 37, 35, 38, 35, 33. This demonstrates true improvement. The individual has moved from the mid-40’s to the mid-30’s. Compared to the Normative Data Chart, they would have started around the 25th percentile and moved to the 45th percentile.

**Example 2** - A 73-year-old individual with a Baseline BBT of 38 may, over time, get results like 38, 35, 40, 43, 38, 36, 41, 36, 40, 38, 40, 36, 37, 36. This demonstrates no real improvement. This individual is consistently performing within 5 centimeters of their Baseline. Some individuals will end up in this model and the key for them is that they are remaining at a consistent level and not getting worse, but should continue testing and tracking their balance.

3. **Comparison to Age Group** – This is where the software utilizes the BBT Normative Database to compare each individual to others in their age group. BBT results from over 10,000 individuals make up this database. The scale, from 0 on the left to 100 on the right, represents the percentile ranking of the BBT. The white marker is the baseline measurement and the gray marker is the most recent post-baseline measurement. In the image below, the Baseline is 13% and the Post Baseline is 95%. This can be described as – “Your Baseline BBT in the 13th percentile was better than only 12% of people in your age group and now your Post-Baseline of 95% puts you better than 94% of people- a huge improvement.” The Comparison to Age Group is provided to allow individuals to have an understanding of how they compare to others and this can provide an incentive to improve or maintain their BBT result.

![Comparison to Age Group](image.png)

For age group 65-69, Baseline BBT was in the 13th Percentile and the most recent Post-Baseline BBT was in the 95th Percentile.
4. **Fall Risk Assessment (FRA)** – The Fall Risk Assessment (FRA) categorizes an individual’s fall risk as either Low, Moderate or High. While this assessment is calculated for each individual, it is recommended that it be utilized only for adults aged 60 and above. The assessment is determined by comparing the individual’s BBT to the average BBT of an adult aged 20-39. Adults aged 20-39 are not considered fall-risk candidates and after testing thousands of individuals in this age range an average has been calculated which is 23cm.

Baseline BBT of 49 was HIGH Fall Risk.
Post-Baseline BBT of 17 was LOW Fall Risk.

A Fall Risk Assessment of **LOW** is provided when the BBT is lower than 1 standard deviation above the average. This means a BBT result between 0cm and 30cm has a LOW FRA.

A Fall Risk Assessment of **MODERATE** is provided when the BBT is between 1 and 2 standard deviations above the average. This means a BBT result between 31cm and 38cm is MOD FRA.

A Fall Risk Assessment of **HIGH** is provided when the BBT is greater than 2 standard deviations above the average. This means a BBT result of 39 or greater is HIGH FRA.

When the FRA is HIGH, the BBT is 39 or greater. Obviously, someone with a BBT of 39 doesn’t sway as much as a person with a BBT of 77. The simplest way to explain this is by referring to the Normative Data - the norms show the BBT of 77 in a lower percentile than the 39. The table below shows the normative results for all age groups and illustrates two well documented population statistics – 50% of individuals over age 80 have high fall risk and about 25% of individuals at age 65 have high fall risk.
Important Note - There are many risk factors that contribute to falling and while balance is critical, others such as age, medications, vision, strength/weakness, dizziness and foot problems should also be considered.

5. Advanced Metrics – There are 10 additional measurements provided for analyzing Center-of-Pressure (COP) along with some additional visualizations. The visualizations provide a close-up inspection of the path length trace with an overlay of the 95% Ellipse Area on top of the trace. The Ellipse Area is the smallest ellipse that fits 95% of the COP trace.

These additional metrics are provided for Health and Wellness Professionals who would like to analyze the COP trace in greater detail. The metrics are provided with descriptions but Balance Tracking does not draw conclusions or provide normative data based on the metrics.

The Metrics are:

1) 95% Ellipse Area: Smallest ellipse fitting 95% of COP data
2) Mean Velocity: Total COP length divided by the trial duration
3) Mean Distance: Average distance from COP data center
4) Mean Frequency: Average number of loops to cover COP data
5) RMS-ML: Square root of mean squared medial-lateral COP data
6) RMS-AP: Square root of mean squared anterior-posterior COP data
7) Range-ML: Max minus Min COP data in medial-lateral direction
8) Range-AP: Max minus Min COP data in anterior-posterior direction
9) Approximate Entropy-ML: Unpredictability of medial-lateral COP data
10) Approximate Entropy-AP: Unpredictability of anterior-posterior COP data