Perform stabilometry measurements for the reliability analysis of center of pressure parameters

Gergely Nagymáté,Zsanett Orlovits,Rita M. Kiss

Abstract

The protocol describes guidelines and steps for taking repeated stabilometry measurements. The parameters calculated from repeated measurements can be user for reliability analysis of certain center of pressure parameters used to describe postural control and balancing capability. The guidelines are based on recommendations of the literature. It is important to be consistent during all the measurements and follow the guidelines as they regulate important aspects of the measurements. The changes of these aspects can signifficantly alter the motion of the center of pressure.

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Guidelines

Avoid audio or visual disturbance of the subjects during the trials, maintain comfortable temperature for the measurements.

Position the investigated subjects in bipedal standing, with the distance between the 2 ankle joint centers equal to the distance between the right and left anterior superior iliac spines.

Maintain both limbs in full knee extension, the heels aligned in a line, and the feet parallel and faced forward, with arms resting by the sides.

During the stance on the dominant leg, the dominant leg should be in full knee extension, and the non-dominant leg flexed at 90 degrees.

Since a 60 second single leg standing trial is challenging, in case the subject have to put down the other leg or shows substantial arm or whole body movements, the measurement should be aborted and repeated.

The exact foot placement should be maintained during the trials and visually controlled since its changes could affect the stabilometry parameters.

During stances with the eyes open, the eyes should be focused on the wall at eye level at least 3 meter from the subject.

The measurements can be started after the initial transients of the subject’s self-adjustment. The adjustment time is usually approximately 10 seconds, but a minimum of 5 second wait is required

after the subject stood on the platform.

For the reliability assessment the measurements should be performed by the same person.

Record 60 second trials (started after the initial transitions) on 100 Hz sampling frequency.

Apply a Butterworth low-pass digital filter on the center of pressure coordinates with 10 Hz cut-off frequency before calculating the center of pressure parameters.

Generally, maintain the exact conditions under each trial of the subjects.

Before start

Register the basic anthropometrical data of the participants.

Determine the dominant leg by a balance recovery test.

The perturbation is a nudge from the tester applied to the subject at the midpoint between the scapulae from directly behind the subject and sufficient to require the participant to respond by taking a step. The leg that the subject uses to recover balance is considered to be the dominant leg. (Hoffman M, Schrader J, Applegate T, Koceja D. Unilateral postural control of the functionally dominant and nondominant extremities of healthy subjects. J Athl Train. 1998;33: 319–322)

Materials

- Force plate of force distribution plate by Contributed by users
- Processing software to calculate center of pressure stabilometry parameters by Contributed by users

Protocol

Step 1.

Determine the required sample size and repetition.

(Bujang MA, Baharum N. A simplified guide to determination of sample size requirements for estimating the value of intraclass correlation coefficient: a review. Arch Orofac Sci. 2017;12: 1–11. Available: http://www.dental.usm.my/aos/docs/Vol_12/aos-article-0246.pdf)

Step 2.

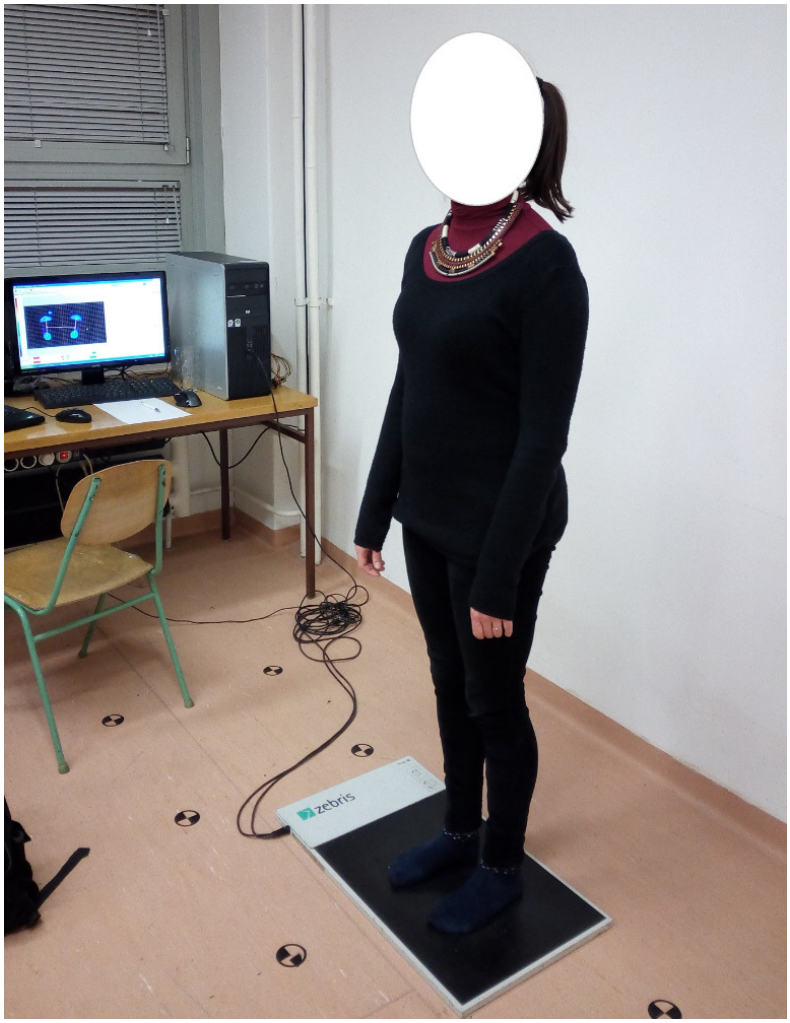
Following the **guidelines** ask the participant to perform on the force plate

- a 60 second bipedal stance trial with eyes open,

- a 60 second bipedal stance trial with eyes closed,

- a 30 second single leg standing trial on the dominant leg.

The trials can be performed consecutively.



Step 3.

Let the participant rest, walk or sit down before the next session. If the participant was sitting let him or her stand or walk for 30 seconds before the next session.

Step 4.

Repeat 2. and 3. for the required number of times determined in 1.

Step 5.

Repeat 2.-4. with the required number of subjects determined in 1.

Warnings

Do not perform single leg stance trial if the participant has difficulties with it.

Use aids for the trials if the studied participants have difficulties with bipedal standing or loss of balance, falling is possible.