

## Standardization in Clinical Stabilometry:

### Towards a Consensus

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#### Introduction

The following document, in its current release, is intended as a *working draft* to be reviewed and approved in its content, by the informal Committee for Standardization in Clinical Stabilometry (CS) promoted by the International Society for Posture and Gait Research (ISPGR). The aim of the document is to later provide a systematic framework which is finally suitable as the entry point of the informed feedback and experience of a **selected** and **multidisciplinary** pool of experts in stabilometry. Collected feedbacks will then be objectively and systematically analyzed and, after a final Consensus Meeting, will be proposed for publication to the Gait & Posture journal.

The sections of the document address four main pillars aimed at achieving a common language within the clinical and scientific community, and an agreement on the appropriate usage of CS in routine practice:

- definition of relevant signals and biomechanical quantities
- list of procedural variables to standardize or control
- minimum set of technical requirements for the measurement device
- minimum set of relevant parameters to be computed, and their algorithmic definition.
- 

During the Consensus process it will be advisable to estimate the strength of the agreement within the panel of experts on the aforementioned topics. Based on their background and previous experience, experts can be involved in all or some of the previous pillars. Each one of them is addressed in the different sections of this document.

**SECTION I: TERMINOLOGY**

We propose to find a common language in CS starting from the following definitions.

HOW TO: Please make minor changes directly in the text using a red font. If you want to put other definitions up for discussion, add the text in the corresponding empty cell of the table (please also include the reference). As for the Yes/No questions just mark your choice by putting your answer in red.

Definition 1: Stabilometry	Notes/Proposed changes
<p>1.1 “Stabilometry is the objective study of body sway during quiet standing, i.e., stance in the absence of any voluntary movements or external perturbations. Conventionally, the study focuses on the properties of body sway during upright standing, thus far primarily measured by means of force plates.”</p> <p>1.2 “Stabilometry aims at collecting information indicative of the steady-state functioning of the postural control system, and of its success in stabilizing the body against gravity, by examining the properties of measures, directly or indirectly related with postural sway.”</p>	<p>1.1</p> <p>1.2</p>
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• L. Chiari, “Stabilometry”, in Encyclopedia of Neuroscience, Eds: M.D. Binder, N. Hirokawa, U. Windhorst, Springer, Berlin-Heidelberg, pp. 3830-3, 2008. [ISBN: 978-3-540-23735-8]</li> <li>• T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>
<p><b>Synonyms:</b></p> <ul style="list-style-type: none"> <li>• Static posturography</li> <li>• Stabilography</li> <li>• Computerized stabilometry</li> </ul>	<p>Add / Delete</p>

🏠 **AGREE THAT DEF.1 IS NEEDED?**

[YES] - [NO]

Definition 2: Center of Pressure (COP)	Notes/Proposed changes
<p>2.1 "COP is the point location of the vertical ground reaction force vector."</p> <p>2.2 "It represents a weighted average of all the pressures over the surface area of the feet in contact with the ground."</p> <p>2.3 "Its <b>position</b> can be directly measured with a force platform - by means of a set of mechano-electrical force transducers (strain gage <b>or piezoelectric crystals</b>) - or with a pressure platform – by means of a pressure sensitive mat or an insole".</p> <p>2.4 "Two platforms are required to quantify the COP changes within each foot. When one single platform is used only a net, resultant COP is available."</p>	<p>2.1</p> <p>2.2 It seems to me that the CoP is a point, not a pressure ?</p> <p>2.3.3 The reference to the piezoelectric crystal <u>MUST be removed</u> because they do not pass the DC component, essential to clinicians.            Platforms of pressure ... I do not think they can be mixed with force platforms, our experience is that they do not provide the same information (Faugouin, 1997)</p> <p>2.4</p>
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>D.A. Winter, "Human balance and posture control during standing and walking". Gait Posture 3:193–214, 1995</li> </ul>	<p><b>Add / Delete</b></p> <p>Faugouin A. (1997) Comparaison des résultats obtenus par l'emploi simultané d'un footscan et d'une plateforme stabilométrique. in Lacour M., Gagey PM, Weber B. (Eds) Posture et Environnement. Sauramps, Montpellier, 187-192.</p>
<p><b>Synonyms:</b></p>	<p><b>Add / Delete</b></p>

⏏ **AGREE THAT DEF.2 IS NEEDED?** [YES] - [NO]

Definition 3: Center of Mass (COM)	Notes/Proposed changes
<p>3.1 “COM is a point equivalent of the total body mass in the global reference system” and</p> <p>3.2 “is the weighted average of the COM of each body segment in the 3D space.”</p> <p>3.3 “When using a force platform the whole body COM location is not directly accessible for measurement and it should be estimated.”</p> <p>3.4 “Several platform-based methods are available to estimate COM location from COP that involve the definition of an adequate biomechanical model of the body. In the simplest case, an inverted pendulum model of the body can be used.”</p>	<p>3.1</p> <p>3.2</p> <p>3.3</p> <p>3.4</p>
<p>References:</p> <ul style="list-style-type: none"> <li>• D.A. Winter, “Human balance and posture control during standing and walking”. Gait Posture 3:193–214, 1995</li> <li>• T. Shimba, “An estimation of center of gravity from force platform data”. Journal of Biomechanics 17, 53–60, 1984.</li> <li>• Gagey B. (2013) Du centre de pression au centre de gravité par un calcul analytique. <a href="http://ada-posturologie.fr/CoP-CoG_analytical_calcul-f.pdf">http://ada-posturologie.fr/CoP-CoG_analytical_calcul-f.pdf</a></li> </ul>	<p>Add / Delete</p>
<p>Synonyms:</p>	<p>Add / Delete</p>



**AGREE THAT DEF.3 IS NEEDED?**

[YES] - [NO]

Definition 4: Center of Gravity (COG)	Notes/Proposed changes
4.1 "COG is the vertical projection of the COM onto the ground."	4.1
<b>References:</b> <ul style="list-style-type: none"> <li>• D.A. Winter, "Human balance and posture control during standing and walking". Gait Posture 3:193–214, 1995</li> </ul>	Add / Delete
<b>Synonyms:</b>	Add / Delete



**AGREE THAT DEF.4 IS NEEDED?**

[YES] - [NO]

Definition 5: Stabilogram	Notes/Proposed changes
<p>5.1 “Represents the time course of the COP recorded in <b>upright quiet</b> standing position in either the anteroposterior (AP) or the mediolateral (ML) direction.”</p> <p>5.2 “The time scale is to be taken horizontally. COP displacements in anterior and right directions, respectively, should be written on the positive vertical axis.”</p>	<p>5.1</p> <p>5.2</p>
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• L. Chiari, “Stabilometry”, in Encyclopedia of Neuroscience, Eds: M.D. Binder, N. Hirokawa, U. Windhorst, Springer, Berlin-Heidelberg, pp. 3830-3, 2008. [ISBN: 978-3-540-23735-8]</li> <li>• T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>
<p><b>Synonyms:</b></p> <ul style="list-style-type: none"> <li>• Monodimensional COP</li> </ul>	<p>Add / Delete</p>



**AGREE THAT DEF.5 IS NEEDED?**

[YES] - [NO]

Definition 6: Statokinesigram	Notes/Proposed changes
<p>6.1 “Represents the top-view of COP displacements on the ground during standing.”</p> <p>6.2 “In its graphical presentation: the ML displacements should be reported on the horizontal axis (positive when pointing to the right); the AP displacements should be reported on the vertical axis (positive when pointing anteriorly).”</p>	<p>6.1</p> <p>6.2</p>
<p>References:</p> <ul style="list-style-type: none"> <li>• L. Chiari, “Stabilometry”, in Encyclopedia of Neuroscience, Eds: M.D. Binder, N. Hirokawa, U. Windhorst, Springer, Berlin-Heidelberg, pp. 3830-3, 2008. [ISBN: 978-3-540-23735-8]</li> <li>• T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. <i>Agressologie</i> 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>
<p>Synonyms:</p> <ul style="list-style-type: none"> <li>• Bidimensional COP</li> <li>• Planar COP</li> </ul>	<p>Add / Delete</p>



**AGREE THAT DEF.6 IS NEEDED?**

[YES] - [NO]

**Notes:**

- *a table may be added with recommended measurement units for the above signals and quantities*
- *add graphical examples for Defs 5 and 6?*



**WOULD YOU ADD OTHER DEFINITIONS?**

[YES] - [NO]

If your answer is Yes please add them in the following table. Replicate the table for each new definition.

**Definition 7: Standardization**

7.1 "Standardization is an effort to try to eliminate random differences due to measurement systems and anthropological or behavioral characteristics of subjects, in order to achieve a better comparison of results between subjects and laboratories."

References:

Gagey PM (2013) Un problème de langage.  
<http://clinicalstabilometry.freeforums.org/post12.html#p12>

Synonyms:

- ...

**Definition 8: ...**

"... .."

References:

- ...

Synonyms:

- ...

...



**SECTION II: PROCEDURE**

We propose to standardize or control (i.e. measure) the following procedural variables (PV) that have been shown to affect the results of the stabilometric test.

HOW TO: Please make minor changes directly in the text using a red font. If you want to add more variables for discussion, add the text in the corresponding empty cell of the table (please also include the reference). As for the Yes/No questions just mark your choice by putting your answer in red.

**PV 1: Visual Input – Light      Your Agreement/Notes/Proposed changes**

<p><b>1.1 “For recordings of visual postural stabilization (i.e. with eyes open) the peripheral field of vision should provide information on the vertical, and the room should have normal (diffuse) illumination of at least 40 lux (lumen per square metre).”</b></p>	<p>Totally agree</p> <input checked="" type="checkbox"/>	<p>Mostly agree</p> <input type="checkbox"/>	<p>Mostly disagree</p> <input type="checkbox"/>	<p>Totally disagree</p> <input type="checkbox"/>
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>			
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>Feasibility? Is it realistic to think that clinical labs are able to measure and/or control their lighting conditions?</li> </ul>	<p>Add / Delete</p>			

⏪ **AGREE THAT PV.1 IS NEEDED?**      [YES] - [NO]

**PV 2: Visual Input – Target Size & Shape**

**Your Agreement/Notes/Proposed changes**

**Note: 2.1 and 2.2 represents alternative solutions, keep this in mind when expressing your agreement**

<p><b>2.1 “For recordings of visual postural stabilization (i.e. with eyes open) the target should be a circular area with a diameter of 5 cm.”</b></p>	<table style="width: 100%; text-align: center;"> <tr> <td style="width: 25%;">Totally agree</td> <td style="width: 25%;">Mostly agree</td> <td style="width: 25%;">Mostly disagree</td> <td style="width: 25%;">Totally disagree</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>Height of the target and color are not specified.</li> </ul>	<p>Add / Delete</p> <p>Visual Target must be seen at the eye level in order to prevent any version movement.</p>								
<p><b>2.2 “For recordings of visual postural stabilization (i.e. with eyes open) the target should be a vertical black line, with a width of 5 cm and a height of 2 m.”</b></p>	<table style="width: 100%; text-align: center;"> <tr> <td style="width: 25%;">Totally agree</td> <td style="width: 25%;">Mostly agree</td> <td style="width: 25%;">Mostly disagree</td> <td style="width: 25%;">Totally disagree</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>Italian National Institute of Health (ISS)</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p>	<p>Add / Delete</p>								

☐ **AGREE THAT PV.2 IS NEEDED?** [YES] - [NO]

**PV 3: Visual Input –Walls & Target Distance**

**Your Agreement/Notes/Proposed changes**

**Note: 3.1, 3.2 and 3.3 represents alternative solutions, keep this in mind when expressing your agreement**

<p><b>3.1</b> “The subject should be placed at least 1 metre from any wall, 3 metres straight ahead from the visual target.”</p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njiokiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. <i>Agressologie</i> 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li></li> </ul>	<p>Add / Delete</p>								
<p><b>3.2</b> “The visual target should be placed at 1 to 3 metres ahead of the subject.”</p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>Japanese standard</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p>	<p>Add / Delete</p>								
<p><b>3.3</b> “The subject should be placed at least 1 metre from any wall, 2 metres straight ahead from the visual marker.”</p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>Italian National Institute of Health (ISS)</li> </ul>	<p>Add / Delete</p>								

<p><b>3.4 «The subject is at 50 centimeters from the wall of the cabin and at 90 centimeters from the visual target.</b></p>	<p style="text-align: center;">Totally agree      Mostly agree      Mostly disagree      Totally disagree</p> <p style="text-align: center;"> <input checked="" type="checkbox"/>      <input type="checkbox"/>      <input type="checkbox"/>      <input type="checkbox"/> </p>
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• Paulus W. M., Straube A., Brandt Th. (1984) Visual stabilization of posture: physiological stimulus characteristics and clinical aspects. Brain, 107: 1143-1164.</li> <li>• Association Française de Posturologie (1985) NORMES85. Editées par l'ADAP (Association pour le Développement et l'Application de la posturologie) 20, rue du rendez-vous 75012 Paris.</li> <li>• Espace visuel &amp; Visual space <a href="http://clinicalstabilometry.freeforums.org/post18.html#p18">http://clinicalstabilometry.freeforums.org/post18.html#p18</a></li> </ul>	<p>Add / Delete</p>



**AGREE THAT PV.3 IS NEEDED?**

**[YES] - [NO]**

**PV 4: Visual Input– Lack of**

**Your Agreement/Notes/Proposed changes**

**Note: 4.1 and 4.2 represents alternative solutions, keep this in mind when expressing your agreement**

<p><b>4.1 “Recordings in the lack of visual inputs should be done asking subjects to keep their eyes closed.”</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njiokiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li></li> </ul>	<p>Add / Delete</p>								
<p><b>4.2 “Recordings in the lack of visual inputs should be done through visual occlusion.”</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li></li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p>	<p>Add / Delete</p>								

🏠 **AGREE THAT PV.4 IS NEEDED?**

[YES] - [NO]

**PV 5: Room size**

**Your Agreement/Notes/Proposed changes**

<p><b>5.1 “The room should be large enough to prevent acoustic spatial orientation, the minimum area being preferably 3 x 4 metres.”</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p>Add / Delete</p>								
<ul style="list-style-type: none"> <li>Association Française de Posturologie (1985) NORMES85. Editées par l'ADAP (Association pour le Développement et l'Application de la posturologie) 20, rue du rendez-vous 75012 Paris.</li> <li>Espace visuel and Visual Space: <a href="http://clinicalstabilometry.freeforums.org/post10.html#n10">http://clinicalstabilometry.freeforums.org/post10.html#n10</a></li> </ul>	<p>Add / Delete</p> <p>Such dimensions of the room <u>must not be required for all clinicians</u>. The use of a cabin having walls tissue eliminates the risk of acoustic orientation and restricts the size of the affected area to stabilometry.</p>								



**AGREE THAT PV.5 IS NEEDED?**

[YES] - [NO]

**PV 6: Acoustic input**

**Your Agreement/Notes/Proposed changes**

<p><b>6.1 “No fixed sound sources should deliver information for spatial orientation in the room; the noise level in the room should preferably be below ISO 40 dB(A).”</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• T.S. Kapteyn, W. Bles, C.J. Njiokiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> <li>• Japanese standard</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• Feasibility? Is it realistic to think that clinical labs are able to measure and/or control sound levels?</li> <li>•</li> </ul>	<p>Add / Delete</p> <p>YES</p>								

🏠 **AGREE THAT PV.6 IS NEEDED?**

[YES] - [NO]

**PV 7: Force plate - installation**

**Your Agreement/Notes/Proposed changes**

<p>7.1 "The plate should be embedded in the ground; if this is not possible its top plate should not exceed 10 cm in height from the ground."</p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>Italian National Institute of Health</li> </ul>	<p>Add / Delete</p>								
<p><b>7.2: "The platform must be based on a hard and horizontal ground."</b></p> <p><b>References:</b></p> <p>Le Quiniou A, Boudot E. (2012) Good bases are needed for statilometric recordings. International Symposium on Osteopathy and Transdisciplinarity. Paris, 20 May 2012.</p>	<p>Add / Delete</p>								

🏠 **AGREE THAT PV.7 IS NEEDED?**

**[YES] - [NO]**



**PV 8: Force plate - maintenance**

**Your Agreement/Notes/Proposed changes**

<p><b>8.1</b> “Due to in-situ installation procedures, usage and aging, the accuracy of force plates data may decrease. It is therefore recommended that force plates are regularly recalibrated.”</p>	<table border="1"> <tr> <td style="text-align: center; vertical-align: middle;">Totally agree</td> <td style="text-align: center; vertical-align: middle;">Mostly agree</td> <td style="text-align: center; vertical-align: middle;">Mostly disagree</td> <td style="text-align: center; vertical-align: middle;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• N. Chockalingam, G. Giakas, A. Iossifidou, “Do strain gauge force platforms need in situ correction?”, <i>Gait Posture</i>, 16:233–7, 2002.</li> <li>• A. Cappello, F. Bagalà, A. Cedraro, L. Chiari, “Non-linear re-calibration of force platforms”, <i>Gait Posture</i>, 33(4):724-6, 2011.</li> </ul>	<p style="color: red;">Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>•</li> </ul>	<p style="color: red;">Add / Delete</p>								

🏠 **AGREE THAT PV.8 IS NEEDED?**

[YES] - [NO]

**PV 9: The feet – wearing**      **Your Agreement/Notes/Proposed changes**

<p><b>9.1 “Recordings should be done barefoot.”</b></p>	<table border="1"> <tr> <td style="text-align: center; vertical-align: middle;">Totally agree</td> <td style="text-align: center; vertical-align: middle;">Mostly agree</td> <td style="text-align: center; vertical-align: middle;">Mostly disagree</td> <td style="text-align: center; vertical-align: middle;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, “Standardization in platform stabilometry being a part of posturography”. Agressologie 24:321–326, 1983</li> </ul>	<p><b>Add / Delete</b></p> <p>I think we can, and even we should make recordings also with shod feet, in order to test if there is an effect of the shoes on the posture.</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li></li> </ul>	<p><b>Add / Delete</b></p>								

🏠 **AGREE THAT PV.9 IS NEEDED?**      [YES] - [NO]

**PV 10: The feet - Position**

**Your Agreement/Notes/Proposed changes**

**Note: 10.1-10.6 represent alternative solutions, keep this in mind when expressing your agreement**

<p><b>10.1 "Feet position should be heels together, at an angle of 30 degrees between the medial sides of the feet."</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>T.S. Kapteyn, W. Bles, C.J. Njikiktjien, L. Kodde, C.H. Massen, J.M. Mol, "Standardization in platform stabilometry being a part of posturography". Agressologie 24:321-326, 1983</li> </ul>	<p>Add / Delete</p>								
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li></li> </ul>	<p>Add / Delete</p>								
<p><b>10.2 "Feet position (based on average preferences in two populations) should be with 17 cm between heel centres, and an angle of 14 degrees between the long axes of the feet."</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>W.E. McIlroy, B.E. Maki, "Preferred placement of the feet during quiet stance: development of a standardized foot placement for balance testing", Clin Biomech, 12(1):66-70, 1997.</li> </ul>	<p>Add / Delete</p> <p>Gagey PM, Di Mascio G, Lecerf A. (2013) Quel Référentiel? Quelle position des pieds? <a href="http://clinicalstabilometry.freeforums.org/post110.html#p110">http://clinicalstabilometry.freeforums.org/post110.html#p110</a></p>								
<p><b>Notes:</b></p> <p>It is better to measure the interval between the heels rather than the distance between the centers of the heels.</p>	<p>Add / Delete</p>								
<p><b>10.3 "Feet should be parallel hip-width apart."</b></p>	<table border="1"> <tr> <td style="text-align: center;">Totally agree</td> <td style="text-align: center;">Mostly agree</td> <td style="text-align: center;">Mostly disagree</td> <td style="text-align: center;">Totally disagree</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						

	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>								
<b>References:</b> <ul style="list-style-type: none"> <li>D.A. Winter, A.E. Patla, F. Prince, M. Ishac, K. Gielo-Perczak, "Stiffness control of balance in quiet standing", J Neurophysiol., 80(3):1211-21, 1998.</li> </ul>	Add / Delete								
<b>Notes:</b>	Add / Delete								
<b>10.4 "Feet position should be with 3 cm between the heels with an angle of 30 degrees between the medial sides of the feet."</b>	<table style="width: 100%; text-align: center;"> <tr> <td>Totally agree</td> <td>Mostly agree</td> <td>Mostly disagree</td> <td>Totally disagree</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
<b>References:</b> <ul style="list-style-type: none"> <li>Italian National Institute of Health</li> </ul>	Add / Delete								
<b>Notes:</b>	Add / Delete								
<b>10.5 "Feet should be in the preferred position but such position should be traced both to correct for it and for allowing consistent within-subject repeated trials."</b>	<table style="width: 100%; text-align: center;"> <tr> <td>Totally agree</td> <td>Mostly agree</td> <td>Mostly disagree</td> <td>Totally disagree</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	Totally agree	Mostly agree	Mostly disagree	Totally disagree	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Totally agree	Mostly agree	Mostly disagree	Totally disagree						
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>						
<b>References:</b>	Add / Delete								
<b>:</b>	Add / Delete Too much complicated								

10.6 "Feet should be parallel, close together."

Totally agree

Mostly agree

Mostly disagree

Totally disagree





References: : Japanese Standards	Add / Delete
Notes:	Add / Delete



AGREE THAT PV.10 IS NEEDED?

[YES] - [NO]

**PV 11: The arms - Position**      **Your Agreement/Notes/Proposed changes**

**Note: 11.1-11.2 represent alternative solutions, keep this in mind when expressing your agreement**

	Totally agree	Mostly agree	Mostly disagree	Totally disagree
<b>11.1 "Arms should be crossed on the chest."</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<b>References:</b> •	Add / Delete			
<b>Notes:</b> •	Add / Delete			
<b>11.2 "Arms should be extended and kept at the sides."</b>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>References:</b> •	Add / Delete			
<b>Notes:</b>	Add / Delete			

🏠 **AGREE THAT PV.11 IS NEEDED?**

**[YES] - [NO]**

## INSTRUCTIONS

1. no standardized instructions
2. “stand quietly” or “stand as still as possible” (Zok, 2007)
3. **OK** “Keep natural standing”; “do not talk”; “do not turn your head”; “(stare at) **look toward** the target”; “arms at sides and relax” (ISS; A.F.P. (1985) Normes 85. Editées par l'ADAP (Association pour le Développement et l'Application de la posturologie) 20, rue du rendez-vous 75012 Paris; <http://clinicalstabilometry.freeforums.org/post92.html#p92> )

## NUMBER OF TRIALS

1. single repetition
2. **OK** 3 répétitions (ISS; Pinsault N, Vuillerme N. (2009) Test-retest reliability of centre of foot pressure measures to assess postural control during unperturbed stance. Med Eng Phys 31, 2: 276-286; Gagey B, Ouaknine M, Bourdeaux O, Vuillerme N, Gagey PM (2013) New algorithm for calculating the center of gravity, starting from the center of pressure, in standardized clinical stabilometry. [http://ada-posturologie.fr/CoP\\_CoG\\_New\\_Algorithm.pdf](http://ada-posturologie.fr/CoP_CoG_New_Algorithm.pdf))
3. 5 repetitions (Doyle, 2007)

## TRIAL DURATION

1. **OK** 30 seconds Pinsault N, Vuillerme N. (2009) Test-retest reliability of centre of foot pressure measures to assess postural control during unperturbed stance. Med Eng Phys 31, 2: 276-286; Gagey B, Ouaknine M, Bourdeaux O, Vuillerme N, Gagey PM (2013) New algorithm for calculating the center of gravity, starting from the center of pressure, in standardized clinical stabilometry. [http://ada-posturologie.fr/CoP\\_CoG\\_New\\_Algorithm.pdf](http://ada-posturologie.fr/CoP_CoG_New_Algorithm.pdf))
2. 50 seconds (Kapteyn, 1983)
3. 60 seconds (Doyle, 2007)
4. 60 seconds; 30 seconds in case of inability of standing 60 seconds (Standard Japan)
5. 90 seconds (Ruhe, 2010)

## INDIVIDUAL DIMENSIONS

1. Height, Weight, Footprint (ISS)
2. Height, Weight (Kapteyn, 1983)
3. **OK** Taille, Pointure (Gagey B (2013) Études sur le coefficient de l'équation de Winter. [http://ada-posturologie.fr/Programme\\_Winter\\_k2.pdf](http://ada-posturologie.fr/Programme_Winter_k2.pdf))

**Reliability of traditional measures: (The topic of this section is not very clear, for me)**

Trial duration from 25-40s (Scoppa et al., 2013), or 60s (Carpenter et al., 2001; Lafond et al., 2004) ? **2 options: 30-60**

# of suggested repetitions: **3-5** (Ruhe et al., 2010, Santos et al., 2008). Maybe 3 to avoid fatigue in old/neurological populations?

We distinguish two types of recordings:

- To compare the performance of the subject to the reference values found in a 'normal' population, thanks to statistics. Then we make three recordings of 30 seconds each, according to the results of the thesis of N. Pinsault, 30 seconds or more exactly 31.6 seconds when using the algorithm for calculating the center of gravity  
  
(Pinsault N, Vuillerme N. (2009) Test-retest reliability of centre of foot pressure measures to assess postural control during unperturbed stance.. Med Eng Phys 31, 2: 276-286;). (GAGEY B, Ouaknine M, Bourdeaux O, N Vuillerme, GAGEY PM (2013) New algorithm for Calculating the center of gravity, starting from the center of pressure, in clinical STANDARDIZED stabilometry. [http://ada-posturologie.fr/CoP\\_CoG\\_New\\_Algorithm.pdf](http://ada-posturologie.fr/CoP_CoG_New_Algorithm.pdf))
- To verify the modifications of his performances when we modify various inputs of his upright postural control system. Then we make a single 30-seconds recording in order to test several manipulations without too much fatigue ([http://ada-posturologie.fr/Normes13\\_Directives.pdf](http://ada-posturologie.fr/Normes13_Directives.pdf))



### SECTION III: TECHNICAL REQUIREMENTS

We recommend that instrumental measurement performance of the force plate comply with the following set of minimal requirements.

HOW TO: Please make minor changes directly in the text using a red font. If you want to add more variables for discussion, add the text in the corresponding empty cell of the table (please also include the reference). As for the Yes/No questions just mark your choice by putting your answer in red.

- Accuracy\*: better than 0.1 mm YES but without 'better than'
- Precision: better than 0.05 mm ??? (See latter)
- Resolution: higher than 0.05 mm YES but without 'higher than'
- Linearity: better than 90% over the whole range of measurement parameters ??? (See latter) (Scoppa et al., 2013)
- Sampling frequency of 100Hz with a cut-off level at 10Hz (Scoppa et al., 2013) YES, but ...
  - 1) specifying the type of filter and not just its cut-off frequency.
  - 2) clearly announcing that the phase of the signal is modified (th  r  me Plancherel).

#### Notes:

\*«Accuracy of measurement» is defined as: «closeness of agreement between the result of a measurement and a true value of the measurand.» (International Vocabulary of Basic and General Terms of Metrology, §3.5. International organization for standardization Gen  ve, 1993)

"Precision" is not a term of the vocabulary of metrology. I do not know what it means.

«Resolution (of a displaying device» is defined as: «smallest difference between indications of a displaying device that can be meaningfully distinguished» (This concept applies also to a recording device) .» (International Vocabulary of Basic and General Terms of Metrology, §5.12. International organization for standardization Gen  ve, 1993)

"Linearity" is not a term of metrology, it concerns the signal. It is necessary to specify whether we mean the linearity of the signal from each sensor or the linearity of the measurement chain. 90% of the measuring range really seems undemanding. For Bizzo, the sensors must have a non-linearity <0.1% of full scale. 0.1% of full scale is probably too demanding and deserves that the temperature conditions are specified. Then what value?

#### References:

- Bizzo G., Guillet N., Patat A., Gagey PM (1985) Specifications for building a vertical force platform designed for clinical stabilometry. Med. Biol. Eng. Comput., 23: 474-476;
- Browne J, O'Hare N. (2000) Recette de plates-formes de force Physiol. Meas. 21, 515-524;
- Browne J 1999 The development of a quantitative posturography system and its clinical evaluation MSc Thesis Trinity College Dublin).
- Bizzo G, Ouaknine M, Gagey PM (2001) Projet d'  talonnage d'une plate-forme de stabilom  trie <http://ada-posturologie.fr/RecetteProtocole.htm>

ADD

- Mean time between failures (MTBF). It is desirable that the manufacturers give the MTBF of their measurement system so that users can verify their instrument at the right time.

References:

Parre F (2004) Qualification d'une plate-forme de Stabilométrie, Rapport de stage d'un DESS de Physique, Université de Toulouse. disponible à ><http://ada-posturologie.fr/Parre.pdf><

**SECTION IV: STABILOMETRIC PARAMETERS**

We recommend that the following minimum set of relevant parameters is computed, according to the reported algorithmic definition.

HOW TO: Please make minor changes directly in the text using a red font. If you want to add more variables for discussion, add the text in the corresponding empty cell of the table (please also include the reference). As for the Yes/No questions just mark your choice by putting your answer in red.

### ***Time-domain***

**MD** (mm)

**RMS** (mm)

**PATH** (mm)

**RANGE** (mm)

**VELO** (mm/s)

**AREA** (mm<sup>2</sup>)

**S-AREA** (mm<sup>2</sup>/s)

### ***Frequency-domain***

**PWR** (mm<sup>2</sup>)

**MF** (Hz)

**F95** (Hz)

**CF** (Hz)

**FD** (-)

It seems that Lorenzo did not have enough time to develop this section IV before giving us "THE DRAFT".

To advance the debate, I give here the view of the Latin posturologists that treat functional disorders of the upright postural control system, using the properties of nonlinear dynamical systems. Their views were collected on a discussion forum, open to all, at the following address:> <http://clinicalstabilometry.freeforums.org/post55.html#p55> <

### What parameters for clinicians?

Since there are almost a hundred stabilometric parameters, the idea of making a choice of a few parameters of special interest to clinicians do not need to be defended! ...

The following list focuses on parameters that HAVE A SENSE, for US, clinicians of functional disorders, which use the nonlinear dynamic properties of the upright postural control system, to treat it.

#### References

- Gagey PM, Bizzo G. (2001) La mesure en Posturologie.

><http://ada-posturologie.fr/MesureEnPosturologie.htm><

- Gagey P.M. Weber B. (2007) Posturologie Régulation et dérèglements de la station debout. Troisième édition, Masson-Elsevier, Paris. (there are four translations of this book: in Italian, Spanish, Bresilian, Russian; but no English or Japanese translation)

1) Tonic parameters provide an indication of the postural tonic basic activity of the subject (Symmetry: X-mean, general tonic level: Y-mean).

2) The phasic parameters explore the stability of the subject:

- accuracy in space (area; Takagi A., Fujimura E., Suehiro S. (1985) A new method of statokinesigram area measurement. Application of a statistically calculated ellipse. In Igarashi M., Black F.O. (Eds) Vestibular and visual control of posture and locomotor equilibrium. Karger (Basel): 74-79.
- accuracy in time (time constant [http://ada-posturologie.fr/Constante\\_de\\_temps.html](http://ada-posturologie.fr/Constante_de_temps.html) <),
- muscular effort required by this precision (Center of Gravity Acceleration and Speed)

3) The frequency parameters that explore:

- The tone of the paraspinal muscles
  - Gagey P.M. Toupet M. (1998) L'amplitude des oscillations posturales dans la bande de fréquence 0,2 Hertz: Étude chez le sujet normal. in Lacour M. (Ed) Posture et Équilibre. Sauramps, Montpellier, 155-166.)
- The cortical involvement in postural control
  - (Ferrey G. (1995) Abord psychosomatique des traumatisés du crâne. Masson, Paris.
  - Ferrey G., Gagey PM (1988) Le syndrome subjectif et les troubles psychiques des traumatisés du crâne. Encycl. Méd. Chir. (Paris), Psychiatrie, 37520 A10, 20 pages.
  - Gagey P.M. Weber B. (2007) Posturologie Régulation et dérèglements de la station debout. Troisième édition, Masson-Elsevier, Paris)

### Parameters confirmed

Tonic parameters (from the CdG signal )

statokinesigram

X-mean

Y-mean

Phasic parameters (from the CdG signal )

stabilograms

Position ( Stability)

Speed (Energy)

Acceleration (Importance of the Muscles activity)

Time Constant (Frequency of the Muscles activity)

Parameters from the CoP signal

ANØ2X & Y

Intercorrélation of the COP signal

Parameters being studied  
Lyapunov exponent

### Special Parameters for Clogs

The choice of the clinicians is not yet done

Rossato M., Bourgeois P., Ouaknine M. (2013) Stabilometry standard guidelines 2011-2013 during clinical practice. Marrapese, Roma

## V. RELEVANT LITERATURE

Bizzo G., Guillet N., Patat A., Gagey PM (1985) Specifications for building a vertical force platform designed for clinical stabilometry. Med. Biol. Eng. Comput., 23: 474-476.

A.F.P. (1985) Normes 85. Editées par l'ADAP (Association pour le Développement et l'Application de la posturologie) 20, rue du rendez-vous 75012 Paris.

McIlroy WE, Maki BE. (1997) [Preferred placement of the feet during quiet stance: development of a standardized foot placement for balance testing](#). Clin Biomech (Bristol, Avon). Jan;12(1):66-70.

Floirat N., Bares F., Ferrey G., Gaudet E., Kemoun G., Carette P., Gagey PM (2005) Aporia of stabilometric standards. Gait & Posture, 21, Supp. 1, 52.

Skvortsov D, Weber B, Gagey PM (2009) Standardization of clinical stabilometry is a part of posturology. Proceed. Congress ISPGR Bologna

Bourgeois P, Ouaknine M. (2003) Normes et evolutions stabilométriques à partir de la plate-forme 40/16 des paramètres standards et séparés de chaque pied des enfants de 8 à 10 ans. In Lacour, Solal (eds). Posture et Equilibre. Physiologie, Techniques, Pathologies. pp : 91-100

Scoppa F, Capra R, Gallamini M, Shiffer R. (2013) [Clinical stabilometry standardization: Basic definitions - Acquisition interval - Sampling frequency](#). Gait & Posture 37(2):290-2.

Rossato M., Bourgeois P., Ouaknine M. (2013) Stabilometry standard guidelines 2011-2013 during clinical practice. Marrapese, Roma

Gagey P.M. (2013) The point of view of Latin people about the stabilometry standardization. Lecture given to the ISPGR Committee during Akita Congress 22-26/06/2013. [http://ada-posturologie.fr/Standardisation\\_Les\\_latins-a.pdf](http://ada-posturologie.fr/Standardisation_Les_latins-a.pdf)

Forum for latin therapists: <http://clinicalstabilometry.freeforums.org/>

