

Aporia of stabilometric standards

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INTRODUCTION:

Why do half of the patients with clinical criteria of ‘postural’ disorders [1] have ‘normal’ stabilometric statistical criteria [2,3]?

One possible avenue leading to an answer is that stabilometric statistics (norms 85) do not consider the subject’s psychological profile [4]

We decided to see if common psychological disorders could modify the stabilometric performances [5,6] of subjects examined in normal clinical practice.

We observed that obsessive-compulsive subjects stabilize their posture in a stiff, abnormal way, with their EO SKG area (eyes open statokinesigramm) often below the lower confidence limit: 39 mm² and their EC SKG area (eyes closed statokinesigramm) 79 mm² [2].

MATERIALS:

We use a Dynatronic 3 receptor stabilometric platform giving a two dimensional analysis sway of the center of pressure (COP), placed in a examination cabin closed on three sides (front, right and left side) eliminating extraneous visual stimuli (horizontal and vertical) allowing to obtain a standardization of visual input. (Palus et al., 1984)

Cabin depth: 2 m; width: 1.5 m, height: 2.4 m. The platform is on a low based analyser 60cm X 40 cm.

A removable mark is installed behind the subject's feet assuring reproducible positioning including a foot angle opening at 30°.

Visual target lit at 2000 lux a focal point 90 cm in front of the platform.

The examination is performed in a stable acoustical environment, thus avoiding distraction of the subject examined.(Gurfinkel et al., 1972)



METHODS

A psychological profile evaluation of 2 200 patients in common clinical practice allowed selection of those with obsessive-compulsive profiles.

We obtain 47 volunteers who complied with at least 5/6 criteria listed below :

1. Do you put away: work tools, personal documents, clothes, etc ...
2. Do you repeatedly check: that doors, water or gas taps are closed, other verifications, etc
3. Are you a perfectionist: at home, at work, in recreational activities, etc ...
4. Are you a collector: stamps, dolls, plates etc..., specify your collection ...
5. Do you save old or used objects "in case" ...
6. Do people tell you that you are precise, meticulous, obsessive, other ...

We then compared their posturographic performances with normal subjects group (Newman-Keuls tests)

Measurements:

Recordings lasted 51.2 seconds on a 5 Hz sampling frequency. Each recording was repeated twice. The average of the two recordings was used.

The receptors were calibrated before each recording.

Weekly checks were done to rule out center of pressure (CP) displacement.

The "eyes open barefoot" measurement was used as the reference point.

Each person received an explanation about the platform and procedure methods before recording.

The subject was placed barefoot on the platform, his back to the posturologist and facing the lighted target.

His position on the platform was standardized with a removable foot mark.

The recording started immediately after its removal.

Measurement conditions were identical in the two groups (P = obsessive-compulsive; N = normal)

RESULTS:

Chi' _ Test :

The Eyes Open Statokinesigramm Area (EO-SKG area) and the self-evaluation score from a questionnaire discerning an obsessive disorder (≥ 5) were systematically recorded for 2 200 patients. 143 of them had an area $<40 \text{ mm}^2$ and 143 of the remaining 2,057 files were randomly selected to construct a contingency table.

Area	Score ≥ 5	Score <5	Total
$\leq 40 \text{ mm}^2$	47	96	143
$>40 \text{ mm}^2$	0	139	139*
Total no.	47	235	282

*Four patient's data were uninterpretable. $\chi^2=54.82$; $p<0.001$.

Newman-Keuls tests :

Newman-Keuls criteria, from the two groups "P and N" were compared.

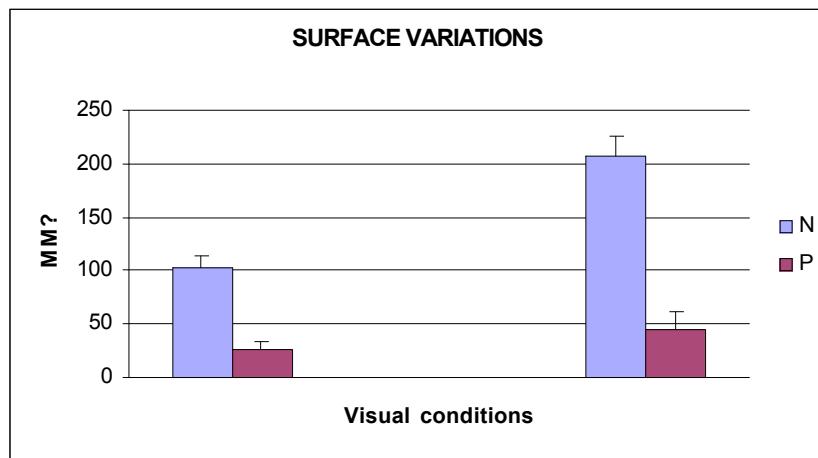
We found significant differences in (1) EO-SKG area, (2) standard variation of COP displacement speed, (3) LFA (Length as a function area)

Furthermore, there were significant, constant and global decreases of these 3 criteria in the P group. Almost all posturographic parameters varied by a 1 / 100 ratio. Although posturographic parameters which exceed these values is unusual , we found the SKG area frequently above this ratio.

For example, in our clinical experience, we measured a subject with an obsessive-compulsive neurosis with a EO-SKG area of 6 mm₂ and one the traumatic stress disorder (PTSD) at 23

000 mm₂. These two extremes are in a ratio of variability of EO-SKG area at 3 833mm².

Comparison of performances EO and EC-SKG areas

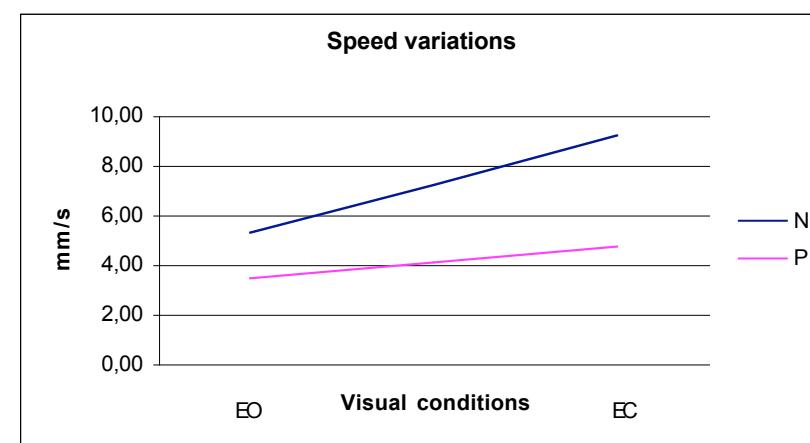


Eyes open

Eyes closed

The results of Newman-Keuls criteria, show us that P subjects had an EO-SKG area of 27.6 mm₂ and N subjects had an EO-SKG area of 101.2 mm₂. Under "eyes closed" conditions, P subjects were at 48.7 mm₂, N subjects were at 203.4 mm₂. We found the variation in SKG area of the two groups to be not linear, being less in the eyes open group. This suggests a deficiency in visual postural control, (postural amblyopia in P subjects).

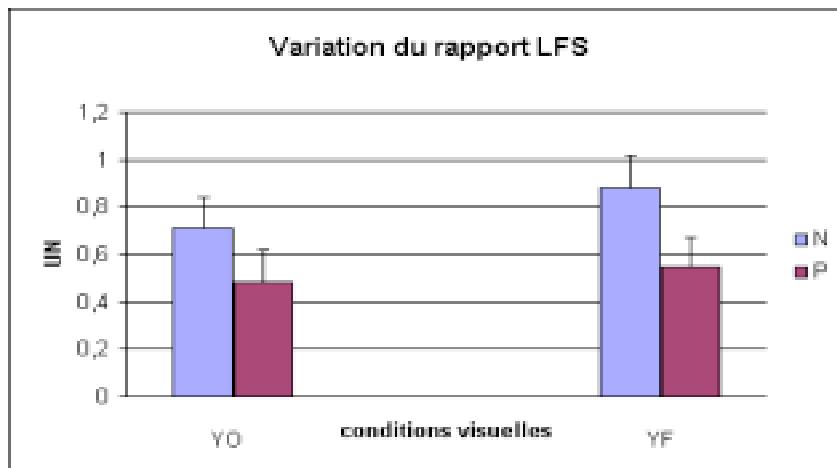
Comparison of performances and variations of standard COP displacement speed:



This diagram made with N-K criteria shows a severe lowering of performances in P subjects with COP displacement and speed at 2.8 mm / sec (eyes open) and 4.3 mm / sec (eyes closed) while the N group was found at 5.3 mm / sec (eyes open) and 9.7 mm / sec (eyes closed).

This difference is analogous to the EO-SKG area differential.

Comparison of performances and variations of LFA parameters:



The energy spent can be roughly evaluated by the ratio between the total length of the position shifts of the center of pressure and the surface in which it evolves: this is the parameter of Length as a Function of Area,(LFA) (Norré in Gagey & Weber, 1999)

We found that subjects from the P group have the LFA parameter systematically below the inferior norm.

DISCUSSION:

The Stabilometric behavior and postural performances of P group subjects suffering from an obsessive compulsive disorder is fundamentally different from N group subjects.

Their stabilometric testing reveals a regular and significant decrease in performance levels compared to N group subjects. This suggests that the P group's postural system is constantly modulated which in turn suggests the presence of a "**postural supervisor**". The "postural supervisor's" role seems to be to reduce the impact of anxiety by decreasing turbulency of the orthostatic postural sway. This seems similar to the effect of plantar manipulation done by posturological-podiatrists in Post Traumatique Stress Disorder

(PTSD).

These decreases are so marked that we have often recorded areas under 10 mm_ eyes open. Finally, this unpredictable postural behavior of P group subjects as well as the postural supervisor leads us to propose the concept of a "**therapeutic warning**". This therapeutic warning should draw clinicians' attention to the fact that posturological therapy may be poorly tolerated by these subjects. They may generate chaotic reactions and / or paradoxical anti-postural reflexes.

CONCLUSION:

The data from the psychological evaluation and SKG area from obsessive-compulsive disorder subjects composing the P group indicated the **existence of a thymo-cognitive input**.

In light of these findings, **the influence of thymo-cognitive input seems capable of significantly modulating postural control.**

This continuous influence on postural control can be measured and quantified by means of psychological testing combined with measurements on a normalized stabilometric platform. It seems that hereon, psychological influences and especially functional disorders must be accounted for when establishing a statistical basis for generating stabilometric norms.

We may subsequently conclude in the existence of a "**Norm Aporia.**"

This will require a complete revision of stabilometric standards which including a complete and precise listing of postural stabilometric findings characterizing various psychological dysfunctions.

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□ 1: Aporia: definition (18th century ecclesiastical latin)

a : without, **poros** : path. Term used in logic to indicate an unsurmountable rational difficulty, often an unsolvable conflict. Difficulty in resolving a problem, a contradiction or difficulty of reasoning.

□ 2 Normality limits in norms 85: values of EO-SKG area parameter:

average for female subjects:

with eyes open: 102.9 mm_ (15.2 mm_ / 190.5 mm_)

with eyes closed: 257.8 mm_ (36.3 mm_ / 551 mm_)

average for the male subjects :

with eyes open: 96.2 mm_ (18.33 mm_ / 174.2 mm_)

with eyes closed: 260.1 mm_ (19.7 mm_ / 539.9 mm_)

average both sexes:

with eyes open: 91 mm_ (39 mm_ / 210 mm_)

with eyes closed: 225 mm_ (79 mm_ / 638 mm_)

Values of LFA parameter:

average for female subjects:

with eyes open: 1.03.

with eyes closed: 0.99.

average for the male subjects :

with eyes open: 0.99.

with eyes closed: 1.05.

Values of the speed parameter:

average for female subjects:

average speed with eyes open : 9.67 millimeters / seconds.

average of variation with eyes open: 2.21 millimeters / seconds.

average speed with eyes closed: 10.39 millimeters / seconds

average of variation with eyes closed :2.37 millimeters / seconds

average for males subjects:

average speed with eyes open : 11.4 millimeters / seconds
average of variation with eyes open : 2.37 millimeters / seconds
average speed with eyes closed: 12,6 millimeters / seconds
average of variation with eyes closed : 2.5 millimeters / seconds

Values both sexes:

Recording with eyes open, average: 10.6
Standard variation: 3.7
Lower confidence limits at 95% (3.4 millimeters / seconds/ 17.7 millimeters / seconds)
Recording with eyes closed, average 11.5 millimeters / seconds

Standard variation: 3.4 millimeters / seconds
Lower confidence limits at 95% (4.8 millimeters / seconds / 18.2 millimeters / seconds)