

## HOW CAN POSTURO-ACOUSTIC SYSTEM HELP THE SINGER IN VOICE QUALITY RESEARCH?

Joseph Quoidbach

IMEP - Institut Supérieur de Musique et de pédagogie, Namur, Belgium

**Abstract:** Since September 2010, a Postural-acoustic Lab has been taking shape at the IMEP School of Music and Music Education in Namur, Belgium.

Thanks to recent developments about the Postural System in the Field of Neurophysiology, as well as to progress in Information Technology and Robotics, it is now possible to provide Music Students with a modern set of tools leading to the optimizing of an ergonomic position in performing, regardless of the instrument.

It's about moving away from the sole system of "retro-control" to a system of anticipation, in other words, from a system of feedback to a system of "feedforward".

### INTRODUCTION

In this paper the following points will be addressed:

- What are the benefits of the proposed approach in which three means of "retro-control" are applied simultaneously, as part of the musician's strategy to verify posture as sound is emitted.
- The notion of posture and posturology
- Postural-acoustic laboratory developed at IMEP, Namur
- Conclusions

### METHODS

What are the benefits of the proposed approach in which three means of "retro-control" are applied simultaneously, as part of the musician's strategy to verify posture as sound is emitted?

There are a number of them.

To begin with, this approach is about creating the conditions in which musicians learn to move from a system of feedback to a system of anticipation ("feedforward"). This is the starting point that will allow musicians to go from a system of long loops, to a system of short loops.

Secondly, this approach will offer a set of tools allowing musicians to gradually grow in independence regarding the ability to check whether the sound that is actually being produced is the sound that they had the intention of producing.

Musicians also can discover on a screen the relation between harmonics and voice quality

This issue is of particular interest for singers, given the fact that in reality they don't hear the actual sound that they are producing.

Initially, this need for singers led to the idea of a postural-acoustic lab. It was then observed that it could be equally applicable to other instruments besides the voice.

The concept of posture and posturology

In order to fully understand how this postural-acoustic approach works, it is indeed necessary to mention a series of notions about posture as well as some elementary notions about the neurophysiology of the postural system.

What would the definition of posture be?

According to Paillard, posture refers to "the body attitude or to the position of the whole set of segments at any precise moment".

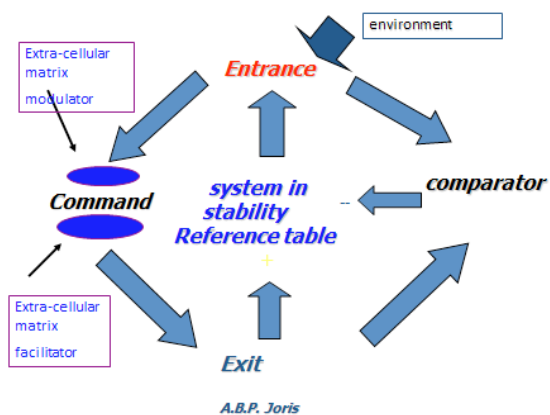
Based on this way of referring to posture, we can move on to the definition of posturology:

According to Gagey, Posturology is the study of the geometrical and bio-mechanical organization of different segments of an individual in space and of the regulation process involved. In this sense, it is the sum of neurological mechanisms which allow the balancing of these elements in space during the standing position or during the walking action.

The notion of a postural system implies inputs and outputs, as well as a central computer processing the stream of information.

The term "postural system" obviously includes the notion of "system".

By its own definition, a system is a combination of elements put together in a way that allows them to become a whole.



In general, and in normal conditions, in terms of its referential elements the postural system is in balance.

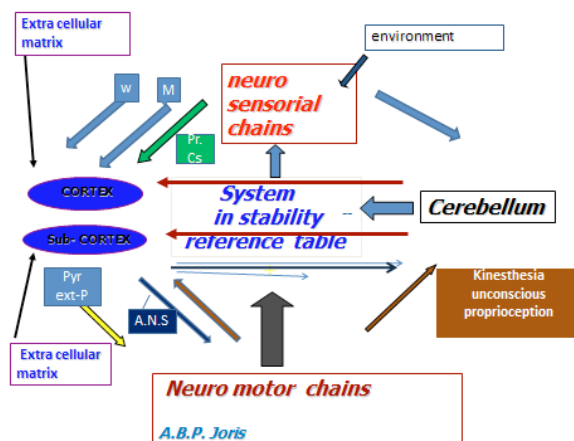
When taken away from its balance, it refers to inputs, which will in turn give information to a commanding system and a comparer.

These last two elements will influence outputs whose actions will bring the system back to balance.

When referring to the system concerning the human body, the pattern as illustrated by Doctor Maurice Joris, President of the Belgian Society of Posturology is as follows:

“Posture is based on a notion of stability or balance, in other words, the fact of returning to the initial position after having left it. In order to obtain this stability, it is necessary to use a reliable postural system.

In order to understand the logic behind the postural system, here’s a systems analysis.



When the system moves away from its reference points, or from its maneuvering margin, it refers to inputs which are neurosensory chains, which in turn influence the cortex and subcortex through a “three-lane highway”.

These three routes are:

- the path of conscious “self-perception”
- the vascular mechanical-receptors described by Mittelsteadt
- the spinal column according to Wike

The neurosensory chains equally influence the cerebellum through specific paths.

The cortex and the subcortex influence the neuromotor chains through the paths of the pyramidal and extrapyramidal system as well as through paths of the autonomous nervous system.

The neuromotor chains give information thanks to the paths of the kinaesthesia (unconscious “self-perception”) for the cortex and the subcortex.

Attention should be drawn to the fact that the neurosensory chains in which the eyes, the internal ear, the masticating system, the skin, as well as the mechano-receptors of the vascular system are found, are under the environment’s influence.

The extra-cellular matrix, which is either modulator of facilitator, influences the cortex or the sub-cortex.

The whole of these mechanisms of great precision should allow individuals to place themselves correctly in space, and to perceive their subjective vertical line as well as their physical vertical line.

In reality, this process should happen quite naturally in most cases, but unfortunately, we are forced to

acknowledge that there is often divergence. The process of integrating the physical vertical line often takes place inaccurately. People think that they are in a certain position while they really are in another.

There is often a sensory conflict.

This is the reason why it seems important to establish an approach offering a set of tools allowing people to correct these inaccuracies.

For musicians it is imperative to be able to considerably adjust their position, in order to create the conditions that allow the production of the most performing sound, as close as possible to the reality of sound they aim for.

Postural-acoustic Laboratory developed at the IMEP (School of Music) in Namur, Belgium.

A Postural-acoustic Laboratory has been taking shape since 2010 at IMEP (School of Music and Music Education) in Namur, Belgium.

Since 2003, with the aim of constantly improving the quality of teaching, experiments in the field of posture and acoustics began to take place. Unfortunately the Information Technology potential at the time didn’t allow for confirming or questioning the hypotheses being put forward through our approach.

The core of the subject was to prove that: body posture has an influence on the quality of sound production, regardless of the instrument being played. Progress in Information Technology has allowed the way of functioning to evolve in a very positive way.

In June 2009, a physiotherapy student came with the request of some assistance in her research for the end of her undergraduate studies.

In June 2010, she presented the results of her work and research which had taken shape thanks to the resources (both technological and human) made available and put at her disposal by the IMEP.

The subject of her research (end of studies project) was “The influence of Posture on Sound Quality in Students majoring in Voice Studies”.

She managed to demonstrate that there was in fact a very close correlation between body posture and the quality of sound production. Based on these results, it became obvious that it was important for voice students to have access to a reliable and tangible set of tools.

An article published by Professor Richard Miller and Juan Carlos Franco in the National Association of Voice Teachers’ Journal, followed in June 1995 by the Voice Teachers Association Bulletin already spoke about the “Spectography” of the singing voice.

We became interested in this publication, and based, among other sources, on this particular one, we have shaped and brought together a series of elements put into practice in our School of Music, which are the object of our conference today.

What are the functions of this approach or set of tools?

-To establish a sound “identity card” from the time of enrollment to the school. Students can record

themselves and become aware of the physical points of reference of the produced sounds.

-To allow a linear follow-up of the way in which the sound is evolving throughout the five-year program. A computerized file gives students and teachers the opportunity to visualize the specific and objective physical characteristics involved in the production of sound, and how they are being transformed as this awareness grows through the application of the proposed approach.

-To make use of a feedback procedure.

Musicians are able to observe, either directly or in a re-play of a recording, on screen, the various significant curves of the produced sound.

-To pursue a body attitude which is in correlation with the sound, by means of a feed-back procedure which is made possible in a visual manner through the use of large mirrors placed at a 45° angle.

Musicians can see themselves simultaneously from the front and from the side, which facilitates the possibility of seeking the most suitable and ergonomic position, depending on the instrument being played.

What are the elements needed for this postural-acoustic laboratory?

- A set of standing mirrors, placed at a 45° angle
- A force platform, such as the “biorescue” type, allowing the musician to measure a series of points of reference, mostly foot tracks on the ground, and to control the center of pressure in the standing and still position, as well as while singing.
- A microphone (Neumann type) linked to a sound card and to an Audio spectrographical analyzer. (City)

Working session procedure:

Take the case of a singer. We ask him/her to stand on the platform, to check his points of pressure, to control verticality thanks to the mirrors, then to begin to sing in the required position.

It's possible to vary the points of reference, as follows:

-head position backwards and forwards, left/right rotation of the cervical column as well as left/right inclination of the cervical column.

-position of the tongue

-Transfer of the center of pressure of the body, in various directions.

-With a sound in the medium register as a starting point, we explore the other registers.

-The spectogram will be evaluated according to the preceding combinations.

-It's crucial to evaluate how the basic overtones as well as the multiple overtones evolve.

-The singer eventually recognizes the position in which the sound production will be at its best. By repeating the result again and again, he/she will memorize and engrain it.

## CONCLUSIONS

It's important to provide a School of Music with the most advanced resources now available in order to allow an optimal development of the Students' musical skills. Thanks to the progress in Technology, as well as in the field of Posturology, we now have access to such resources.

We are at the dawn of fascinating work, with an endless scope of research in various fields.

## REFERENCES

- [1] anatomie clinique du système nerveux central professeur Prades Masson édition
- [2] posturologie clinique. Dysfonctions motrices et cognitives Weber et Villeneuve, 2007, éditions Masson.
- [3] Le sens du mouvement Alain Berthoz éditions Odile Jacob
- [4] posturologie clinique tonus, posture et attitude, 26e journée de posturologie clinique. B. Weber et Ph. Villeneuve 2009.
- [5] Analyse spectrographie de la voix chantée. Richard Miller et Jaun Carlos Franco in N A TS journal septembre 1991. (Journal de l'association nationale des professeurs de chant aux États-Unis).