Postural Auriculotherapy. Double Blind Randomized Study about effectiveness of auricular stimulation on postural disorders.

Auricoloterapia Posturale. Studio Randomizzato in Doppio Cieco sull'efficacia della stimolazione auricolare negli squilibri posturali.

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ABSTRACT

The AA wanted to verify with normalized stabilometry (Amplifon Svep model) the effects of Auriculotherapy upon the postural control of the subject.
After a long experimentation, specific auricular points were identified, for postural rebalancing (ATPS method, Scoppa 2006).
2 group of patients suffering with muscular skeletric pains, in chronic phase, were subdivided randomly in 2 groups.
group A, 82 patients evaluated with stabilometry before and after postural Auriculotherapy
group B, 70 patients evaluated with stabilometry before and after administration of a placebo.
The research has evidenced statistically significant differences between group A and group B.
The stabilometric evaluation has confirmed what had been shown clinically: Auriculotherapy following the ATPS method is capable of modifying the postural control of the subject.

KEY WORDS

- Auricolotherapy
- Postural Control
- Stabilometric Examination
- Double Blind Randomized Study

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1
Introduction : aim of the research

Auriculotherapy is the utilization of the auricle for therapeutical purposes.
Discovered by Dr. Paul Nogier of Lyon in 1951, it has been recognized by the World Health Organization in the OMS meeting of Lyon in 1990
Since the discovery by Nogier, Auriculotherapy has been the object of several neurophysiological studies. Recently, Auriculotherapy has been proposed with the aim of reprogramming the Postural Tonic System (23): the term Postural Auriculotherapy defines the utilization of Auriculotherapy for the treatment of postural unbalances, through the stimulation of one or more auricular spots highly reflexogenic for the Tonic Postural System.
The purpose of this work is the assesment of the modifications induced by Postural Auriculotherapy according to Scoppa (ATPS) to the balance of the body in space and, thus, to the postural control. In order to do so, a study has been carried out, through stabilometric analysis, on a sample of subjects suffering with algic-dysfunctional pathologies of the locomotory apparatus (rhachialgiae, arthropathies) and postural unbalance evident to the clinical and stabilometric examination. The experimental ATPS group has been subjected to stabilometric examination before and after treatment with postural Auriculotherapy. The control group has been subjected to a stabilometric examination before and after the administration of a placebo. **Presenting this research we will then show the criteria**

with which the sample has been chosen, the procedure used to performe the examination and the collection of data, the equipment used, the method for the elaboration and analysis of the collected data, the results and the conclusion.

1.1 Sample

The analyzed sample consists in two groups:
1) *experimental group or ATPS* (82 subjects, of which 47 men and 35 women);
2) *control group or placebo* (70 subjects, of which 36 men and 34 women).
Both examined samples have an age comprised between 14 and 65 years. It has been chosen not to use subjects under the age of 14 because the development of the auricle, where the auriculotherapeutic stimulation takes place, is completed only after this age. **The samples have been chosen randomly**, as it was not known beforehands whether a person would be subjected to therapy or not. Moreover, **the research has been conducted in double blind**: patients did not know which kind of treatment was administered to them (therapy or placebo); two different persons have been employed for the collection and analysis of data, also in this case without them knowing whether the subjects had been treated with therapy or placebo.

1.2 Equipment

A stabilometric platform has been used for the collection of data, the board is a model S.V. and P., made by Amplifon, built according to the standard international norms (Normes 85) of the French Posturology Association (Associatione Francaise de Posturologie AFP). The platform is positioned on the floor and, before any measure is taken, the horizontality of the surface is assessed with a spirit level. The instrument is capable of supplying a series of output information like the personal details of the patient, date and time of examination, type of examination (for example: eyes open or closed, placebo, ATPS), a part from the variables that are of interest to us in order to evaluate the effects of therapy and that will be described futher on.

1.3 Execution Mode for the Stabilometric Examination

The platform is located in a specific room, with dim illumination in order not to disturb the patient: according to the indications given by the AFP, lighting should be approximately of 2000 lux. The sampling rate of the instrument is of 5 Hz and the length of acquisition is of 51.2 seconds.
The wall in front of the board is free from objects that may distract the patient, a monitor presenting a white vertical line on black background is used as a visual target. The foveal visual centre is at approximately 90 cm.
The exam is carried out without shoes and the patient is in the Romberg position, this consists in taking a standing position with the arms along the body, the feet are positioned according to the guides present on the board and toes are kept open at 30°. The patient is also invited to maintain a relaxed position and normal breathing, the weight of the body should be equally distributed on both feet, the mouth should be kept lightly closed, the patient should remain silent and focused on the white line on the monitor.
The patient is first examined with open eyes then with closed eyes. If the subject wears an habitual prescription the measure is taken with and without glasses, although in this analysis only those without glasses have been taken into consideration. In a second phase the same

measures with open and closed eyes have been taken after ATPS. In the same manner, measures after placebo have been taken in a second time.

1.4 Analyzed variables

The stabilometric examination allows the obtainment of a series of important output information regarding the patient. Among them, those utilized to study the effectivness of Postural Auriculotherapy according to Scoppa, are listed and described below.

1.4.1 *X* Average ($\overline{X}$) - *Y* Average ($\overline{Y}$)

The variable $\overline{X}$ represents the lateral average shift (right-left) of the pressure centre of the patient. These movements are detected by the abscissa axis X.
In the same manner, the variable $\overline{Y}$ shows the average antero-posterior movement of the pressure centre, detected by the axis of the ordinates *y*.

1.4.2 Length (L) - Surface (S)

The variable L represents the total length of the tracking, meaning the length of the path of the pressure centre during the stabilometric recording phase.
This parameter goes by the name of *length of the statokinesigram* and is linked to the energetic consuption necessary to the maintenance of the standing position: smaller length corresponds to less consumption.
The variable S identifies the surface of the ellipse of confidence that contains 90% of the positions sampled from the pressure centre and gives information regarding the precision of the system: the smaller the surface, the higher the accuracy.
These two parameters are little correlated between them, given, as can be easily guessed, that inside one same surface the pressure centre could have shifted only a little, having thus covered a short path, or viceversa, could have shifted covering long tracks.

1.5 Statistic Test

The test performed to evaluate the effects of Postural Auriculotherapy according to Scoppa is a T test by Student for double ended coupled data.
The test consists in considering the difference between each of the above mentioned parameters as obtained after ATPS or after placebo, and the relative original measures.
The analysis of these parameters allows us to establish whether the differences between the variables taken into consideration are significant, and accordingly whether therapy has changed the postural balance of the subject, or , on the contrary, if the differences are not significant, thus showing that therapy hasn't had any effect.
A double ended test has been chosen because it is interesting to detect the variations of the examined parameters in both directions, which, in any case show a new postural strategy of the subject and a re-elaboration of the bodily scheme. Moreover, other researchers have noticed a deterioration of the stabilometric parameters, such as length and surface, immediately after a postural re-programming therapy, followed, in the successive months, by a meaningful improvement. This might be due to the fact that, with an effective postural therapy, what is obtained at the beginning is a destructuration of the dysfunctional motor and postural schemes and, thus, of the adaptations and compensations adopted by the organism, while successively a re-programming of the postural balance takes place.

2
Data Analysis

The results obtained using the test t for double ended coupled data will be described and commented in this paragraph. The test has been used to assess the effects of ATPS on each of the four stabilometric parameters taken into consideration, both with open and closed eyes examination.

2.1 ATPS Test

Following, for each of the different quantities are listed the average values and the relative standard deviations, parameter t and the probability P associated to it, before and after ATPS. The probability P, just mentioned, allows us to establish the level of significance of the test at 5 or 1%.
For this analysis only the sample of subjects that has undergone therapy has been taken into consideration (82 patients).

2.1.1 $\overline{X}$

The variable $\overline{X}$ describes the lateral shifts (right-left) of the subject and is measured in millimeters (mm).

$\overline{X}$ Open Eyes

X initial average	$\overline{X}_{OE}^{in}$	1,94
X average after ATPS	$\overline{X}_{OE}^{ATPS}$	3,01
Difference $\overline{X}_{OE}^{in}$ - $\overline{X}_{OE}^{ATPS}$	d	1,07
Standard Deviation	$s_{\overline{d}}$	0,58
Specimen dimension	N	82
Test	t	1,85
Probability	P	6,8%

As can be observed, $\overline{X}_{OE}^{ATPS} > \overline{X}_{OE}^{in}$. This could lead to think that, following therapy, the parameter X has tendency towards deterioration. Actually, performing a double ended test t with ñ = N - 1 = 81 degrees of freedom, a value for t can be obtained to which a probability P = 6,81 is associated, that, although just by a little, is greater than the level of significance of 5%. This shows that the two sample averages can be considered as belonging to the same population, thus therapy has not modified parameter *X*, either negatively or positively.

$\overline{X}$ Closed Eyes

X initial average	$\overline{X}_{CE}^{in}$	2,36
X average after ATPS	$\overline{X}_{CE}^{ATPS}$	2,44
Difference $\overline{X}_{CE}^{in}$ - $\overline{X}_{CE}^{ATPS}$	d	-0,08
Standard Deviation	$s_{\overline{d}}$	5,74
Specimen dimension	N	82
Test	t	-0,13

Probability	P	89,4%

Also by performing the measurements with closed eyes, a probability *P* can be obtained which is much greater than 5%, this leads us to the conclusion that the difference between the values of the two averages is not significant, but rather due to statistic fluctuations. This confirms the previous case results, meaning, therapy does not modified this parameter.

2.1.2 $\overline{Y}$

The variable $\overline{Y}$ describes the antero-posterior shifts of the patient and is measured in millimeters (mm).

$\overline{Y}$ Open Eyes

Y initial average	$\overline{Y}_{OE}^{in}$	-38,69
Y average after ATPS	$\overline{Y}_{OE}^{ATPS}$	-40,72
Difference $\overline{Y}_{OE}$ - $\overline{Y}_{OE}^{ATPS}$	d	2,02
Standard Deviation	$s_{\bar{d}}$	8,41
Specimen dimension	N	82
Test	t	2,18
Probability	P	3,2%

In this case to the value observed is associated a probability P = 3, 2% inferior to 5%. This probability is too low, so the hypothesis that the two sample averages could belong to the same population (void hypothesis) is to be refused. Therefore therapy can be considered to be effective in modifying significantly the average antero-posterior position of the pressure centre.

$\overline{Y}$ Closed Eyes

Y initial average	$\overline{Y}_{CE}^{in}$	-37,48
Y average after ATPS	$\overline{Y}_{CE}^{ATPS}$	-40,71
Difference $\overline{Y}_{CE}$ - $\overline{Y}_{CE}^{ATPS}$	d	3,32
Standard Deviation	$s_{\bar{d}}$	8,55
Specimen dimension	N	82
Test	t	3,42
Probability	P	0,1%

Performing Student's test for the variable *Y* in closed eyes mode, a very low probability is obtained, inferior to 1%. This allows us to conclude that the void hypothesis is to be refused also at the significance level of 1% and that therapy has therefore had highly significant effects upon the variation of this parameter, that, as known, has a specific proprioceptive meaning.

2.1.3 L

Variable *L*, measured in millimeters, allows us to assess the length of the statokinesigram, meaning the length of the path covered by the pressure centre during the stabilometric recording.

L Open Eyes

L initial	L_{OE}^{in}	319,79
L after ATPS	L_{OE}^{ATPS}	304,93
Difference L_{OE}^{in} - L_{OE}^{ATPS}	d	14,86
Standard Deviation	$s_{\bar{d}}$	59,83
Specimen dimension	N	82
Test	t	2,25
Probability	P	2,7%

Student's test for the variable L provides a value for t to which a probability P = 2, 7% < 5%. This result tells us that the difference between the two sample averages is significant at the 5% level. Particularly, being $L^{ATPS} < L^{in}$, we may conclude that Postural Auricolotherapy according to Scoppa has had significant effects upon the economy of the system.

L Closed Eyes

L initial	L_{CE}^{in}	534,18
L after ATPS	L_{CE}^{ATPS}	472,84
Difference L_{CE}^{in} - L_{CE}^{ATPS}	d	61,35
Standard Deviation	$s_{\bar{d}}$	128,03
Specimen dimension	N	82
Test	t	4,34
Probability	P	<1%

For the measurements taken with closed eyes, the test provides a very low value of the probability (P < %1), confirming the effectiveness of therapy. The result obtained in this case is highly significant; futhermore it can be observed that the difference
d results greater compared with the open eyes case. This confirms the validity of ATPS at the proprioceptive level above all, in fact with closed eyes the visual receptor is eliminated, therefore, proprioceptive function acquires specific importance.

2.1.4 S

This last parameter taken into consideration measured in square millimeters (mm^2), represents the surface of the ellipse of confidence containing 90% of the positions sampled from the pressure centre.

S Open Eyes

S initial	S_{OE}^{in}	153,16
S after ATPS	S_{OE}^{ATPS}	148,71
Difference S^{in} - S_{OE}^{ATPS}	d	4,45
Standard Deviation	$s_{\bar{d}}$	95,11
Specimen dimension	N	82
Test	t	0,42
Probability	P	67,5%

The value of the probability obtained for the variable S is very high (P >>

5%). For this reason the hypothesis that the two sample averages may belong to the same population is not to be refused. This means that the result $S_{OE}^{ATPS} < S_{OE}^{in}$ cannot be attributed to therapy, but just to statistic fluctuations.

S Closed Eyes

S initial	S_{CE}^{in}	302,36
S after ATPS	S_{CE}^{ATPS}	287,84
Difference S^{in} - S_{CE}^{ATPS}	d	14,52
Standard Deviation	$s_{\bar{d}}$	228,15
Specimen dimension	N	82
Test	t	0,58
Probability	P	56,7%

In this last case also, the average value of parameter S measured after ATPS is inferior compared to the initial one, but the very high value of the probability indicates a scarcely significant result.

2.2 Placebo Test

Following are the results obtained performing Student's test on a sample made by 70 patients subjected, after an initial measurement, to placebo. This consists in having the patient observe, while in the Romberg position, an intermittent red light, 5 seconds at low frequency and 5 at double frequency. The light comes from a led positioned at eye level at a distance of approximately one meter. This procedure, proposed to the patient as therapy, does not result in having any effect or correlation with the postural control of the subject, as confirmed by the results of the present research.

$\bar{X}$ Open Eyes

X initial average	$\bar{X}_{OE}^{in}$	4,05
X average after Placebo	$\bar{X}_{OE}^{Plcb}$	3,64
Difference $\bar{X}_{OE}^{in}$ - $\bar{X}_{OE}^{Plcb}$	d	0,40
Standard Deviation	$s_{\bar{d}}$	3,60
Specimen dimension	N	70
Test	t	0,93
Probability	P	35,5%

$\bar{X}$ Closed Eyes

X initial average	$\bar{X}_{CE}^{in}$	3,86
X average after Placebo	$\bar{X}_{CE}^{Plcb}$	3,15
Difference $\bar{X}_{CE}^{in}$ - $\bar{X}_{CE}^{Plcb}$	d	0,71
Standard Deviation	$s_{\bar{d}}$	4,01
Specimen dimension	N	70
Test	t	1,48

Probability	P	14,7%

$\overline{Y}$ Open Eyes

Y initial average	$\overline{Y}_{OE}^{in}$	-36,94
Y average after Placebo	$\overline{Y}_{OE}^{Plcb}$	-38,22
Difference $\overline{Y}_{OE}$ - $\overline{Y}_{OE}^{Plcb}$	d	1,29
Standard Deviation	$s_{\overline{d}}$	5,75
Specimen dimension	N	70
Test	t	1,87
Probability	P	6,6%

$\overline{Y}$ Closed Eyes

Y initial average	$\overline{Y}_{CE}^{in}$	-35,77
Y average after Placebo	$\overline{Y}_{CE}^{Plcb}$	-37,11
Difference $\overline{Y}_{CE}$ - $\overline{Y}_{CE}^{Plcb}$	d	1,34
Standard Deviation	$s_{\overline{d}}$	6,13
Specimen dimension	N	70
Test	t	1,82
Probability	P	7,4%

L Open Eyes

L initial	L_{OE}^{in}	301,38
L after Placebo	L_{OE}^{Plcb}	305,83
Difference L_{OE}^{in} - L_{OE}^{Plcb}	d	-4,45
Standard Deviation	$s_{\overline{d}}$	59,16
Specimen dimension	N	70
Test	t	-0,63
Probability	P	53%

L Closed Eyes

L initial	L_{CE}^{in}	504,98
L after Placebo	L_{CE}^{Plcb}	480,99
Difference L_{CE}^{in} - L_{CE}^{Plcb}	d	23,99
Standard Deviation	$s_{\overline{d}}$	100.77
Specimen dimension	N	70
Test	t	1,99
Probability	P	5,1%

S Open Eyes

S initial	S_{OE}^{in}	137,59
S after Placebo	S_{OE}^{Plcb}	144,27
Difference S^{in} - S_{OE}^{Plcb}	d	-6,68
Standard Deviation	$s_{\bar{d}}$	93,89
Specimen dimension	N	70
Test	t	-0,60
Probability	P	55,3%

S Closed Eyes

S initial	S_{CE}^{in}	247,34
S after Placebo	S_{CE}^{Plcb}	250,39
Difference S^{in} - S_{CE}^{Plcb}	d	-3,05
Standard Deviation	$s_{\bar{d}}$	115,57
Specimen dimension	N	70
Test	t	-0,22
Probability	P	82,7%

As can be observed, Student's test, performed after placebo, both with closed and open eyes, provides probability values greater than the confidence level of 5%. This indicates that the sample averages of all studied variables, belong to the same population. In other words, differences between the two averages are due to statistic fluctuations only, thus, as we expected, placebo has had no effect upon patients.

3
Conclusions and comments

The purpose of this work is that of evaluating the effects of Postural Auriculotherapy according to Scoppa upon the balance of the body in space, and consequently upon postural control. In order to do so, a double blind research has been carried out whith stabilometric examination over a sample of patients affected by algic-dysfunctional pathologies of the locomotory apparatus (rachialgiae, arthropathies) and postural dysequilibrium, evident upon clinical and stabilometric examination. Both therapy and placebo have been administered to the sample randomly. For each patient, lateral ($\overline{X}$) and antero-posterior ($\overline{Y}$) shifts of the pressure centre have been analysed, together with tracking of the pressure centre (*L*) and the surface of the ellipse that covers 90% of the positions sampled (*S*). Measures have been taken both with open and closed eyes. The test used for the statistic analysis is a test t by Student for double ended coupled data. This because we are interested in verifying the variations of the examined parameters in both directions, which, anyway, show a new postural strategy by the subject and a rielaboration of the bodily scheme. The data analysis obtained for the sample subjected to placebo confirms , as expected, the ineffectiveness of this treatment in modifying the examined parameters. As far as the sample subjected to Postural Auriculotherapy is concerned, the test, on the contrary, allows us to verify a significant variation of parameters $\overline{Y}$ and *L*, although no significant alterations have been detected in parameters $\overline{X}$ and *S*.

The results of this stabilometric research confirms what already evidenced clinically: Postural Auriculotherapy is capable of modifying in a significant way the balance of body in space.

The conclusions previously related can be briefly commented as follows.

The modification of the length, both in eccess and in difect, indicates that therapy acts upon the energetic consumption for postural control: likely, in a first time dismantelling the old postural scheme and successively reducing the consumption of energy thus optimizing the system.

The significant variation of parameter length, indicates that Auriculotherapy is capable to optimize the energetic consumption of the Postural Tonic System.

The significant modification of Y average indicates that therapy is capable to change the balance of the body on the sagittal plane: therefore it acts upon the flectors-extensors movement of the proper postural musculature. Specifically, Auriculotherapy is capable of shifting backwards the centre of gravity in patients with the scapular plane anteriorized with respect to the gluteal plane, a very frequent condition (more than 70% of observed cases) of postural unbalance, and particularly disadvantageous from the biomechanical point of view. The altered load, anteriorly unbalanced, predisposes patients with anterior scapulum to a series of typical postural disorders: lumbalgiae associated with contractures and stiffness (typical is the lumbar bar pain), cervico-dorsalgiae, metatarsalgiae, trochanteritis and femur-rotula dysfuntion.

The usefulness of a procedure that, like ATPS, helps the retropositioning of the centre of gravity, can be guessed.

Finally, creating a subgroup with the worst patients, which means we exclude the relatively centred patients, Auriculotherapy gives even better results, evident in all examined parameters (Surface, Length, Xaverage, Yaverage). Coherently with our previous researches (Scoppa e Guidetti, 2002; Costa, 2004), we therefore observe that **in the presence of a great postural unbalance, Auriculotherapy provides the best and more significant results.**

All in all, the clinical and stabilometric monitorings leave us to suppose that **Auriculotherapy favours the choice for a new postural strategy**.

The new information (Postural Auriculotherapy), included in a dynamic non linear system, as is the postural system, interacts with the subject's bodily scheme, producing a readjustment of the intersegmentary relations and a normalization of the muscolo-fascial tensions (Scoppa, 2006).

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