

In previous articles, the effects of laser stimulation on a force platform have been verified, as well as the beneficial effect obtained by the stimulation of 8 acupoints with the above-cited novel laser device. Our test confirms the effectiveness of this treatment, which is painless, devoid of any major contraindication, and can be performed easily and quickly even by physiotherapists that are not specifically familiar with Traditional Chinese Medicine. The method, which presents practically no contraindications, could be massively applied to prevent the Risk-Of-Fall originated by proprioceptive deficit thus achieving significant socio-sanitary benefits through a quick, painless and non-invasive treatment. The results of this pilot study will be of help in designing an appropriate Clinical Trial.

involved in the examination of balance tests and acted as assistants during the test.

The purpose of this demonstrative test, fully within the framework of the research project, was to verify the effectiveness of the laser stimulation in the prevention of falls in a sample of "compensated" senior citizens. The test was performed in the Posturology Master Course held at "La Sapienza" University (Rome – Italy) with the active involvement of students participating as test subjects. The students were also

Objective

As reported [5], a preliminary test on four subjects (2+2 controls) has evidenced the capability of a novel Ultra-Low-Light-Level-Laser (ULLL) to effectively reduce closed eyes sway both in a patient affected by a known disabling pathology and in a patient suffering from a more common musculoskeletal condition. With a view to designing a full Randomized Controlled Trial (RCT) on a statistically significant sample of "compensated" senior citizens, it was decided to verify both these findings and the feasibility of the test itself on a population of cooperating young normal individuals.

The Test

The test was performed within the Posturology Master Course held at "La Sapienza" University (Rome – Italy) with the active involvement of students participating as test subjects. The students were also

Stimulation is obtained by manually emitting 20 half second emissions at a distance of about 25 mm over the skin with a spot size of about 4 mm in diameter. The total energy for a single point stimulation is therefore <0.3 mJ and its density is less than 2.5 mJ/cm².

Test	ID	SD(x) mm	SD(y) mm	S Path mm/sec	S Area mm ² /sec	Ellipse A mm ²	ST s	SD mm	Tot X Pwr mm ² /Hz	Tot Y Pwr mm ² /Hz	SPF
Closed Eyes Test	1	4.76	4.39	15.13	32.82	252.68	0.8	5.34	442.66	257.8	0
	2	4.4	3.63	26.52	43.95	194.92	0.4	7.84	182.11	162.14	4
	3	7.68	4.93	39.48	104.49	460.12	0.28	12.58	699.02	322.83	15
	4	9.35	6.83	40.95	125.2	768.82	0.26	17.13	1027.48	692.74	17
	5	3.12	2.75	13.05	14.88	98.35	1.18	3.92	127.19	123.03	2
	6	6.64	9.39	24.67	85.17	758.39	0.42	8.97	693.74	1538.35	8
	7	7.68	5.36	33.58	87.47	498.34	0.37	12.06	762.4	392.31	8
	8	9.42	9.76	66.87	252.96	1114.95	0.17	14.96	918.56	1353.85	32
	9	5.62	6.22	22.37	49.1	424.56	0.46	9.57	443.13	608.07	1
	10	6.04	4.92	31.89	74.66	361.73	0.35	8.15	549.03	299.82	5
	11	6	5.16	21.15	51.75	371.72	0.49	9.3	522.6	406.43	0
	12	4.83	6.03	16.94	42.74	347.88	0.71	6.02	352.46	641.04	0
	13	4.22	3.28	19.81	28.09	168.06	0.73	4.21	219.18	168.78	1
	14	5.05	6.77	22.97	54.44	405.47	0.51	6.28	353.33	825.86	0
	15	4.72	5.98	33.43	69.59	326.94	0.39	7.96	217.88	580.65	8
	16	7.32	9.62	34.35	105.86	853.12	0.34	14.82	818.86	1219.22	17
	17	3.96	3.59	12.91	20.39	171.34	0.98	4.16	203.1	211.5	0
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Citation: Scoppa F, Gallamini M, Belloni G (2016) Treating Balance Disorders with Ultrasound Acupuncture Stimulation: A Further Pilot Study on Normal

with more subjects and, if possible, with narrower SPF stratified samples subdivided into TRT and NO-TRT groups;

Performing a further measurement the following day. According to TCM indications, the beneficial effects of acupuncture treatment will be fully deployed after more than three hours and will more likely be detected in an assessment performed after 24 hrs.

SPF parameter

The SPF variation is strongly significant and quite capable of allowing discrimination between individuals.

Although this parameter has to undergo a more extensive testing on severely impaired patients in a clinical environment, it may possibly provide a reliable synthesis of quiet stance balance functionality. Its adoption and correlation with clinical tests (Berg Balance Scale [31], Tinetti [32], Functional Independence Measure or FIM Scale [33], Falls Efficacy Scale International or FES-I [34]) could perhaps open the way to a dependable assessment of the Risk-Of-Fall, one of the major concerns for the senior population.

Sway density

This is a "structural" parameter [35-37] that offers a novel approach to balance performance analysis. Derived from a non-linear processing of the COP Path, it is extremely helpful in the assessment of the most likely origin of the balance dysfunction. By analyzing the COP Pattern it is possible to identify a sequence of temporary slowdowns followed by rapid displacements to a new stabilization point. Through a specific algorithm it is possible to find the Instantaneous Stabilization Points and to calculate the length of the stay around the points as well as the time and spatial displacement between the points. Averaging these data three new parameters can be proposed, namely:

- The Mean Stay Time, expressed in seconds.
 - The Mean Spatial Distance, expressed in mm.
 - The Mean Time Difference, expressed in seconds.
- Through the analysis of these data it is possible to ascertain the presence of proprioceptive and/or control deficit.

- The Mean Stay Time value in "Closed Eyes" recording seems likely to be affected by the intensity and amplitude of afferent interferences capable of unbalancing the subject. Therefore the higher the Mean Stay Time value, the better.
- The Mean Spatial Distance between subsequent Stabilization Centers appears to be proportional to the space required by the subject to regain balance. For this reason it can be regarded as a measure of efficiency of postural control. Therefore the smaller the Mean Spatial Distance value, the better.
- Given the above indications, with regard to our test, from the Sway Density Graph of Figure 5 above, it is quite apparent that almost all the Treatment Group subjects – who were later subjected to Biolite® treatment – do show low Mean Stay Time values.

Proprioceptive deficit detected by force platform balance test

The ratio between Sway Parameters (Closed Eyes vs. Open Eyes) is the classical measure of the proprioceptive deficit, defined as the Romberg Quotient: a Romberg Quotient in excess of 2 in the Sway Path and in excess of 3 in the Sway Area values is considered specific to dysfunctional status.

Apparently even more specific is the criterion of the difference between SPF values (Closed Eyes minus Open Eyes). Even more so when the Open Eyes values are within normal range (Figure 6).

Acupunctural stimulation

The observed differences confirm the effectiveness of acupuncture-like ULLLT stimulation. The beneficial effects seem to be dependent on a close link between proprioceptive signals and noxious stimuli – sometimes even those below the pain perception threshold – that are reduced by acupuncture-like stimulation [38].

Conclusion

The proposed laser-acupunctural stimulation by Biolite® is effective, quick and easy to administer. It is devoid of any major contraindication and, being painless, enjoys the highest patient compliance.

Figure 6: Romberg Sign Legend

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