Prolonged Effect of TENS on Semi-occluded Vocal Tract in Teachers of Chillán

Jazmín Pérez[1], Francisca Carrasco[2], Rodrigo Fuenzalida[3], Alejandro Núñez[4]

[1]Fonoaudiología, Universidad Pedro de Valdivia, Chillán, Ñuble, Chile
[2]Fonoaudiología, Universidad Pedro de Valdivia, Chillán, Ñuble, Chile
[3]Fonoaudiología, Universidad Pedro de Valdivia, Chillán, Ñuble, Chile
[4]Fonoaudiología, Universidad Pedro de Valdivia, Chillán, Ñuble, Chile

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Introduction: Teachers are the group of professionals who need to use their voice for prolonged periods of time, so they are more exposed to suffer vocal disorders[1]. TENS to treat swallowing and voice disorders is relatively new[2]. TENS uses percutaneous electrodes to transmit waveforms through the skin to stimulate large diameter nerve fibres. This stimulation triggers central inhibitory systems, which reduces fatigue, relaxes the muscles and causes better vascularization [3][4]. The TVSO exercises refer to a series of postures whose purpose is to lengthen and/or partially occlude the vocal tract, thus causing a change in the vibratory and resonant pattern of the vocal folds [5]6]. The reported benefits of the use of TVSO are greater economy in the production of the voice and changes in the pattern of vibration of the vocal folds. The objective of this research is to determine the prolonged effect of TENS on TVSO exercises in the voice of teachers from Chillán.

Methods: A quantitative, longitudinal study of descriptive-comparative level and quasi-experimental design was carried out. The sample consisted of 19 professors between 26 and 50 years old, with a minimum of 2 years of work experience and at least 30 teaching hours per week. The Teachers' voices were analysed with PRAAT software in the following parameters: Jitter, Shimmer, HNR and Maximum Phonation Time (MPT), pre-intervention, post-intervention (Re-ev.1), re-evaluation after a 2 month vocal rest (Re-ev.2) and re-evaluation again after 4 months of vocal load (Re-ev. 3). The intervention with TVSO consisted of: Control group: First session with tube phonation, Second session with ascending and descending glissandos. Third session with phonation in a tube with water. Fourth session with ascending and descending glissandos in a tube with water. Experimental group: IDEM to control and TENS.

Results: In the descriptive results, corresponding to the initial evaluation, it is observed that the average of the MPT values of the control group are better than the experimental group, but the standard deviation is more dispersed. The Jitter, Shimmer and HNR parameters of both groups appear normal, only local Shimmer is slightly above normal. In these parameters, the standard deviation of the control group is more dispersed in Jitter and Shimmer, while in HNR the dispersion is more accented in the exper-

imental group. It is noteworthy that in the second re-evaluation, which is after vocal rest, the indicators show a tendency to raise their disturbance levels in each vocal parameter. In this measurement the control group has higher perturbation levels than the experimental group. In re-evaluation 3 the levels decrease again in both groups, but the differences in means are more noticeable in the experimental group than in the control group. However, only significant intergroup differences are obtained in Local Shimmer of the control group and HNR in both groups.

Parámetros Acústicos	Evaluación X(SD)	Reev. 1 X(SD)	Reev. 2 X(SD)	Reev. 3 X(SD)	P
TMF Tens-TVSO	12,6 (3,28)	12,6(3,28)	13,44(5,22)	15,0 (5,22)	0,66
TMF TVSO	14,2 (3,61)	14,7((3,61)	14,20(3,61)	15,9 (10,07)	0,89
Jitter Tens-TVSO	0,6 (0,51)	0,3 (0,12)	0,44 (0,23)	0,3 (0,17)	0,24
Jitter TVSO	0,3 (0,11)	0,3 (0,19)	0,46 (0,99)	0,4 (0,17)	0,40
Shimmer TensTVSO	3,9 (4,04)	2,0 (0,35)	2,43 (0,94)	1,8 (0,64)	0,16
Shimmer TVSO	2,6 (0,99)	2,3 (1,02)	3,25 (0,91)	2,0 (0,68)	0,04
HNR Tens-TVSO	21,4 (4,56)	24,8(1,18)	21,8 (2,67)	24,8(2,88)	0,03
HNR TVSO	224 (2,53)	24,9(2,32)	19,9 (2,62)	23,2(3,32)	0,00

Table N°1: Averages(X) and standar deviation (SD) of acoustic parameters and intergroup p value with T of students for related samples. P <0.05 is considered. Control Group (TVSO). Experimental Group (TENS-TVSO).

Discussion: According to the results obtained in MPT, there were improvements in averages in both groups, which indicates improvement in glottic closure, similar to results obtained by Ras (2016)[7]. In the case of Jitter, Shimmer and HNR, the averages are improved in the final evaluation, however, only significant differences in HNR of both groups are observed. This differs from other authors who found no differences in any parameter (Mansuri, 2019; Guirró 2008) [8][9]. In TVSO there was a significant difference in Shimmer, but no better averages compared to TENS and TVSO, this differs compared to a study by Mansuri (2018)[10], who finds differences in Shimmer when applying TENS and Vocal Therapy. In conclusion, TENS can be used as a complementary therapy to improve TVSO results.

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