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NEUROFEEDBACK, CRANIAL ELECTROTHERAPY STIMULATION AND MICROCURRENT ELECTRICAL STIMULATION TO TREAT TINNITUS: A CASE SERIES

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Abstract

Background: Tinnitus is a vexing disorder characterized by phantom sound perceptions that have no external source. Individuals with tinnitus who seek treatment are often told they must learn to live with it. There has been some initial evidence that neurofeedback and electrical stimulation therapy modalities may suppress tinnitus in some individuals. The purpose of this study was to retroactively examine a case series of individuals treated for tinnitus with varied neuromodulatory interventions, specifically to explain relationships between etiological factors for tinnitus and differential responses to these interventions.

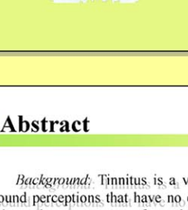
Measures: 5 client records were obtained from a university-based neurotherapy clinic. These records were used to examine the efficacy of several different treatment modalities used to treat tinnitus, which included neurofeedback, cranial electrotherapy stimulation, and microcurrent electrical therapy. Pre and post-test measures, BAI, BDI, BHS, PSQI, Tinnitus Handicap, and Tinnitus Severity were then assessed for pre and post changes on assessment measures related to treatment outcomes.

Results: 40% of subjects evidenced appreciable improvements in their tinnitus symptoms.

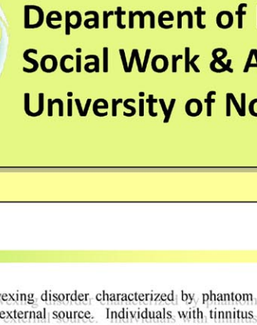
Conclusions: This small pilot study furthers tentative findings that individuals who belong to a somatosensory subgroup of tinnitus sufferers (those with unilateral tinnitus that is fluctuating in intensity and having possible EMG pathogenesis) may benefit from neurofeedback or microcurrent electrical stimulation therapy (MET).

Devices

EEG Biofeedback
BrainMaster Atlantis



Cranial Electrotherapy Stimulation (CES)
Alpha-Stim SCS by EPI, Inc.



Microcurrent Electrical Therapy (MET)
Alpha-Stim 100 by EPI, Inc.

Methods

- This archived data-based study used records of five tinnitus cases that were treated multi-modally at a university based clinic.

Participants

- Demographics: N = 5 Caucasian females ages 27, 56, 60, 61 and 70

Case 1

Case 1. A 56-year-old female developed constant severe unilateral left-side tinnitus immediately following a hysterectomy surgical procedure. Her tinnitus persisted for the past 5 years. The client was treated with QEEG-based neurofeedback at T4 with a 2-9 Hz and 20-30 Hz inhibit protocol. On the 8th day of training at this site, the client reported her tinnitus had disrupted for a full day for the first time in years. Training was continued at temporal/parietal (T4/T6/P4) sites, which continued to produce a fluctuation in her tinnitus between sessions (and, at times, modulate within sessions). By session 14, the client reported that her tinnitus was suppressed 50% of the time (either completely on, or completely off). The client's baseline QEEG was reviewed and shown to have the location of highest delta amplitude and lowest alpha amplitude occurring at site F3. The client reported additional gains from receiving treatment at this site. She reported that the tone and severity improved; and usually within an hour following each session, her tinnitus would remit and was now suppressed 75% of the time. Given that the Alpha-Stim 100 has been shown to produce a similar increase in alpha while decreasing delta and high beta (Kennerly, 2006), it was hypothesized that adding CES to the treatment regimen might augment clinical results. The client used the CES component of the Alpha-Stim 100 (attached by ear lobe clips) for >20 sessions. She reported that using the CES device seemed to keep her tinnitus subdued and better managed when not receiving tinnitus NF training. We then hypothesized that treating auricle sites that may have more precise correlation with tinnitus might make a difference, such as in the case of treating pain at the location of the pain with MET. The client was then treated with the microcurrent electrical therapy component of the Alpha-Stim 100 using the probes for a pain protocol. A succession of repeated administrations of MET at 5 points in and around the auricle of the ear gradually suppressed the active tinnitus into full remission within the first treatment administration. The client then self-administered this protocol at home and found the tinnitus to be suppressed 80-90% of the time and otherwise barely audible (a subjective change from an 8 to a 3 on a scale of 1 - 10). However, the client noted that when she stopped using the Alpha-Stim/MET for periods of time, the tinnitus would return. The resumed use of the device would reinstate tinnitus suppression.

Case 2

A 61-year-old female developed bilateral tinnitus with spontaneous onset 2 years ago. This client was initially treated with the CES component of the Alpha-Stim 100 (attached by ear lobe clips) for 20 sessions with no change in tinnitus symptoms. However, a single treatment session using the MET modality of the Alpha-Stim 100 resulted in nearly complete suppression of the tinnitus. The same Alpha-Stim MET pain protocol consisting of a succession of repeated administrations at 5 points in and around each auricle gradually suppressed the tinnitus (first gradually on the left ear, then gradually on the right ear) into nearly full remission (subjective rating from a 5 to a 0.5 on a scale of 1 – 10). Her tinnitus has not returned. Of interest to note, the client also reported modulation of her tinnitus when the probe was placed on her upper trapezius/neck muscle (a divergence to address upper back/neck tension),

Case 3

A 27-year-old female developed bilateral tinnitus with spontaneous onset 5 years ago. This client had received audiological testing and had nerve damage and hearing loss. Her tinnitus was severe and consisted of 3 different pitches bilaterally. Client was initially treated with CES, but discontinued after 6 sessions due to headaches, dizziness and fatigue. Client then used MET, but discontinued after 5 sessions due to an increase in tinnitus pitch loudness. The loudness returned to its previous level 1-2 weeks later.

Case 4

A 60-year-old female developed bilateral tinnitus with spontaneous onset 3 years ago. Client received 20 CES and 20 MET treatments with no reported change from application of either modality.

Case 5

A 70-year-old female developed bilateral tinnitus with spontaneous onset 30 years ago. Client received 20 CES and 20 MET treatments with no reported change from either modality.

Analysis

Table 1

Percentage of Improvement in Pre and Post Tinnitus Severity and Handicap Measures

	Tinnitus Severity			Tinnitus Handicap		
Case	Pre	Post	% Diff	Pre	Post	% Diff
1	62	32	48.39%	60	34	43.33%
2	30	15	50.00%	20	12	40.00%
3	51	54	-5.88%	64	62	3.13%
4	24	19	20.83%	6	4	33.33%
5	17	15	11.76%	4	8	-100.00%

Note: Percentage difference changes ranged from -100% to 50%

Table 2

Pre and Post Severity Scores

Case	BAI		BDI		BHS		PSQI	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1	36	10	23	5	10	4	13	7
2	4	1	0	1	1	1	5	5
3	16	5	7	3	2	1	23	2
4	0	2	2	1	9	1	3	2
5	4	3	1	6	4	2	2	3

Table 3

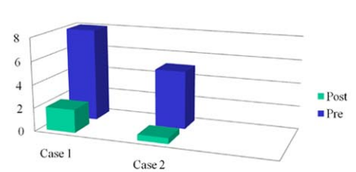
Client Demographics and Tinnitus Characteristics

Case	Age	Gender	Ethnicity	Side	Length	Fluctuation	EMG	Improved?
1	56	F	C	Left	6	Yes	Yes	Yes
2	61	F	C	Left/Bi	2	Yes	Yes	Yes
3	27	F	C	Both	4	Yes	TMD	No
4	60	F	C	Both	3	Yes	TMD	No
5	70	F	C	Both	30	No	No	No

Note: Length is measured in years

Figure 1

Subjective Ratings of Tinnitus Improvement in Somatosensory Subgroup Cases



Conclusions

Neurofeedback and MET may improve tinnitus for some individuals. In this small pilot study, those most likely to benefit from these neurotherapy modalities belonged to a somatosensory subgroup of tinnitus presentation in which tinnitus percept is unilateral or greater in degree on one side, fluctuates in intensity, and appears to involve musculoskeletal pathogenesis. Tentative findings also suggest that responsiveness to treatment in this subgroup may occur in the first session MET.

Limitations of the Study

- This study consisted of a small sample size and did not include controls.
- Surveys were self-report.

Selected References

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