

Impact of a relaxation training on psychometric and immunologic parameters in tinnitus sufferers

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Abstract

Objective: Tinnitus often entails severe psychological distress. Reversely, tinnitus may be considered as a chronic stressor. Based on this hypothesis, we investigated whether improving stress-managing capabilities would influence psychological and stress-related immunological parameters in chronic tinnitus sufferers. **Methods:** Tinnitus (TPs, $n=26$) and non-tinnitus participants (NTPs, $n=13$) took part in a standardised 10-week relaxation program. An additional group of tinnitus sufferers ($n=18$), randomly assigned to a waiting list, served as control (TC) subjects. Mood, perceived stress, global quality of life, and tinnitus disturbance were assessed before and after the intervention. The

stress-sensitive immunological parameters TNF- α , IL-6, and IL-10 were measured before, during, and at the end of the intervention.

Results: The program resulted in a significantly decreased perception of stress, anxious depression, anger, and tinnitus disturbance, paralleled by a reduction of TNF- α . No alterations were noted for IL-6 or IL-10. For the NTPs and TCs, no relevant psychological or immune changes could be observed. **Conclusion:** The data suggest that (1) the training offered improved stress-managing capabilities in chronic tinnitus sufferers, and (2) TNF- α may be conceived as a stress marker. © 2002 Elsevier Science Inc. All rights reserved.

Keywords: Cytokines; Relaxation training; Stress; Tinnitus; Tumour necrosis factor alpha

Introduction

A link between tinnitus and psychological distress has been confirmed in many studies [1–6]. Given the association between tinnitus and psychological distress, tinnitus may also be regarded as a chronic stressor, creating a vicious circle of stress and an exacerbation of tinnitus [7]. Psychoneuroimmunological research has given substantial evidence for the fact that psychological distress is associated with dramatic changes in immune measures [8–10]. Uncontrollability of the stressor has been identified as a major determinant of the immunological stress response [11,12], a characteristic that also applies to the condition of tinnitus. We therefore hypothesised that tinnitus, perceived as disturbing and uncontrollable, acts like a chronic stressor and

thereby interferes with stress-related Th1/Th2 cytokines. TNF- α was selected as a marker of the Th1 cytokines, since it has been shown to react to acute stress in mice models [13] as well as to psychological stress in humans [14,15]. IL-6 and IL-10 represent Th2 cytokines. Increased IL-6 levels have been described in association with psychological stress and major depressive disorders [16,17]. IL-10 has also been demonstrated to increase with psychological stress [15], although stress-related alterations of this cytokine are still not fully elucidated.

A relaxation training aiming at stress reduction was expected to produce a reduction of psychological distress and changes in the cytokine network.

Method

Patients were referred to us from the ENT Clinic of the Charité. Any underlying retrocochlear pathology was excluded by full medical and audiological evaluation.

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Table 1
Demographic details

	TP	NTP	TC
<i>n</i>	26	13	18
Age (mean ± S.D.)	43.2 ± 9.7	32 ± 6.7 ^a	42.0 ± 11.3
Sex			
Male	16	8	8
Female	10	5	10

No significant differences between groups were noted (except: see footnote).

^a The NTPs were significantly younger than the TPs ($t=3.60$; $P=.001$), which can be attributed to the fact that a high percentage of students were addressed via advertisement on the medical campus, representing half of the NTP group.

Non-tinnitus participants (NTPs) were recruited via local advertisement on the University Hospital campus. A waiting list of 18 tinnitus patients served as a control group (TC). Inclusion criteria were the following: age 20 to 65 years, absence of acute or chronic diseases, no medication, and written informed consent. Training sessions were held weekly, in mixed groups of 10 participants, with a standardised program based on the principles of progressive muscle relaxation (PMR) led by a trained psychologist, plus regular practice at home for at least three times a week.

The psychological assessment included the following questionnaires: (1) The Berlin Mood Questionnaire (BMQ) [18–21] assesses the present state of mood with regard to six different dimensions known to be relevant in tinnitus and stress [22]. (2) The Perceived Stress Questionnaire (PSQ) [23–25] measures the subjectively perceived stress (expressed as a sum score, range 0–1). (3) The Anamnestic Comparative Self Assessment (ACSA) [26], a visual analogue scale consisting of one item (range 0–10), represents a measure for the global quality of life (QOL). (4) Tinnitus disturbance was assessed by the Tinnitus Questionnaire (TQ) [1,27], the German adaptation of the original scale by Hallam et al. [28].

The study was approved by the local ethics committee (No. 200/99).

Cytokine Analyses

Venous blood samples of 20 ml were collected from each study participant at about 18:00 h. Serum samples were kept frozen at -80°C until assayed. Cytokine levels were determined by ELISA techniques. For TNF- α assessment, a commercially available high sensitive ELISA kit was purchased (R&D) and the distributors' instructions were followed. For measuring levels of IL-6 and IL-10, antibody pairs were used (Pharmingen). Ninety-six-well plates were coated and ELISA was performed according to the standard protocol provided by the company. The colorimetric reaction was analysed by using a plate spectrophotometer at 450 nm.

Statistical Analyses

Data were analysed using SPSS 9.0, including t tests, chi-square statistics, Mann–Whitney U tests, Wilcoxon signed rank test, and correlation analyses (Spearman's rho), according to applicability. If multiple comparisons on the same set of data were performed, we adjusted the significance level of $\alpha=5\%$ by performing the Bonferroni correction ($\alpha=.05/3=.0167$). The significance level was set at $P<.05$.

Results

Demographic details are presented in Table 1.

The tinnitus participants (TPs) showed a significant reduction of anxious depression and anger, as analysed by the BMQ. These changes were paralleled by a decrease of motivation. No relevant alterations could be observed in NTPs or TCs. The perceived stress significantly decreased in the TPs, but not in the NTPs or TCs. Tinnitus disturbance was significantly reduced in the TPs. Table 2 presents the psychometric data.

Table 2
Psychological assessment pre/post intervention in the three groups

	TP			NTP			TC		
	Mean ± S.D.			Mean ± S.D.			Mean ± S.D.		
	T1 (pre)	T3 (post)	<i>P</i>	T1 (pre)	T3 (post)	<i>P</i>	T1 (pre)	T3 (post)	<i>P</i>
Mood (BMQ)									
Tiredness	1.18 ± 0.82	1.07 ± 0.85	NS	1.12 ± 0.98	0.92 ± 0.67	NS	1.27 ± 0.92	1.26 ± 0.89	NS
Depression/anxiety	0.82 ± 0.70	0.47 ± 0.68	.022*	0.49 ± 0.55	0.42 ± 0.42	NS	1.35 ± 1.19	1.11 ± 1.01	NS
Anger	0.45 ± 0.42	0.20 ± 0.32	.013*	0.037 ± 0.045	0.62 ± 0.57	NS	0.79 ± 0.64	0.75 ± 0.32	NS
Indifference	0.33 ± 0.57	0.35 ± 0.043	NS	0.35 ± 0.44	0.38 ± 0.55	NS	0.62 ± 0.78	0.36 ± 0.53	.04*
Motivation	2.38 ± 0.86	2.03 ± 1.06	.035*	2.35 ± 0.74	1.80 ± 1.2	NS	2.15 ± 0.85	2.16 ± 0.84	NS
Elevated mood	1.38 ± 0.91	1.58 ± 1.05	NS	1.72 ± 0.70	1.69 ± 1.14	NS	1.12 ± 1.06	1.18 ± 1.05	NS
Perceived stress (PSQ)	0.42 ± 0.20	0.39 ± 0.20	.030*	0.41 ± 0.17	0.41 ± 0.17	NS	0.50 ± 0.23	0.48 ± 0.19	NS
Global QOL (ACSA)	4.92 ± 2.37	5.70 ± 2.14	.063	5.85 ± 1.78	6.35 ± 1.43	NS	4.12 ± 2.76	4.38 ± 2.23	NS
Tinnitus disturbance (TQ)	30.50 ± 14.38	25.88 ± 13.04	.002**	–	–	–	35.06 ± 14.92	35.38 ± 17.40	NS

* $P<.05$.

** $P<.01$.

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