

Differential Outcome of a Multimodal Cognitive-Behavioral Inpatient Treatment for Patients with Chronic Decompensated Tinnitus

Joachim Graul,¹ Regine Klinger,² Karoline V. Greimel,³ Stephan Rustenbach,² and Detlev O. Nutzinger^{1,4}

¹Medical-Psychosomatic Clinic, Bad Bramstedt; ²Department of Psychology, University of Hamburg, Hamburg; ³Department of Clinical Psychology, Salzburg University Hospital, Salzburg; and ⁴Department of Psychosomatics and Psychotherapy, University of Lübeck, Lübeck, Germany

Abstract: We examined 179 inpatients with severe chronic tinnitus for tinnitus-related distress and psychological dysfunction after treatment. We conducted a prospective, nonrandomized, noncontrolled study. We calculated treatment outcome in tinnitus-related distress, depression, and somatic complaints by analysis of variance with repeated measurement at admission, at discharge, and at 3, 6, and 12 months after treatment. Additionally, on the basis of reduction in tinnitus-related distress, responders and nonresponders were determined. We compared the effects of treatment for both groups on tinnitus-related distress, depression, and somatic complaints. In our entire sample, tinnitus-related distress, depression, and somatic complaints decreased significantly at discharge. After discharge, all patients showed improvement for up to 12 months as compared to their condition at admission. Of the 179 severely distressed patients, 67% were found to have improved clinically at discharge, and 47% still benefited after 12 months. In comparison to the nonresponders, the responders displayed less depression, fewer physical complaints, and fewer body-related anxieties at each measuring point. The only distinguishing factors between responders and nonresponders were their age and the extent of their psychosocial stress. Limitations of the study and consequences for treatment of chronic tinnitus patients are discussed.

Key Words: cognitive-behavioral therapy; inpatient treatment; psychosomatics; tinnitus

Chronic tinnitus is a widespread phenomenon. Estimates maintain that 14–17% of the population experiences a permanent ringing in the ear, and 0.5–2.4% of tinnitus patients suffer chronically [1–3]. Various studies have examined distress associated with tinnitus (e.g., symptom distress, sleep loss [4], hearing difficulties, and psychological problems [5]). In particular, psychological complaints, such as depression, anxiety, or substance abuse, are to be found more often among tinnitus sufferers [3,6–15]. In a random sample of patients with complex chronic tinnitus, Hiller et al.

[16] found that 65% suffered some kind of depressive disorder. Other researchers have found somatic disorders, hypochondriacal anxieties [17], or increased anxiety, especially among those affected by severe tinnitus [18]. Sleeping disturbances, depressive moods, and emotional distress involving relatives have also had prognostic relevance for impairment of the quality of life [19] or for the inability to work [20,21].

The symptoms suffered by severely distressed tinnitus patients are so complex that they require a multimodal treatment concept [22–25]. Multimodal treatment approaches focus on changing the way in which tinnitus is perceived, on reducing psychosocial distress and disorders, on improving both mental and physical coping mechanisms, and on enhancing a sufferer's ability to maintain or regain occupational performance [22, 24,26,27].

Reprint requests: Dr. Joachim Graul, Medical-Psychosomatic Clinic, Bad Bramstedt, Birkenweg 10, 24576 Bad Bramstedt, Germany. Phone: (+49) 4192-504 689; E-mail: jgraul@schoen-kliniken.de

Cognitive-behavioral treatment approaches have generally been proven to be helpful in reducing the perception of distress, emotional distress, and psychological and sleeping disorders and have contributed to an improvement in patients' ability to cope [7,14,28–32], even if the assessment of the effects in meta-analysis and reviews of treatment strategies has proved cautious [33,34].

In the German Federal Republic, comparatively few evaluations have been performed on multimodal inpatient treatment concepts [22,35–41]. All of them use the same tinnitus questionnaire (TQ) [42] to measure the effects; psychological distress has been recorded in only the studies by Goebel and coworkers [22,35–37]. Statistical positive short- and long-term therapy effects on the disturbance caused by tinnitus have been recorded; nothing has been written about the clinical relevance of the respective findings. In their meta-analyses, Andersson and Lyttkens [30] and Olderog [33] report medium pre- and posttreatment effect sizes of $\alpha = .50$ – $.58$ or, in follow-up studies, from $\alpha = .48$ [30].

Our study examines the short- and long-term effects that multimodal inpatient behavioral therapy had on the perception of distress, depression, somatic complaints, and anxieties of patients with chronic complex tinnitus. In addition, we recorded the clinical relevance of the effects and compared the long-term effects of treatment for responders and nonresponders.

METHODS

Subjects

We treated consecutively 372 chronic tinnitus patients suffering from different grades of tinnitus distress as inpatients in the special unit for tinnitus sufferers at the Medical-Psychosomatic Clinic in Bad Bramstedt. Of this number, 102 patients were suffering from light to medium effects, and 270 were either severely or very severely affected by tinnitus-related distress as defined by the TQ [42]. Complete data sets at all measurement points were available for 179 of the 270 patients. Only these 179 patients were chosen for the findings described here. The sociodemographic and disorder-relevant data are summarized in Table 1.

The patients' average age was 52 years. The very severely affected patients were older ($p \leq .004$), had suffered tinnitus for a longer time ($p \leq .01$), and had been occupationally disabled longer before entering the hospital than were the severely affected patients. Experienced clinicians diagnosed the patients' disorders on the basis of the *Diagnostic and Statistical Manual of Mental Disorders*, third edition revised (DSM III-R), categories. One of three senior clinicians (V.G., R.K., J.G.) not involved in treatment verified diagnoses on the basis of

patients' oral reports. Seventy-seven percent of the patients received diagnoses that pointed to their having at least a comorbid mental disorder requiring clinical treatment. The greatest proportion of these patients were categorized as having affective disorders (72%), followed by insomnia (12.9%), anxiety (8.4%), somatic symptoms (1.2%), and other disorders (5%).

Missing Values

In our group of severely distressed tinnitus sufferers ($N = 270$), 91 data sets missed more than one measure point and were excluded from calculation. Compared to those in the smaller sample (179), these 91 patients were significantly older ($p \leq .05$). No difference was seen among all the other sociodemographic and disorder-related variables.

Treatment Concept

Treatment refers to cognitive-behavioral therapy that had been developed for inpatient treatment of chronic tinnitus patients by Goebel et al. [22,35–38]. Every patient took part in a tinnitus counseling group, a tinnitus management group, relaxation therapy (progressive muscle relaxation with guided imagination), and individual psychotherapy. Tinnitus counseling addressed issues around the anatomy of the ear, the hearing process, models of tinnitus generation, audiometric diagnostics, and treatment modalities for tinnitus of different etiologies.

The tinnitus management group addressed such issues as psychogenic factors and tinnitus annoyance, influence of dysfunctional thoughts, awareness, the meaning of habituation, coping with stress, and relapse prevention. Patients were taught to identify internal and external factors influencing tinnitus perception and mood; to modify dysfunctional thoughts and beliefs, shifting awareness to different senses inside and outside their body instead of to the tinnitus; to confront the tinnitus signal itself in calm situations; and to develop skills in coping with daily stress and symptoms. Patients wrote daily diaries to record tinnitus perception, tinnitus loudness, tinnitus annoyance, influence on tinnitus, daily mood, daily annoyances, and quality of sleep. Relaxation therapy was aimed at diverting attention from the tinnitus signal and improving skills for relaxing. Individual therapy addressed primarily issues of modification of dysfunctional thoughts and beliefs in depression, anxiety, or problem solving, depending on patients' goals.

Methods and Instruments

Data collection followed a before-and-after approach, with data obtained at admission, at discharge, and at 3, 6, and 12 months after treatment. Various questionnaires were used to measure the outcome variables of tinnitus

Table 1. Description of the Random Sample (N = 179)

	Total (N = 179)	Level of Distress (TQ)		p Value
		Severe (n = 56)	Very Severe (n = 123)	
Men	90	25	65	NS
Women	89	31	58	
Family status				
Single	27	14	13	≤.03
Married	125	37	88	
Divorced	19	5	14	
Widowed	8	0	8	
Education ^a				
Level I	84	24	60	NS
Level II	62	21	41	
Level III	28	10	18	
Others	5	1	4	
Comorbidity				
No diagnosis	41	13	28	NS
One diagnosis	100	32	68	
Two or more diagnoses	38	11	27	
Distress factor				
None–mild	61	22	39	NS
Moderate	80	24	56	
Severe–catastrophic	38	10	28	
Age ^b	51.79 (10.78)	48.34 (11.98)	53.37 (9.84)	≤.004
Occupationally disabled ^c	12.89 (18.42)	7.10 (14.00)	15.71 (9.84)	≤.01
Onset ^b	7.25 (7.57)	6.89 (7.56)	7.41 (7.60)	NS
Tinnitus severity	65.65 (10.90)	52.68 (3.64)	71.56 (7.40)	
Global assessment of function	59.09 (11.59)	60.27 (11.41)	58.56 (11.68)	NS
Length of stay ^d	56.12 (8.55)	56.46 (6.88)	55.97 (9.23)	NS

NS = not significant; SD = standard deviation.

^aEducation (school): level I, 9 years; level II, 10 years; level III, 13 years (A'level).

^bIn years (mean ± SD).

^cWeeks in the last 12 months (mean ± SD).

^dIn days (mean ± SD).

distress, depression, and somatic complaints and worries. Only some of them are reported here:

- The TQ used [42] is the German version of the TQ by Hallam et al. in 1988 [43]. The questionnaire covers 52 items and measures the extent of the subjective perception of tinnitus effects using the following subscales: emotional distress, cognitive distress, hearing difficulties, sleeping disorders, penetration of the tinnitus, and somatic disorders. Using the tinnitus total scores (range, 0–84) as a basis, a 4-point severity grading was established: mild distress, 0–30, grade I; moderate distress, 31–46, grade II; severe distress, 47–59, grade III; and very severe distress, 60–84, grade IV. Grades I–II are defined as compensated and grades III–IV as decompensated tinnitus.
- The General Depressions Scale (Allgemeine Depressions Skala [ADS]; long version) (CES–D [44]; German version [45]) is a questionnaire that mea-

sures the presence of clinically relevant depression (cutoff, >23) and comprises 20 items, each evaluated on a 4-point scale (total score range, 0–60).

- Using the Complaints List (Beschwerde-Liste [B-L]) [46], general complaints and localizable physical complaints are recorded. The questions cover 24 different symptoms with characteristics scored on a 4-point scale (total score range, 0–96).
- The Whitley Index (WI) [47,48] is a 14-point scale of items (range, 0–14) used to differentiate hypochondriacal and nonhypochondriacal patients (cutoff, ≤8 points).

Besides sociodemographic and disorder-relevant variables (see Table 1), a patient's Global Assessment of Function (GAF) score (1 = lowest functional level; 100 = highest functional level; 0 = no information), psychosocial-and-environmental-difficulties score (range, 1 = none; 6 = catastrophic stress factors; 0 = insufficient information) [49], and occupational status were

recorded at admission and on discharge of the patients from hospital.

Statistical Analysis

The evaluation used SPSS (9.0). Besides the descriptive statistic, chi-squared tests were carried out to check the difference between categorical variables, and single-factor analysis of variance was employed to check the mean value differences. To check the course of treatment, several single-factor variance analyses with repeat measurements (at four time points: at admission and discharge and at 3, 6, and 12 months after treatment) of all independent variables (TQ total, ADS, B-L, WI) based on the general linear model (GLM) were modeled at the first measurement point.

The following formula was used to determine cutoff values for the TQ total score at the time of admission and served to assess separately the clinical relevance of the therapeutic effects for the respective severity groups of severe and very severe [50]:

$$\text{Group cutoff} = \text{mean}_{\text{TQ admittance}} - 2 \times \text{SD}_{\text{TQ admittance}}$$

Responders at the time of discharge were thought to be those patients in the severely affected group who showed a TQ total value of ≤ 46 and those in the very severely affected group who had a TQ total value of ≤ 57 . To determine the therapeutic effects within and between the responder and nonresponder groups, a dual-factor variance analysis—including repeated measurements at three time points (3, 6, and 12 months after treatment)—has been calculated. Dependent variables were TQ total score, depression (ADS), and somatic complaints (B-L, WI). Owing to the multiple measuring times and the unexpected homogeneity of the correlations between the measurements at those times, and to compensate for a possible bias due to heterogeneous correlations between times of measurement, the degrees of freedom for the *F*-tests in MANOVA were adjusted according to the method proposed by Greenhouse and Geisser [51,52].

To calculate the effect sizes ($d_{\text{pre}} - d_{\text{post}}$ or $d_{\text{pre}} - d_{12\text{months}}$), the mean differences were divided by the pooled standard deviations at the measuring times [53].

RESULTS

Treatment Effects in the Entire Sample

Tinnitus distress, depression, physical complaints, and body-related anxieties had decreased significantly by the end of treatment. Over the next 3, 6, and 12 months, however, all dependent variable values increased without ever returning to pretreatment levels. The most obvious reduction was in tinnitus distress: the before-and-after comparison resulted in a great effect size (TQ total score, $d = 1.31$), as compared with the effect sizes of depression ($d = .89$), physical complaints ($d = .56$), and body-related anxieties ($d = .38$), which was considered only moderate to slight. In comparison to the values at admission and 12-month follow-up, the effect size for tinnitus distress (TQ total score), at $d = .83$, reached medium level or more, whereas the effect size for depression ($d = .44$), physical complaints ($d = .14$), and body-related anxieties was much lower ($d = .21$; Table 2).

Responder Analysis

On the basis of the responder criteria given earlier, roughly 67% (119) of the 179 patients were classified as responders and 33% (60) as nonresponders. Significant differences in age, tinnitus distress, physical complaints, and psychosocial burden were found between the two groups at the time of admission: The nonresponders were older [$F = 5.20$ (1); $p \leq .02$] and suffered more from tinnitus distress in total [$F = 13.78$ (1); $p \leq .000$], especially in terms of cognitive dysfunction [$F = 20.74$ (1); $p \leq .000$], emotional problems [$F = 5.16$ (1); $p \leq .02$], hearing problems [$F = 6.29$ (1); $p \leq .01$], sleep disturbances [$F = 6.01$ (1); $p \leq .02$], overbearing tinnitus [$F = 6.23$ (1); $p \leq .01$], and somatic complaints [$F = 5.67$ (1); $p \leq .02$]. Nonresponders also suffered more from

Table 2. Tinnitus Distress, Depression, and Somatic Complaints and Anxieties in the Entire Sample (N = 179)

	Admission		Discharge		3 Months		6 Months		12 Months		Time		d	
	M	SD	M	SD	M	SD	M	SD	M	SD	F (df1; df2)	p Value	t1-t2	t1-t5
TQ ^a total score	65.65	10.90	46.70	18.03	50.09	18.11	52.02	19.65	53.21	19.11	113.26 (2.59; 461.27)	$\leq .001$	1.31	.83
ADS ^b	20.98	8.56	13.98	7.17	16.31	7.57	17.37	8.34	17.24	8.53	36.50 (3.00; 419.01)	$\leq .001$.89	.44
B-L ^c	30.44	12.06	23.22	13.59	26.38	12.62	28.37	13.25	28.65	13.93	35.10 (2.85; 507.21)	$\leq .001$.56	.14
WI ^d	5.48	3.36	4.25	3.04	4.68	3.03	4.87	3.27	4.77	3.38	14.38 (2.69; 478.22)	$\leq .001$.38	.21

d = effect size; M = mean; SD = standard deviation; t1-t2 = admission-discharge; t1-t5, admission-12-month follow-up.

^aRange, 0-84.

^bRange, 0-60; cutoff for clinically significant depression > 23.

^cRange, 0-96.

^dRange 0-14; cutoff values > 8 points.

Note: Mean values of each of the scales differ significantly in the quadratic trend.

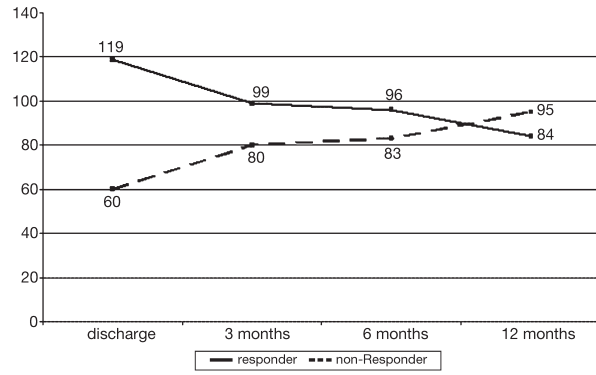


Figure 1. Number of responders and nonresponders from discharge to 12 months.

psychosocial problems ($\chi^2 = 10.29$; $df 4$; $p \leq .04$) and physical complaints measured by B-L [$F = 4.19$ (1); $p \leq .04$]. No difference was found between the two groups in terms of depression [$F = 1.75$ (1); $p \leq .19$] and hypochondria [$F = 1.90$ (1); $p \leq .17$].

As Figure 1 shows, the number of responders decreased within the 12-month period as the nonresponders increased. Nevertheless, in the original responder group, 81% of the patients ($n = 96$) after 6 months and 71% of the patients ($n = 84$) after 12 months still fulfilled the criteria for responder. In the entire sample ($N = 179$), 54% ($n = 96$) at 6 months and 47% ($n = 84$) at 12 months still met the responder criteria.

At the 12-month follow-up, 29% of the patients in the responder group ($n = 35$) switched to the nonresponder group. We saw little change in the nonresponder group itself: Only 6 patients (10%) improved enough to move to the responder group.

Responders vs. Nonresponders: Tinnitus Distress, Depression, Somatic Complaints, and Anxiety After Treatment

Over the entire follow-up period, the extent of tinnitus distress of those patients in the nonresponder group remained relatively stable as compared to that of the responders; the perception of the distress among the responders increased. The benefit to the patients who had received the treatment increased moderately during follow-up.

Nonresponders suffered more depression, physical disorders, and somatic anxiety than did the responders. On average, the depression values did not reach the critical values of clinically significant depression (>23). All three variables demonstrated statistically significant time effects but no important interaction effects (Table 3).

During follow-up, depression, physical disorders, and anxieties increased in both groups throughout the

Table 3. Comparison Groups (Responder vs. Nonresponder) in Tinnitus Distress, Depression, Physical Complaints, and Anxieties During the Course of Treatment ($N = 179$)

	Admission			Discharge			3 Months			6 Months			12 Months			Group			ANOVA Time			Interaction		
	M	SD		M	SD		M	SD		M	SD		M	SD		F (df1; df2)	p Value		F (df1; df2)	p Value		F (df1; df2)	p Value	
TQ total score ^{a,b}	R 63.58	10.51		36.45	11.46		41.18	14.11		44.48	17.71		45.67	17.08		15.52 (2.00; 353.93)	$\leq .001$		11.81 (2.00; 353.93)	$\leq .001$		11.81 (2.00; 353.93)	$\leq .001$	
	NR 69.77	10.55		67.03	9.24		67.77	10.64		66.98	13.98		68.17	13.27										
ADS ^c	R 20.38	8.45		11.78	5.34		13.85	5.70		14.82	6.80		15.45	7.60		51.61 (1; 177)	$\leq .001$		17.05 (2.37; 419.01)	$\leq .001$		17.05 (2.37; 419.01)	$\leq .001$	
	NR 22.17	8.73		18.35	8.31		21.18	8.44		22.43	8.84		20.88	9.17										
B-L ^d	R 29.12	11.80		19.73	12.14		23.03	11.09		25.38	12.13		25.31	12.67		28.12 (1; 177)	$\leq .001$		33.69 (2.11; 373.04)	$\leq .001$		33.69 (2.11; 373.04)	$\leq .001$	
	NR 33.05	12.41		30.13	13.76		33.02	12.94		34.30	13.47		35.27	14.05										
WI ^e	R 5.24	3.40		3.53	2.74		3.93	2.86		4.13	3.15		4.00	3.21		25.14 (1; 177)	$\leq .001$		7.63 (2.06; 363.88)	$\leq .001$		7.63 (2.06; 363.88)	$\leq .001$	
	NR 5.97	3.24		5.67	3.12		6.17	2.81		6.35	3.01		6.28	3.22										

M = mean; NR = nonresponder; R = responder; SD = standard deviation.
^a As the groups were formed according to the TQ total scores (criteria), no results were reported in factor "group."
^b Range, 0–84.
^c Range, 0–60; cutoff for clinically significant depression, > 23 .
^d Range, 0–96.
^e Range, 0–14; cutoff values > 8 points.
 Note: Mean values of each of the scales differ significantly in the quadratic trend.

12-month period, whereas tinnitus distress increased only in the responder group. Nonresponders' tinnitus distress remained stable over time. In comparison to the values found at admission, however, the nonresponders' distress remained significantly lower.

DISCUSSION

We evaluated the effects of a multimodal treatment concept for patients with chronic complex tinnitus. When patients left the hospital, they were found to have significant reduction in tinnitus distress, depression, physical complaints, and anxieties. The effect sizes of the reduced subjective perception of tinnitus distress was very good ($d = 1.31$), and that of depression and physical complaints was considered good ($d = .89$ or $d = .56$, respectively). The difference in values for the TQ total score before and after treatment was 19 points. Good effect sizes were still found for tinnitus distress after 12 months ($d = .83$).

Similar results have been reported in other studies of inpatient treatment of chronic tinnitus sufferers [37–40]. The average reduction of the TQ total score in these studies was between 8 and 13 points. Among severely and most severely affected patients (TQ grades of III and IV), the reduction was greatest (between 11 and 16 points). Generally, the severely to most severely affected patients seem to benefit most from inpatient treatment [37–39]. In these studies, the long-term effects after 6 and 12 months, respectively, remained largely stable: 35 TQ total score after 6 months [39] and 46.6 TQ total score after 12 months [37,38]. In our sample, after 12 months, tinnitus distress was considerably higher (TQ total = 53.2). This difference is largely due to the fact that, in the other studies, patients with compensated and decompensated tinnitus considered together.

Increased tinnitus distress after discharge without reaching the levels at admittance were reported also by Hesse et al. [39]. Only 39% of their patients continued to improve after being released from the hospital. In the rest, the distress level either remained stable or deteriorated again and, after 6 months, 24% of patients even recorded levels of impairment higher than at the beginning of treatment. Nelting et al. [41] found similar results in a follow-up period of between 1 and 3 years. Thereafter, 69% of patients displayed stable effects, and only 9% began to show significant change after leaving the hospital. Of those, 14% displayed fluctuating effects, and 8% found their perception of distress to have worsened. In a recent longitudinal study, Goebel et al. [54] reported stable effects in tinnitus annoyance at 15 years after discharge, with 86% of the original sample responding to follow-up inquiry. Most of the patients had been severely disturbed by chronic tinnitus at admission and suffered

considerable psychiatric and psychosomatic complaints. Improvement in tinnitus distress, as measured by TQ total score, was found as compared to admission 15 years earlier. Stable results in TQ total score were shown if compared to the end of inpatient treatment.

Goebel et al. [37,38] found a reduction in the symptom checklist values that usually remained stable for 12 months, even if, for example, the depression values increased again. This tendency—increases in depression, physical complaints, and body-related anxieties—was confirmed by our random sample.

In our study, 67% of patients could be classified as responders and 33% as nonresponders. This is similar to other studies, in which there were 71% responders among the inpatients [35]. In their recent study, Goebel et al. [54] still found 39% to be responders 15 years after discharge. Conversely, 28% had worsened symptoms, and 33% were unchanged.

During the follow-up in our study, nonresponders, as expected, were more depressed and complained of more physical distress and body-related anxieties than did the responders. The variance in the extent of the tinnitus distress among the responders was much higher than that among the nonresponders. This was confirmed by the increased experience of impairment in this group during the follow-up as compared to the nonresponders, who remained stable. At admission to the hospital, the nonresponders were older than those in the other group, suffered more from tinnitus and psychosocial stress, and complained more of physical symptoms.

Of those patients, 35% of the responder group experienced more subjective discomfort after 12 months. Other studies reported 10–14% saying their symptoms had worsened after 12 months [37,38,41]. This subgroup of responders whose condition worsened did not differ in our study from the other patients in the responder group at the time of admission in terms of their socio-demographic, psychological, and temporal variables. Nevertheless, those patients who responded to treatment at discharge and turned to nonresponders 12 months later were suffering more than other patients in the responder group from both intensity of tinnitus and physical complaints and benefited less from the therapy.

A series of studies highlighted the close connection among depression and body-related anxiety [9,11,17,18,55,56], sleeping disorders [4,57], and the extent of the effects of tinnitus. Furthermore, severely affected patients seem to experience more acute distress and suffer more physical disorders and illness, especially in the cardiopulmonary system, than do less-affected tinnitus patients [58]. In particular, among patients with somatoform disorders, an increased awareness of such physical symptoms as tinnitus, feelings of helplessness, and dysfunctional attributes with their resulting psychosocial

consequences seemed important for sustaining the feeling of impairment. Removal from the calming, supportive, and treatment-oriented surroundings of the inpatient unit seems to make durable transfer of the treatment effects more difficult, especially among those patients with a high level of suffering resulting from intense tinnitus symptoms and the physical disorders that accompany it. In this regard, the extent of the subjectively perceived helplessness in dealing with symptoms could contribute to reinforcing the negative processes of self-consciousness and passive coping strategies.

A series of limiting factors pertains to this study. The lack of a control group makes it impossible to assess the universal veracity of the treatment results. Conversely, research involving waiting-list patients with decompensated tinnitus has found no evidence of significant levels of remission [37,38]. Audiological parameters were not used, as no connection between subjective tinnitus impairment and treatment success could be established [59]. The role of other influential variables (e.g., physical diseases, pharmaceutical therapies, motivation for therapy, the role played by a subjective disease model, or the secondary benefits of disease, such as a patient's retiring and making a pension claim on the basis of illness) was not controlled. Thus, the extent of physical illness might well influence the subjectively perceived limitations caused by tinnitus [58]. The effect of nonspecific factors, such as the inpatient setting, creates difficulty in assessing the specific factors, even if more proof supports the efficacy of cognitive-behavioral therapy procedures than supports nonspecific treatments.

In general, our study conclusions correlate well with those of other studies [37–41]; the random samples are similar even if the patients studied here were very severely affected. Comparisons are made more difficult by the fact that only some of the cited studies differentiate between compensated and decompensated tinnitus sufferers and some contain almost no details of the psychological suffering of the patients.

Our study confirms that a multimodal behavioral treatment concept can contribute in both the short and long term to an effective reduction of tinnitus annoyance and psychological distress experienced by severely affected tinnitus sufferers. The results also show that because of the chronicity of tinnitus and its psychosocial consequences, many sufferers are in need of further outpatient treatment designed to maintain or enhance the inpatient treatment effects [37,60].

Further research to differentiate subgroups of patients with complex tinnitus and their distinguishing features is necessary to devise more precise treatment strategies. In addition, knowledge is lacking about the prediction of short- and long-term therapeutic effects, limiting the possibility of timely screening of groups at risk in the treat-

ment process and the capability of doctors to react to them with diverse suitable treatment and posttreatment care.

REFERENCES

1. Pilgramm M, Lebisch H, Rychlick R, Kirchhoff D. Epidemiologie des Tinnitus in der Bundesrepublik Deutschland. *Zeitschr Audiol Suppl* 3:195–196, 2000.
2. Pilgramm M, Rychlick R, Lebisch H, et al. Tinnitus in the Federal Republic of Germany. A Representative Epidemiological Study. In *Proceedings of the Sixth International Tinnitus Seminar*. London: Biddles Short Run Books, 1999:64–67.
3. Scott B, Lindberg P. Epidemiologie, Auswirkungen, Klassifikation. In G Goebel (ed), *Ohrengeräusche. Psychosomatische Aspekte des komplexen chronischen Tinnitus*. Munich: Urban & Vogel, 2001:33–46.
4. Folmer RL, Griest SE. Effects of insomnia on tinnitus severity: A follow-up study. In *Proceedings of the Sixth International Tinnitus Seminar*. London: Biddles Short Run Books, 1999:271–275.
5. Sanchez L, Stephens SDG. Perceived problems of tinnitus clinic clients at long-term follow up. *J Audiol Med* 2:94–103, 2000.
6. Alster J, Shemesh Z, Organ M, Attias J. Sleep disturbance associated with chronic tinnitus. *Biol Psychiatry* 34:84–90, 1993.
7. Andersson G. Psychological aspects of tinnitus and the application of cognitive-behavioral therapy. *Clin Psychol Rev* 22:977–990, 2002.
8. Fichter M, Goebel G. Psychosomatische Aspekte des chronisch komplexen Tinnitus. *Deutsches Ärzteblatt* 93: 1771–1776, 1996.
9. Goebel G. Somatoforme Störungen bei Tinnitus. *Psychiatr Danubina* 12:215–222, 2000.
10. Härter M, Maurischat C, Weske G, et al. Psychische Belastungen und Einschränkungen der Lebensqualität bei Patienten mit Tinnitus. *HNO* 52(2):125–131, 2004.
11. Hiller W, Goebel G. Psychiatric Disorders and Their Degree of Severity in Patients with Severe Tinnitus and Pain Syndromes. In *Proceedings of the Fourth International Tinnitus Seminar*. Amsterdam: Kugler, 1992:441–444.
12. Holgers KM, Zöger S, Svedlund J, Erlandsson SI. Psychiatric Profile of Tinnitus Patients Referred to an Audiologic Clinic. In *Proceedings of the Sixth International Tinnitus Seminar*. London: Biddles Short Run Books, 1999:283–285.
13. Marciano E, Carrabba L, Giannini P, et al. Psychiatric comorbidity in a population of outpatients affected by tinnitus. *Int J Audiol* 42:4–9, 2003.
14. Schilter B. *Therapie des chronisch subjektiven Tinnitus. Metaanalyse zur Effektivität medikamentöser und psychologischer Therapie*. Frankfurt/Main: VAS, 2000:1–305.
15. Zöger S, Svedlund J, Holgers KM. Psychiatric disorders in tinnitus patients without severe hearing impairment: 24 month follow-up of patients at an audiological clinic. *Audiology* 40:133–140, 2001.

16. Hiller W, Goebel G. Komorbidität psychischer Störungen. In G Goebel (ed), *Ohrengeräusche. Psychosomatische Aspekte des komplexen chronischen Tinnitus*. München: Urban & Vogel, 2001:47–67.
17. Hiller W, Janca A, Burke KC. Association between tinnitus and somatoform disorders. *J Psychosom Res* 6:613–624, 1997.
18. Andersson G, Vretblad P. Anxiety sensitivity in patients with chronic tinnitus. *Scand J Behav Ther* 2:57–64, 2000.
19. Erlandsson SI, Hallberg IRM. Prediction of quality of life in patients with tinnitus. *Br J Audiol* 34:11–20, 2000.
20. Andersson G. Longitudinal follow-up of occupational status in tinnitus patients. *Int Tinnitus J* 2:127–129, 2000.
21. Holgers KM, Erlandsson SI, Barrenäs ML. Predictive factors for the severity of tinnitus. *Audiology* 39:284–291, 2000.
22. Goebel G, Hiller W, Rief W, Fichter M. Integratives verhaltensmedizinisches stationäres Behandlungskonzept. In G Goebel (ed), *Ohrengeräusche. Psychosomatische Aspekte des komplexen chronischen Tinnitus*. Munich: Urban & Vogel, 2001:139–176.
23. Goebel G, Decot E, Marek A. Entscheidungshilfen bei der Diagnostik und Wahl psychologischer Behandlungshilfen. *HNO* 12:1036–1048, 2001.
24. Kröner-Herwig B, ed. *Psychologische Behandlung des chronischen Tinnitus*. Weinheim: Beltz, 1997:1–179.
25. Schaaf H, Klofat B, Doelberg D, Hesse G. Tinnitus Therapie: Wann ambulant, wann stationär—psychosomatisch, wann psychiatrisch? *HNO Forum* 1:22–28, 2006.
26. Greimel KV. Psychologische Maßnahmen zur Bewältigung des chronischen Tinnitus. *Gruppenkonz Psychomed* 7:70–74, 1995.
27. Klinkenberg N, Kraft M, Broda M. Gruppenpsychotherapie bei chronisch komplexen Tinnitus. *Praxis Klin Verhaltensmed Rehab* 48:36–39, 1999.
28. D'Amelio R, Archonti C, Scholz S, et al. Psychische Korrelate und Ausmaß der Belastung bei Patienten mit akutem Tinnitus. *HNO* 52(7):599–603, 2004.
29. Andersson G, Melin L, Hagnebo C, et al. A review of psychological treatment approaches for patients suffering from tinnitus. *Ann Behav Med* 4:357–366, 1995.
30. Andersson G, Lyttkens L. A meta-analytic review of psychological treatments for tinnitus. *Br J Audiol* 33:201–210, 1999.
31. Dobie RA. A review of randomized clinical trials in tinnitus. *Laryngoscope* 109:1202–1211, 1999.
32. Goebel G. Wirksamkeit psychotherapeutischer Verfahren. In G Goebel (ed), *Ohrengeräusche. Psychosomatische Aspekte des komplexen chronischen Tinnitus*. Munich: Urban & Vogel, 2001:97–138.
33. Olderog M. Metaanalyse zur Wirksamkeit psychologisch fundierter Behandlungskonzepte des chronisch dekompensierten Tinnitus. *Zeitschr Med Psychol* 1:5–18, 1999.
34. Wilson PH, Hery JL, Nicholas MK. Cognitive methods in the management of chronic pain and tinnitus. *Aust Psychol* 3:172–180, 1993.
35. Goebel G, Keeser W, Fichter M, Rief W. Neue Aspekte des komplexen chronischen Tinnitus: Teil I. Überprüfung eines multimodalen verhaltensmedizinischen Behandlungskonzeptes. *Psychother Psychosom Med Psychol* 41:115–122, 1991.
36. Goebel G, Keeser W, Fichter M, Rief W. Neue Aspekte des komplexen chronischen Tinnitus: Teil II. Die verlorene Stille: Auswirkungen und psychotherapeutische Möglichkeiten beim komplexen chronischen Tinnitus. *Psychother Psychosom Med Psychol* 41:123–133, 1991.
37. Goebel G, Hiller W. Effects and Predictors of a Psychotherapeutic Inpatient Treatment for Chronic Tinnitus. In *Proceedings of the Fifth International Tinnitus Seminar*. Portland: American Tinnitus Association, 1996:568–574.
38. Goebel G. Fortschritte bei der verhaltensmedizinischen Diagnostik und Behandlung quälender chronischer Ohrgeräusche. *Otorhinolaryngol Nova* 5:178–189, 1995.
39. Hesse G, Rienhoff NK, Nelting M, Laubert A. Ergebnis stationärer Therapie bei Patienten mit chronisch komplexen Tinnitus. *Laryngorhinootologie* 80:503–508, 2001.
40. Horn J, Follert P. Die stationäre verhaltensmedizinische Behandlung des dekompensierten chronischen Tinnitus. In M Zielke (ed), *Angewandte Verhaltensmedizin in der Rehabilitation*. Berlin: Pabst Science Publishers, 2001: 774–789.
41. Nelting M, Schaaf H, Rienhoff NK, Hesse G. Katamnese — study (1 or 2 Years After In-Patient Treatment). In *Proceedings of the Sixth International Tinnitus Seminar*. London: Biddles Short Run Books, 1999:558–559.
42. Goebel G, Hiller W. *Tinnitus—Fragebogen TF*. Göttingen: Hogrefe Verlag, 1997:1–90.
43. Hallam RS, Jakes SC, Hinchcliffe R. Cognitive variables in tinnitus annoyance. *Br J Clin Psychol* 27:213–222, 1988.
44. Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Appl Psychol Measure* 3:385–401, 1977.
45. Hautzinger M, Bailer M. *Allgemeine Depressions Skala ADS*. Göttingen: Beltz Test Verlag, 1992:1–34.
46. von Zerssen D. *Die Beschwerde-Liste*. Weinheim: Beltz, 1976:1–37.
47. Rief W, Hiller W, Geissner E, Fichter M. Hypochondrie: Erfassung und erste klinische Ergebnisse. *Zeitschr Klin Psychol* 23:34–42, 1994.
48. Rief W, Hiller W, Heuser J. *Das Screening für Somatoforme Störungen SOMS*. Bern: Verlag Hans Huber, 1997: 1–47.
49. Sass H, Wittchen HU, Zaudig M, Houben I. *Diagnostisches und Statistisches Manual Psychischer Störungen DSM III-R*. Göttingen: Huber, 1989:1–436.
50. Jacobson NS, Truax P. Clinical significance: A statistical approach of defining meaningful change in psychotherapy research. *J Consult Clin Psychol* 59:12–19, 1991.
51. Bortz J. *Statistik für Sozialwissenschaftler*. Berlin: Springer, 1989.
52. Stevens J. *Applied Multivariate Statistics for the Social Sciences*. Mahwah, NJ: LEA, 1996.
53. Rustenbach S. *Metaanalyse. Eine anwendungsorientierte Einführung*. Bern: Verlag Hans Huber, 2006:1–291.
54. Goebel G, Kahl M, Arnold W, Fichter M. 15-year pro-

- spective follow-up study of behavioral therapy in a large sample of inpatients with chronic tinnitus. *Acta Otolaryngol* 126:70–79, 2006.
55. Dobie RA. Depression and tinnitus. *Otolaryngol Clin North Am* 36:383–388, 2003.
 56. Newman CW, Wharton JA, Jacobson GP. Self-focused and somatic attention in patients with tinnitus. *J Am Acad Audiol* 8:143–149, 1997.
 57. Hallam RS. Correlates of sleep disturbances in chronic distressing tinnitus. *Scand Audiol* 25:263–266, 1996.
 58. Stobik C, Weber RK, Münte TF, Frömmer J. Psychosomatische Belastungsfaktoren bei kompensiertem und dekompenziertem Tinnitus. *Psychother Psychosomat Med* 53: 344–352, 2003.
 59. Delb W, D'Amelio R, Boisten CJM, Plinkert PK. Kombinierte Anwendung von Tinnitusretrainingtherapie (TRT) und Gruppenverhaltenstherapie. *HNO* 50:997–1004, 2002.
 60. Frenzel, A. *Chronischer Tinnitus: Evaluation eine kognitiv-behavioralen Gruppentrainings und einer Minimalintervention*. Herdecke: GCA-Verlag, 1998.