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

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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].
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 only in 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, Anderson 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-related 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 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
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 uncompensated tinnitus.

- The General Depressions Scale (Allgemeine Depressions Skala [ADS]; long version) (CES–D [44]; German version [45]) is a questionnaire that measures 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]:

Group cutoff = mean_{TQ admittance} – 2 × SD_{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_{pre} – d_{post} or d_{pre} – d_{12months}), 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 = .02] and suffered more from tinnitus distress in total [F = 13.78 (1); p ≤ .000], especially in terms of cognitive dysfunction [F = 20.74 (1); p ≤ .000], emotional problems [F = 5.16 (1); p = .02], hearing problems [F = 6.29 (1); p ≤ .01], sleep disturbances [F = 6.01 (1); p ≤ .02], overbearing tinnitus [F = 6.23 (1); p ≤ .01], and somatic complaints [F = 5.67 (1); p ≤ .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 | F (df1; df2) | p Value | t1–t2 | t1–t5 |
| TQ | 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) | .001 | 1.31 | .83 |
| ADS | 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) | .001 | .89 | .44 |
| B-L | 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) | .001 | .56 | .14 |
| WI | 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) | .001 | .38 | .21 |

* d = effect size; M = mean; SD = standard deviation; t1–t2 = admission–discharge; t1–t5 = admission–12-month follow-up.
* Range, 0–84.
* Range, 0–60; cutoff for clinically significant depression > 23.
* Range, 0.96.
* Range 0–14; cutoff values > 8 points.

Note: Mean values of each of the scales differ significantly in the quadratic trend.
psychosocial problems ($\chi^2 = 10.29; df 4; p < .04$) and physical complaints measured by B–L [F = 4.19 (1); p < .04]. No difference was found between the two groups in terms of depression [F = 1.75 (1); p < .19] and hypochondria [F = 1.90 (1); p < .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

![Figure 1. Number of responders and nonresponders from discharge to 12 months.](image)

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

<table>
<thead>
<tr>
<th></th>
<th>Admission</th>
<th>Discharge</th>
<th>3 Months</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>TQ</td>
<td>R</td>
<td>63.58</td>
<td>10.51</td>
<td>36.45</td>
<td>11.46</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>73.71</td>
<td>14.11</td>
<td>44.44</td>
<td>11.46</td>
</tr>
<tr>
<td>AD</td>
<td>R</td>
<td>20.38</td>
<td>8.45</td>
<td>11.78</td>
<td>5.70</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>22.17</td>
<td>8.73</td>
<td>17.78</td>
<td>8.34</td>
</tr>
<tr>
<td>B-L</td>
<td>R</td>
<td>29.12</td>
<td>11.80</td>
<td>19.73</td>
<td>12.14</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>31.05</td>
<td>12.41</td>
<td>22.18</td>
<td>12.44</td>
</tr>
<tr>
<td>WI</td>
<td>R</td>
<td>5.24</td>
<td>3.40</td>
<td>3.53</td>
<td>2.74</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>5.97</td>
<td>3.24</td>
<td>5.67</td>
<td>3.12</td>
</tr>
<tr>
<td>F value</td>
<td>R</td>
<td>$15.16$</td>
<td>$11.98$</td>
<td>$14.77$</td>
<td>$12.27$</td>
</tr>
<tr>
<td></td>
<td>NR</td>
<td>$21.14$</td>
<td>$12.99$</td>
<td>$18.43$</td>
<td>$13.17$</td>
</tr>
</tbody>
</table>

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

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