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ICD-10 Symptom Rating questionnaire for assessment of psychological comorbidities in patients with chronic tinnitus

Background

The term “tinnitus” (Latin *tinnire* = ringing) refers to the condition in which people perceive sounds in the absence of external acoustic stimuli. There are two types of tinnitus: subjective and objective. “Objective” tinnitus can be perceived with aids—and sometimes even by the examiner. Possible causes comprise vascular malformations, arteriovenous (AV) fistulas, or paragangliomas. “Subjective” tinnitus, however, is far more common. It can only be perceived by the patient and cannot be objectified by conventional audiological diagnostics. Causes for subjective tinnitus are manifold and not always diagnosable. Possible risk factors are, for example, frequent noise exposure, ototoxic drugs, arterial hypertension, or otitis media [1].

Tinnitus is common in the general population. Langguth et al. [2] estimated the prevalence of tinnitus as ranging from 10 to 15%. Epidemiological studies show that chronic tinnitus is highly associated with psychological comorbidities [3, 4]. Common conditions include sleep difficulties, depression, or anxiety disorders that can lead to adverse effects across almost all domains of life for tinnitus sufferers. Depression and anxiety disor-

ders show the highest comorbidity rates in tinnitus [5, 6]; however, tinnitus is also commonly associated with obsessive–compulsive disorder [7], somatoform disorders [8], and eating disorders [5], as well as ineffective coping strategies [9].

To date, psychological phenomena are rarely included in basic diagnostic procedures for tinnitus. Moreover, varying or incomparable questionnaire measures may be applied. To support diagnostics in ENT practice, we use the International Classification of Diseases (ICD)-10 Symptom Rating (ISR) [10]. To detect depression, anxiety, obsessive thoughts or compulsive behaviors, so-

matiform symptoms, and problematic eating behavior, the ISR allows for the screening and diagnosis of respective disorders according to ICD-10 criteria [11]. The current study investigated the following questions: (1) Which comorbidities (as measured with the ISR) can be found in a sample of patients with chronic tinnitus?; (2) Can the ISR reflect response to a brief multimodal treatment program?; and (3) Which ISR scales predict tinnitus burden before and after this treatment?

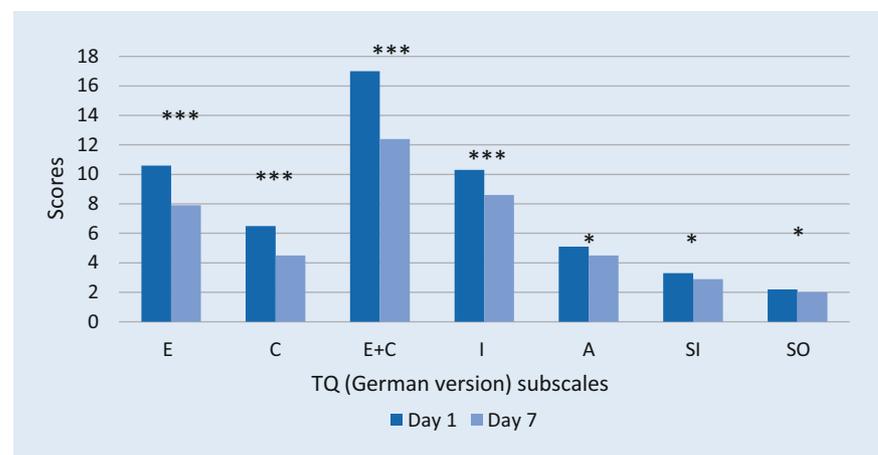


Fig. 1 ▲ Means for the Tinnitus Questionnaire (TQ) subscales (German version) before and after therapy. E emotional distress, C cognitive distress, E+C psychological distress, I intrusiveness, A auditory perceptual difficulties, SI sleep disturbances, SO somatic complaints. * $p < 0.05$, *** $p < 0.001$

The German version of this article can be found under <https://doi.org/10.1007/s00106-019-0618-6>.

Table 1 Correlations of total scores at baseline^a

| Questionnaire day 1 | PSQ | ADS | ISR |
|---------------------|---------|---------|---------|
| TQ | 0.532** | 0.493** | 0.514** |
| PSQ | – | 0.659** | 0.627** |
| ADS | – | – | 0.651** |

ADS General Depression Scale (*Allgemeine Depressionsskala*), ISR ICD-10 Symptom Rating, PSQ Perceived Stress Questionnaire, TQ Tinnitus Questionnaire–German version

** $p < 0.01$

^a $N = 311$ patients

Table 2 Mean scores and standard deviations before and after multimodal intensive tinnitus therapy^a

| Questionnaire | | Day 1 | | Day 7 | | t_{310} | p |
|---------------|------------|-------|------|-------|---------|-----------|-----------|
| | | M | SD | M | SD | | |
| TQ | Total | 37.9 | 16.6 | 30.4 | 16.7 | 14.03 | <0.001*** |
| | E | 10.6 | 5.5 | 7.9 | 5.2 | 6.20 | 0.000*** |
| | C | 6.5 | 3.9 | 4.5 | 3.7 | 6.44 | 0.000*** |
| | E+C | 17.0 | 9.0 | 12.4 | 8.5 | 6.60 | 0.000*** |
| | I | 10.3 | 3.6 | 8.6 | 3.9 | 5.81 | 0.000*** |
| | A | 5.1 | 3.6 | 4.5 | 3.5 | 2.22 | 0.027* |
| | SI | 3.3 | 2.5 | 2.9 | 2.5 | 2.08 | 0.038* |
| | SO | 2.2 | 1.9 | 2.0 | 1.9 | 2.12 | 0.026* |
| ISR | Total | 0.83 | 0.58 | 0.74 | 0.59 | 5.20 | <0.001*** |
| | Depr | 1.19 | 0.92 | 1.01 | 0.93 | 5.27 | 0.000*** |
| | Anx | 0.93 | 0.93 | 0.83 | 0.91 | 2.60 | 0.001*** |
| | OCD | 0.85 | 0.91 | 0.81 | 0.88 | 1.02 | 0.311 |
| | Somatoform | 0.63 | 0.81 | 0.60 | 0.79 | 0.83 | 0.405 |
| | Eating | 0.67 | 0.82 | 0.61 | 0.83 | 2.23 | 0.026* |
| | Suppl | 0.76 | 0.56 | 0.68 | 0.55 | 4.25 | <0.001*** |
| | PSQ | Total | 47.5 | 18.5 | 43.3 | 19.0 | 8.02 |
| Worry | 41.3 | 22.5 | 35.5 | 22.4 | 4.01 | <0.001*** | |
| Tension | 61.2 | 22.8 | 53.7 | 22.6 | 4.15 | <0.001*** | |
| Joy | 45.9 | 22.9 | 50.1 | 23.5 | (-1.91) | 0.047* | |
| Demand | 53.6 | 22.1 | 49.4 | 17.7 | 2.71 | 0.007** | |
| ADS | Total | 18.2 | 11.6 | 13.1 | 10.8 | 12.15 | <0.001*** |

TQ Tinnitus Questionnaire–German version, E emotional distress, C cognitive distress, E+C psychological distress, I intrusiveness, A auditory perceptual difficulties, SI sleep disturbances, SO somatic complaints, ISR ICD-10 Symptom Rating, Depr depressive disorder, Anx anxiety disorder, OCD obsessive–compulsive disorder, Somatoform somatoform disorder, Eating eating disorder, Suppl. supplementary scale, PSQ Perceived Stress Questionnaire, ADS General Depression Scale (*Allgemeine Depressionsskala*), M mean, SD standard deviation

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^a $N = 311$ patients

Method

Sample

Data were collected from 311 patients with chronic tinnitus (i.e., tinnitus lasting for > 3 months) who completed a 7-day multimodal intensive tinnitus therapy at the Charité Universitätsmedizin

Berlin. Patients' age ranged from 22 to 79 years ($M = 48.4$, $SD = 11.6$ years); men and women were included in equal proportions.

Multimodal intensive tinnitus therapy

The 7-day multimodal therapy concept is based on cognitive behavioral therapy (CBT) and involves an interdisciplinary team of ENT doctors, specialists in internal medicine, physicians, psychologists, and physiotherapists. It aims to facilitate tinnitus habituation as well as adaptive coping strategies such as relaxation and attentional re-training. Psychoeducational interventions aim to increase patients' awareness of maintaining mechanisms that influence the perception of tinnitus and to modify dysfunctional cognitions. Other therapeutic goals comprise the promotion of self-control and responsibility. The treatment plan includes group therapy (GT), hearing therapy (HT), progressive muscle relaxation (PMR), exercise therapy (BT), psychoeducational lectures, and individual psychosomatic and physical treatment sessions [12, 13].

Measures

Tinnitus burden

Tinnitus burden was measured using the German version of the Tinnitus Questionnaire (TQ; [14]). The German version consists of 52 statements that are answered on a three-point scale (0 = *not true*, 1 = *partly true*; 2 = *true*). The total score uses 40 items with two items being included twice, thus yielding a score range from 0 to 84. The German TQ contains the following subscales: cognitive (C) and emotional distress (E), as well as a sum scale thereof (psychological distress E+C), intrusiveness (I), auditory perceptual difficulties (A), sleep disturbances (SI), and somatic complaints (SO). The total score can also be divided into mild (up to 30 points, compensated), moderate (31–46 points, compensated), severe (47–59 points, decompensated), and very severe (60–84 points, decompensated) tinnitus burden.

Psychological comorbidities

Psychological comorbidities were measured using the ISR. The ISR consists of 29 items that are answered on a scale from 0 (*disagree*) to 4 (*extremely true*).

Subscales of the ISR include measurements of depressive disorder, anxiety disorder, obsessive–compulsive disorder, somatoform disorder, and eating disorder. A supplementary scale further measures additional indices of psychological distress (e.g., concentration disorders), clinical relevance (e.g., suicidality), or indicators of specific illnesses (e.g., posttraumatic stress disorder). Indexing the extent of emotional impairment, a total score is calculated that weighs the supplementary scale twice. Cut-off scores are 0.5 (total score), 0.75 (depressive and anxiety disorders), 0.67 (obsessive–compulsive disorder), and 0.33 (somatoform disorder and supplementary scale). Furthermore, the ISR has been shown to be suitable for measuring treatment response [15–17]. It is available online, and free to use.

Subjective stress

Subjective stress was measured using the Perceived Stress Questionnaire (PSQ; [18, 19]). It contains 20 items, which are answered on a Likert scale from 1 (*almost never/mostly*) to 4 (*mostly/almost never*) and which are then recoded to a scale ranging from 0 to 100. In addition to a total score, subscales comprise worries, tension, joy (reversely coded), and demands. Compared to the general population, a total score of > 50 points indicates stress-related impairment.

Depressive symptoms

For the additional measurement of depressive symptoms, the 20-item version of the General Depression Scale (*Allgemeine Depressionsskala*, ADS; [20]) was used, which is answered on a scale from 0 (*rarely*) to 3 (*mostly*). The sum score serves as a parameter of current depressive symptoms. A score of > 23 indicates a depressive disorder.

Procedure

All patients agreed in writing that their data could be used anonymously for teaching and research purposes. The investigation period lasted 1 year.

Statistical analysis

Treatment responses were calculated using dependent-samples *t* or χ^2 tests (for the ISR supplementary scale); correlations were calculated computing Pearson coefficients. To investigate possible factors that influence tinnitus distress, linear regressions were calculated before and after treatment (dependent variable: TQ total score). All statistical tests were conducted using IBM's Statistical Package for the Social Sciences, version 24 (SPSS-24; IBM, New York/NY, USA).

Results

Tinnitus burden and psychological comorbidities

Correlations between the total scores of the instruments used are summarized in **Table 1**. All instruments yielded medium-to-high correlations.

Table 2 summarizes the mean scores and standard deviations before and after treatment. At baseline, 65% of patients showed relevant symptom burden due to psychological comorbidities (i.e., ISR total score > 0.5). Subjective stress approximates the relevant cut-off (PSQ > 49). Following multimodal intensive tinnitus therapy, there were significant reductions in key parameters. The proportion of patients suffering from psychological comorbidities above cut-off dropped to 58% with treatment ($\chi^2 = 3.91$, $p < 0.05$).

All scales of the German version of the TQ showed significant reductions with treatment (**Table 2**; **Fig. 1**).

The ISR subscales measuring “depressive,” “anxiety,” and “eating” disorders, as well as the supplementary scale, significantly decreased with treatment (**Table 2**; **Fig. 2**).

Moreover, all PSQ scales showed significant improvements with treatment (**Table 2**; **Fig. 3**).

Prediction of tinnitus burden by psychological comorbidities

At baseline, tinnitus burden was predicted by the ISR “total” and “obsessive–compulsive disorder” scores as well as the PSQ “tension” score. Following

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ICD-10 Symptom Rating questionnaire for assessment of psychological comorbidities in patients with chronic tinnitus

Abstract

Background. Tinnitus frequently occurs alongside psychological comorbidities whose assessment is important for treatment planning and -success. The selection of suitable questionnaires is thus crucial. The present study aims to investigate the ICD-10 Symptom Rating (ISR) to this regard.

Methods. The current study investigated tinnitus burden and psychological comorbidities in a sample of $N = 311$ patients with chronic tinnitus. All participants completed an intensive 7-day multimodal tinnitus-specific therapy. Tinnitus burden was measured using the German version of the Tinnitus Questionnaire (TQ). Psychological comorbidities were measured using the ISR (total score, depressive disorder, anxiety disorder, obsessive–compulsive disorder, somatoform disorder, and eating disorder), the Perceived Stress Questionnaire (PSQ; total score, tension, worries, joy, and demands), and the General Depression Scale (*Allgemeine Depressionsskala*, ADS).

Results. Sixty-five percent of participants suffered from psychological comorbidities. Treatment response comprised improvements in the TQ, ISQ, PSQ and ADS. At baseline, tinnitus-burden correlated with the ISR-total, ISR-obsessive-compulsive disorder and PSQ-tension scores. Post treatment, the—now reduced—tinnitus burden was additionally predicted by ISR-depressive and eating disorder scores.
Conclusion. The ISR is a useful tool for measuring psychological comorbidities in patients with chronic tinnitus as well as short-term treatment response. Therapeutic approaches for chronic tinnitus should address stress-related tension, depressive symptomatology and coping strategies such as maladaptive eating behaviours.

Keywords

Chronic tinnitus · Depressive disorders · Psychological comorbidities · Anxiety disorders · Obsessive-compulsive disorder

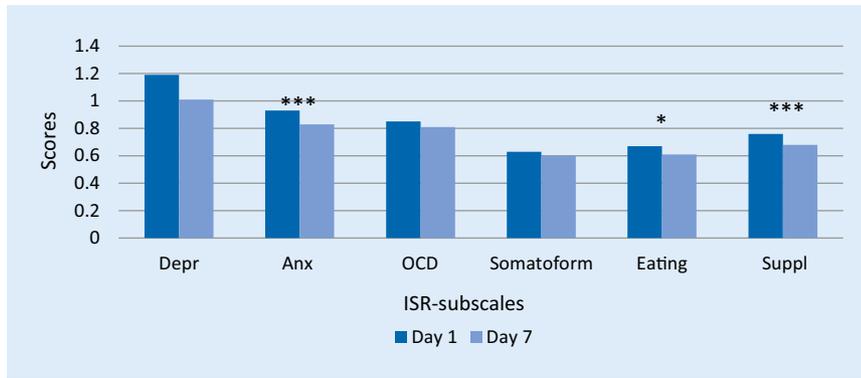


Fig. 2 ▲ Means for the ICD-10 Symptom Rating (*ISR*) subscales before and after therapy. *Depr* depressive disorder, *Anx* anxiety disorder, *OCD* obsessive–compulsive disorder, *Suppl.* supplementary scale. * $p < 0.05$, *** $p < 0.001$

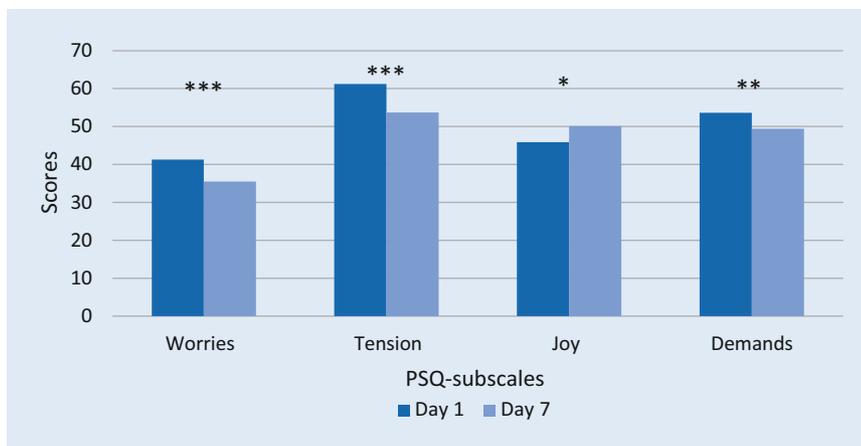


Fig. 3 ▲ Means for the Perceived Stress Questionnaire (*PSQ*) subscales before and after therapy. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

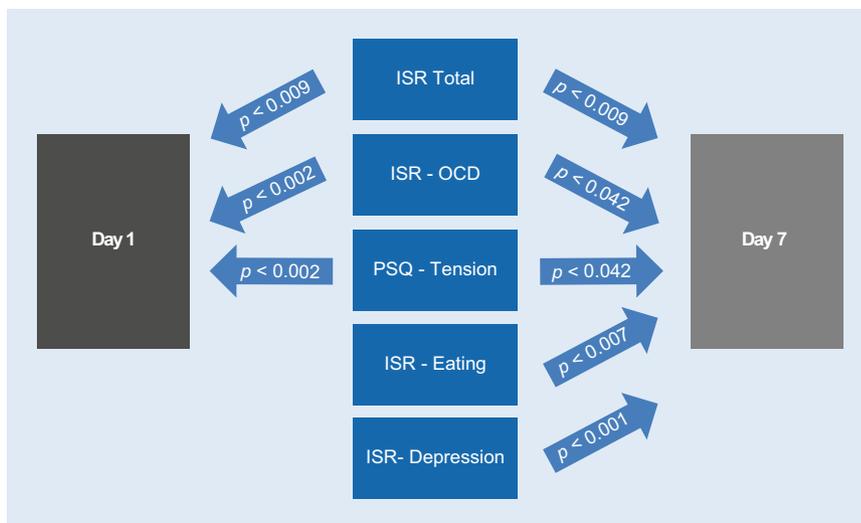


Fig. 4 ▲ Significant regression coefficients (dependent variable: Tinnitus Questionnaire–German version total score) before and after multimodal intensive tinnitus therapy. *ISR* ICD-10 Symptom Rating, *OCD* obsessive–compulsive disorder, *PSQ* Perceived Stress Questionnaire

therapy, the “depressive” and “eating” disorder scores additionally predicted the—now improved—German TQ total score (■ Fig. 4).

Discussion

The observed rate of 65% of patients reporting moderate psychology comorbidities is in keeping with the frequency data described in the literature. Using a structured interview in a clinical sample of patients suffering from chronic tinnitus, Zirke et al. [3] observed that 60% met diagnostic criteria for at least one psychological comorbidity, notably depression (22%), anxiety disorders (20%), and somatoform disorders (16%). Based on studies from German-speaking countries [21], Goebel [22] also describes a close connection between subjective tinnitus burden and mental illness. In his reviews [23, 24], Langguth highlights the connection between tinnitus and psychiatric comorbidities, especially anxiety and depression, which affect about half of all those suffering from subjective tinnitus. Nonclinical patient groups, which habituate to the tinnitus noise without intervention, the psychological comorbidity rates are approximately 20% in German-speaking countries [22].

In addition to the commonly reported stress clusters, the present study also demonstrates heightened manifestations of obsessive–compulsive and eating-related symptoms. Obsessive–compulsive symptoms in tinnitus patients were previously described by Folmer and colleagues [7], who investigated a sample of 196 tinnitus patients and reported high correlations of obsessive–compulsive symptoms with depression, but also tinnitus burden and anxiety. In the present study, we classify the observed compulsive and eating-related symptoms as parts of a depressive symptom cluster—amongst sleep disturbance and emotional distress scales as measured by the German TQ.

At the beginning of therapy, tinnitus burden was predicted by stress-related tension (PSQ: tension) as well as obsessive rumination about tinnitus (ISR: obsessive–compulsive disorder). Obsessive–compulsive symptomatology does

not significantly improve with treatment. After therapy, the (reduced) German TQ total score was additionally predicted by depressive and eating-related symptoms as measured by the ISR. This may indicate that eating behaviors could be used in an attempt to regulate depressive symptoms, including somatic issues. The connection between subjective stress and tinnitus found in the current study has been shown several times and underlines the significance of this construct for the operationalization of tinnitus burden [25–27].

In keeping with previous studies demonstrating the effectiveness of CBT for tinnitus (summarized in [28]), the results of the present study support findings of significant reductions in emotional and tinnitus-related distress following a 7-day multimodal intensive tinnitus therapy. Although the current sample suffered from compensated tinnitus on average (grades 1 and 2 according to Biesinger [29]), a short-term intensive therapy can significantly improve emotional well-being and alleviate tinnitus burden. We reason that interventions that focus on psychological comorbidities and stress regulation techniques, form the core of effective multimodal tinnitus therapy that also shows long-term efficacy [12, 30].

Practical conclusions

- The ISR is an effective and reliable tool for the assessment of psychological comorbidities in tinnitus patients.
- Depression, anxiety, and associated problems such as obsessive control or maladaptive eating symptoms play important roles in the operationalization of tinnitus burden and are well captured by the instrument.
- The ISR can also be used to measure response to short-term treatment.
- We advocate for routine use of the ISR in clinical practice, mainly because of its availability and direct link to ICD-10-related diagnoses of psychological comorbidities.

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Compliance with ethical guidelines

Conflict of interest P. Brueggemann, C. Seydel, C. Schaefer, A.J. Szczepek, N. Amarjargal, B. Boecking, M. Rose, and B. Mazurek declare that they have no competing interests.

For this article no studies with human participants or animals were performed by any of the authors. All patients agreed in writing that their data could be used anonymously for teaching and research purposes.

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