

Wolfgang Hiller\*  
Gerhard Goebel†

\*Department of Clinical Psychology,  
University of Mainz, Mainz,

†Roseneck Centre of Behavioural  
Medicine, Prien, Germany

## Rapid assessment of tinnitus-related psychological distress using the Mini-TQ

### Evaluación rápida del estrés psicológico relacionado con el acúfeno mediante el uso de Mini-TQ

#### Key Words

Tinnitus Questionnaire (TQ)

Mini-TQ

Assessment

Psychometric analysis

Tinnitus distress

#### Abstract

The aim of this study was to develop an abridged version of the Tinnitus Questionnaire (TQ) to be used as a quick tool for the assessment of tinnitus-related psychological distress. Data from 351 inpatients and 122 outpatients with chronic tinnitus were used to analyse item statistics and psychometric properties. Twelve items with an optimal combination of high item–total correlations, reliability and sensitivity in assessing changes were selected for the Mini-TQ. Correlation with the full TQ was  $>0.90$ , and test–retest reliability was 0.89. Validity was confirmed by associations with general psychological symptom patterns. Treatment effects indicated by the Mini-TQ were slightly greater than those indicated by the full TQ. The Mini-TQ is recommended as a psychometrically approved and solid tool for rapid and economical assessment of subjective tinnitus distress.

#### Sumario

El objetivo de este estudio fue desarrollar una versión corta del Cuestionario del Acúfeno (TQ) para usarlo como una herramienta rápida de evaluación del estrés psicológico relacionado con el acúfeno. Se utilizaron los datos de 351 pacientes internados y 122 pacientes externos con acúfeno crónico para analizar la estadística de cada pregunta y sus propiedades psicométricas. Se seleccionaron para el Mini-TQ, 12 preguntas que tenían una óptima combinación de elevada correlación, confiabilidad y sensibilidad para evaluar cambios. La correlación con el TQ completo fue  $>0.90$  y la confiabilidad de comprobación de la prueba fue del 0.89. Se validó la prueba confirmando la asociación con patrones de síntomas psicológicos. Los efectos del tratamiento indicados por el Mini-TQ fueron ligeramente mayores que aquellos indicados por el TQ completo. Se recomienda el Mini-TQ como una herramienta psicométrica sólida, aprobada para realizar una evaluación rápida y económica del estrés producido por el acúfeno subjetivo.

There is strong evidence from the literature of the past 20 years that the clinical picture of tinnitus is not strictly limited to otological considerations (Scott & Lindberg, 2000; Erlandsson & Holgers, 2001). Patients may develop psychological complaints of varying severity, especially when medical treatments fail and the tinnitus has become chronic. Psychological complications include annoyance resulting from the permanent awareness of the noise, concentration problems, depression, anxiety and irritability, sleep disturbances, and intense worrying. It is widely recognized that reliable and valid instruments are needed to describe these different facets and the degree of tinnitus-related distress (McCombe et al, 2001).

In addition to clinical examinations, questionnaires are used commonly for the examination of subjective complaints associated with tinnitus (Hallam et al, 1988; Erlandsson et al, 1992). Patients respond to a set of questions or statements that are presented in a structured and standardized form. Well-developed scales are easy to administer, yield reliable data, and allow a valid interpretation of the patient's current status. There are strict psychometric criteria according to which the scientific and clinical value of existing instruments can be judged (Anastasi & Urbina, 1997). Different questionnaires are available that have been specifically designed for the assessment of tinnitus-related

psychological complaints and symptoms. Table 1 shows the scales that have been developed according to scientific standards and are used in international research.

Although the instruments shown in Table 1 were developed in different countries by independent working groups, they seem to measure a very similar pattern of complaints and handicaps. Baguley et al (2000) administered the Tinnitus Questionnaire (TQ) and Tinnitus Handicap Inventory to the same sample of patients, and found that the convergent validity of both instruments was high, with total as well as subscale scores being significantly correlated. However, the value of subscales seems to be limited, because there is no general agreement about how many of them are needed and how they should be labelled. From our perspective, it seems remarkable that most authors in this field report only global indices of distress and no subscale results.

An unresolved problem with some questionnaires is the relatively large number of items needed to determine a global distress measure. This is a disadvantage when the time available for investigation is limited and other instruments need to be completed as well. For example, 40 of the 52 items of the TQ are needed for computation of the total score (Hiller & Goebel, 1992). Therefore, after many years of working with the TQ, we felt an increasing need for a quicker and more compact measure

**Table 1.** Questionnaires to assess tinnitus-related distress

| <i>Instrument</i> |                                    | <i>No. of items</i> | <i>No. of dimensions</i> | <i>Authors</i>                        |
|-------------------|------------------------------------|---------------------|--------------------------|---------------------------------------|
| TQ                | Tinnitus Questionnaire             | 52                  | 5 or 6                   | Hallam (1996); Hiller & Goebel (1992) |
| TRQ               | Tinnitus Reaction Questionnaire    | 26                  | 4                        | Wilson et al (1991)                   |
| THQ               | Tinnitus Handicap Questionnaire    | 27                  | 3                        | Kuk et al (1990)                      |
| THI               | Tinnitus Handicap Inventory        | 25                  | 1–3                      | Newman et al (1996, 1998)             |
| STSS              | Subjective Tinnitus Severity Scale | 16                  | 5                        | Halford & Anderson (1991)             |

of overall tinnitus distress. Furthermore, we observed that some items were of little value because they seemed to be characteristic only for subgroups of patients or had low relevance for usual clinical decisions.

In the present study, we attempted to develop an abridged version of the TQ, with the primary goal of maintaining its excellent psychometric qualities. This article describes this new instrument, called the Mini-TQ, and provides data on reliability, validity, sensitivity to change, and comparison with the full TQ.

## Methods

### *Sample and procedure*

To analyse scale characteristics, we used a large sample of 351 tinnitus patients treated at the Roseneck Centre for Behavioural Medicine in Prien, Germany. This hospital is a research-oriented unit affiliated to the Medical Faculty of the University of Munich. It provides tertiary care services and forms part of the German mental healthcare system. It includes a department that specializes in the treatment of chronic tinnitus according to the principles of cognitive behavioural therapy (CBT). The demographic characteristics of the sample were as follows: 31.8% female, 68.2% male, and mean age 47.4 years ( $SD = 9.8$ ) (range 17–74 years). All patients had chronic tinnitus (>6 months), in most cases present for 5–20 years. Major aetiological factors were history of sudden hearing loss (about 40%), acoustical trauma or longstanding noise exposure (about 40%), and Menière's disease (about 10%). Abnormal audiograms were found for about 70% of patients, although hearing aids were indicated for only 20–25%.

The TQ was completed within 3 days of admission. As mentioned, this 52-item scale is a well-established instrument for the assessment of the broad spectrum of tinnitus-related psychological complaints. Areas of complaint include emotional and cognitive distress, intrusiveness, auditory perceptual difficulties, sleep disturbances, and associated somatic complaints. The total TQ score indicates the general level of psychological and psychosomatic distress. The TQ has been shown to be reliable and valid in several previous studies (e.g. Hallam et al, 1988; Hiller & Goebel, 1992; Hiller et al, 1994; Baguley et al, 2000). Questions are answered as either true, partly true, or not true. The total score was computed according to the coding criteria published in our previous work (Hiller & Goebel, 1992). Post-treatment TQ data were available for 220 patients in the above sample.

### *Second sample for cross-validation*

A second sample of 122 outpatients was used for cross-validation of the results obtained from the main sample. These patients were treated at the Psychological Institute of the

University of Mainz as part of a treatment programme evaluating CBT for chronic tinnitus patients (Haerkötter & Hiller, 1999; Hiller & Haerkötter, unpublished data). All patients completed the TQ before and after the treatments, which lasted for 4–10 weeks. Of the patients, 43.4% were female, and 56.6% male; the mean age of the entire sample was 49.8 years ( $SD = 13.7$ ) (range 20–78 years). As in the first sample, all patients reported having tinnitus for more than 6 months (28% for more than 5 years). Medical diagnoses and hearing status were largely similar to those for the inpatient sample.

### *Additional instruments*

As general psychopathology is frequently found in chronic tinnitus patients, we employed the Hopkins Symptom Checklist SCL-90R (Derogatis, 1983) as an external criterion to evaluate the validity of the Mini-TQ.

### *Statistical methods*

We used Pearson correlations to analyse the associations between items and total scores, full TQ and Mini-TQ, and tinnitus-related and general psychological complaints, and to measure test–retest reliability. Reliability on item level will be expressed by kappa ( $\kappa$ ), a chance-corrected measure of agreement between categorical variables. To evaluate the magnitude of treatment effects, we calculated sample effect sizes (ESs) according to the  $d$  statistic proposed by Cohen (1988).

## Results

### *Item selection*

To select items for the abridged questionnaire, we determined (1) to what degree each item was associated with the overall tinnitus-related distress (item–total correlations), (2) how often each item was endorsed by tinnitus patients (item frequencies), and (3) how dependably the contents were reported ( $\kappa$  values obtained in the test–retest study). We did not consider items of the subscales 'auditory perceptual difficulties' and 'somatic complaints'. Based on these considerations, the 12 items shown in Table 2 were chosen to constitute the Mini-TQ. Item–total correlations and  $\kappa$  coefficients were generally good to high. Seven items were taken from the intrusiveness and emotional distress subscales (1, 2, 5, 6, 7, 9, 12), three from the cognitive distress subscale (3, 10, 11) and one from the sleep disturbance subscale (8). Item 4 had not previously been considered in TQ subscales, because the area of negative effects on social relationships is not well represented in the item pool of the TQ. However, as this item was found to have good psychometric properties and represents an important aspect of tinnitus-related distress, it was decided to include it in the abridged questionnaire.

**Table 2.** Characteristics of the Mini-TQ items

| Items   | Item-total correlation <sup>a</sup> | Item frequency (true/partly true) <sup>b</sup> | Test-retest reliability <sup>c</sup> |
|---|-------------------------------------|--|--------------------------------------|
| 1. I am aware of the noises from the moment I get up to the moment I sleep            | 0.56                                | 60/27  | 0.49                                 |
| 2. Because of the noises I worry that there is something seriously wrong with my body | 0.39                                | 33/32  | 0.57                                 |
| 3. If the noises continue my life will not be worth living                            | 0.66                                | 15/41  | 0.78                                 |
| 4. I am more irritable with my family and friends because of the noises               | 0.58                                | 40/39  | 0.54                                 |
| 5. I worry that the noises might damage my physical health                            | 0.54                                | 40/32  | 0.57                                 |
| 6. I find it harder to relax because of the noises                                    | 0.57                                | 71/23  | 0.55                                 |
| 7. My noises are often so bad that I cannot ignore them                               | 0.64                                | 75/16  | 0.53                                 |
| 8. It takes me longer to get to sleep because of the noises                           | 0.59                                | 56/24  | 0.62                                 |
| 9. I am more liable to feel low because of the noises                                 | 0.65                                | 55/31  | 0.62                                 |
| 10. I often think about whether the noises will ever go away                          | 0.57                                | 59/26  | 0.49                                 |
| 11. I am a victim of my noises  | 0.71                                | 27/38  | 0.61                                 |
| 12. The noises have affected my concentration   | 0.66                                | 61/31  | 0.63                                 |

<sup>a</sup>Pearson correlation between item and full TQ global score according to Hiller & Goebel (1992), based on  $n = 351$ .

<sup>b</sup>Percentage of patients answering 'true'/answering 'partly true', based on  $n = 351$ .

<sup>c</sup>Kappa ( $\kappa$ ), based on  $n = 60$ , from the study of Hiller et al (1994).

**Table 3.** Pearson correlations between TQ and Mini-TQ

|                       | Full TQ |      |      |      |      |      |      |                 |
|-----------------------|---------|------|------|------|------|------|------|-----------------|
|                       | E       | C    | E+C  | I    | A    | SI   | So   | TQ global score |
| Mini-TQ (inpatients)  | 0.93    | 0.84 | 0.93 | 0.80 | 0.51 | 0.65 | 0.48 | 0.93            |
| Mini-TQ (outpatients) | 0.90    | 0.81 | 0.91 | 0.80 | 0.59 | 0.52 | 0.53 | 0.91            |

Based on  $n = 351$  (inpatients) and  $n = 122$  (outpatients).

Subscales of the TQ: E, Emotional distress; C, Cognitive distress; E + C, Emotional and cognitive distress; I, Intrusiveness; A, Auditory perceptual difficulties; SI, Sleep disturbances; So, Somatic complaints.

**Table 4.** Reliability and internal consistency of the Mini-TQ

|                                   |           |      |
|-----------------------------------|-----------|------|
| Test-retest <sup>a</sup>          | $n = 60$  | 0.89 |
| Cronbachs' $\alpha$ (inpatients)  | $n = 349$ | 0.87 |
| Cronbachs' $\alpha$ (outpatients) | $n = 112$ | 0.90 |

<sup>a</sup>Pearson correlation.

#### Congruence between full TQ and Mini-TQ

Table 3 shows Pearson correlations between the Mini-TQ on one hand, and the subscales and global score of the full TQ on the other. Values  $>0.90$  indicate extraordinarily high congruence of the new 12-item version and the original TQ global score. It can be seen that while our item selection resulted in good overlap with the TQ subscales E, C and I, the correlations with the subscales A and SI are clearly lower.

**Table 5.** Association with general psychopathology

| SCL-90R scales                         | Mini-TQ | Full TQ |
|--|---------|---------|
| Somatization                           | 0.30    | 0.32    |
| Obsessive-compulsive                   | 0.38    | 0.37    |
| Interpersonal sensitivity              | 0.29    | 0.26    |
| Depression                             | 0.42    | 0.38    |
| Anxiety                                | 0.34    | 0.31    |
| Hostility                              | 0.27    | 0.26    |
| Phobic anxiety                         | 0.26    | 0.28    |
| Paranoid ideation                      | 0.29    | 0.28    |
| Psychoticism                           | 0.30    | 0.30    |
| General symptomatic index (GSI)        | 0.40    | 0.39    |
| Positive symptom total (PST)           | 0.37    | 0.36    |
| Positive symptom distress index (PSDI) | 0.41    | 0.38    |

Pearson correlations; based on  $n = 324$ .

#### Psychometric properties of the Mini-TQ

Table 4 shows high test-retest reliability and internal consistency for the Mini-TQ, despite the small number of items. This result is plausible, because a group of relatively homogeneous items with good reliabilities on item level had been selected. It is known that tinnitus-related complaints correlate moderately with general psychological symptoms, which represents an important aspect of validity. Table 5 displays the intercorrelations of the abridged and full TQ with the subscales and scores of the SCL-90R. It can be seen that the values are very similar.

#### Sensitivity of measures for the assessment of change

An important characteristic of a measure is its sensitivity for the assessment of changes over time, e.g. when the course of a disorder or treatment effects are being evaluated. To analyse the applicability of the Mini-TQ as an instrument for repeated measurement, we compared treatment effects obtained for the same samples with the full TQ and with the Mini-TQ. The inpatients

**Table 6.** Use of the TQ and Mini-TQ to measure treatment effects

|             | <i>Subgroup</i> | <i>Measure</i> | <i>Before treatment Mean (SD)</i> | <i>After treatment Mean (SD)</i> | <i>Significance t-value</i> | <i>Pre-Post ES</i> |
|-------------|-----------------|----------------|-----------------------------------|----------------------------------|-----------------------------|--------------------|
| Inpatients  | TQ > 40         | Full TQ        | 59.7 (10.6)                       | 50.3 (16.1)                      | 8.99*                       | 0.70               |
|             |                 | Mini TQ        | 18.4 (3.6)                        | 15.2 (5.1)                       | 8.92*                       | 0.75               |
| Outpatients | TQ > 40         | Full TQ        | 54.7 (9.4)                        | 41.7 (17.0)                      | 6.85*                       | 0.98               |
|             |                 | Mini-TQ        | 17.2 (3.3)                        | 13.0 (5.6)                       | 5.98*                       | 0.94               |
|             | TQ ≤ 40         | Full TQ        | 24.9 (8.0)                        | 16.6 (9.5)                       | 8.01*                       | 0.95               |
|             |                 | Mini TQ        | 9.0 (3.4)                         | 5.5 (3.5)                        | 7.73*                       | 1.03               |

Based on  $n = 156$  (inpatients > 40),  $n = 54$  (outpatients > 40) and  $n = 68$  (outpatients ≤ 40). ES, effect size.  
\* $p < 0.01$ .

of the Roseneck Centre had been treated for 4–10 weeks with an intense programme according to the principles of behavioural medicine, including individual and group CBT, relaxation training, medical consultation, and physical and body-related therapies (Goebel & Hiller, 1996). The outpatients at the University of Mainz were treated according to a newly developed CBT programme consisting of either 10 weekly sessions for severely distressed patients or four sessions for patients with only moderate symptoms (Haerkötter & Hiller, 1999).

Table 6 summarizes the comparison between the full and abridged TQ for decompensated inpatients with initial TQ scores above 40 and for two outpatient subgroups with either high (>40) or moderate (≤40) levels of distress. Both measures were able to identify significant improvements in all groups ( $p < 0.01$ ). However, statistical significance does not guarantee that the Mini-TQ is equally powerful in detecting differences before and after treatment. We therefore calculated Cohen's  $d$  as an ES denoting a standardized difference between two means. The results in Table 6 show that the Mini-TQ is equally, if not slightly more, powerful than the full TQ for the measurement of improvements during treatment.

The Mini-TQ was also able to differentiate more generally between inpatients and outpatients. The entire inpatient group improved from 15.8 (SD = 5.7) to 13.0 (SD = 6.0), and the outpatient group from 12.4 (SD = 5.3) to 8.7 (SD = 5.8). The group main effect for these data was significant in a repeated-measures analysis of variance (df 1,  $F = 44.9$ ,  $p < 0.01$ ).

#### Standardization and norms

The distribution of the Mini-TQ scores must be known if individual test results are to be interpreted properly. We therefore computed cumulative percentages separately for our samples of inpatients and outpatients (Table 7). The mean values (SDs) were 15.4 (5.7) for inpatients and 12.6 (5.3) for outpatients. Interpretation can depend on many variables, such as clinical setting (e.g. private ENT practitioners, otological inpatient units, tertiary care facilities for distressed tinnitus sufferers) or purpose of investigation (e.g. treatment decision). However, our recommendation is to consider patients scoring 1–7 as being compensated (no clinically relevant distress due to the tinnitus), those scoring 8–12 as moderately distressed, those scoring 13–18 as severely distressed, and those scoring 19–24 as most severely distressed.

**Table 7.** Norms for the Mini-TQ

| <i>Scores</i> | <i>Inpatients (n = 351)</i> | <i>Outpatients (n = 122)</i> |
|---------------|-----------------------------|------------------------------|
| 0             | 1                           | < 1                          |
| 1             | 1                           | < 1                          |
| 2             | 2                           | < 1                          |
| 3             | 4                           | 1                            |
| 4             | 4                           | 3                            |
| 5             | 5                           | 10                           |
| 6             | 7                           | 18                           |
| 7             | 11                          | 21                           |
| 8             | 13                          | 27                           |
| 9             | 17                          | 30                           |
| 10            | 21                          | 34                           |
| 11            | 26                          | 43                           |
| 12            | 31                          | 48                           |
| 13            | 35                          | 55                           |
| 14            | 41                          | 62                           |
| 15            | 46                          | 67                           |
| 16            | 52                          | 78                           |
| 17            | 58                          | 81                           |
| 18            | 66                          | 85                           |
| 19            | 71                          | 89                           |
| 20            | 76                          | 93                           |
| 21            | 84                          | 94                           |
| 22            | 91                          | 95                           |
| 23            | 96                          | 98                           |
| 24            | 100                         | 100                          |

Cumulative percentages.

## Discussion

This study was motivated by the desire to optimize the psychometric assessment of tinnitus-related distress. We knew from our long experience with the TQ that subscales are only rarely analysed, and researchers as well as clinicians seem to be primarily interested in a measure of overall distress. Although the TQ is one of the best accepted questionnaires in the field of tinnitus research, its weaknesses are the large number of items (52) and the fact that not all items are used to compute the total score. Furthermore, there is an increasing need for short instruments, because multiple scales are usually employed in research

projects, and the patients' willingness to accept large questionnaire batteries is limited.

The results of the present study are encouraging. The 12 items of the new Mini-TQ were selected according to strictly defined psychometric criteria. We considered items only if they were highly correlated with the general score and had proven to be reliable. Another major criterion was their sensitivity for indicating changes of symptomatology, because evaluating treatment outcome represents a major application. Our analyses confirmed that the Mini-TQ consists of a very homogeneous set of items, with excellent values of reliability and internal consistency. Furthermore, intercorrelations with measures of general psychopathology were practically identical to those obtained with the full TQ. We were also able to demonstrate that the new measure was equally, or probably even slightly more, powerful in the detection of improvements during inpatient and outpatient treatments. In a last step, we provided norms for inpatients and outpatients that may facilitate the interpretation of individual scores for other users. However, as these were not patients usually seen in private ENT practices or audiological clinics, the usefulness and validity of the Mini-TQ remains to be evaluated in these settings.

To summarize, the development of the Mini-TQ represents a further step towards the compact, quick and economical assessment of subjective tinnitus distress. There are no recognizable psychometric disadvantages as compared to the full TQ. We therefore suggest that the full version should only be used if there are special questions concerning the subscales, e.g. if there is an interest in studying auditory perceptual difficulties or sleep disturbances apart from general distress (Baguley et al, 2000). The Mini-TQ is suitable for research and may help in the comparison of findings between countries. It can also be used in everyday clinical practice, because the 12 selected items reflect most central and characteristic aspects of tinnitus distress. Although there are no general limitations, the scale is probably more valuable for chronic tinnitus, since psychological distress in acute patients may be temporary and of lower prognostic value.

## Appendix: the Mini-TQ

The purpose of this questionnaire is to find out whether the noises in your ears/head have had any effect on your mood, habits or attitudes. Please tick the answer that applies to you for each statement.

1. I am aware of the noises from the moment I get up to the moment I sleep
2. Because of the noises I worry that there is something seriously wrong with my body
3. If the noises continue my life will not be worth living
4. I am more irritable with my family and friends because of the noises
5. I worry that the noises might damage my physical health
6. I find it harder to relax because of the noises
7. My noises are often so bad that I cannot ignore them
8. It takes me longer to get to sleep because of the noises
9. I am more liable to feel low because of the noises

10. I often think about whether the noises will ever go away

11. I am a victim of my noises

12. The noises have affected my concentration

(Note: the response alternatives for each item are True, Partly True, and Not True)

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