Tinnitus Reaction Questionnaire: Psychometric Properties of a Measure of Distress Associated With Tinnitus

The development of the Tinnitus Reaction Questionnaire (TRQ), a scale designed to assess the psychological distress associated with tinnitus, is described. Psychometric analyses of the TRQ are examined with a total of 156 subjects in three separate samples. The results indicate very good test-retest reliability (r = .88) and internal consistency (Cronbach’s alpha = .96). Factor analysis yielded four factors that were interpreted as General Distress, Interference, Severity, and Avoidance. Moderate to high correlations were found between the TRQ and clinician ratings (r = .67) and self-report measures of anxiety and depression (r = .58–.87), but a low correlation was found with neuroticism (r = .27). It is concluded that the TRQ provides a useful index of distress related to tinnitus for subject selection and clinical assessment and has potential as a measure of change in coping ability.

KEY WORDS: tinnitus, psychological assessment

Psychological aspects of tinnitus have been the subject of comparatively little systematic study, despite the fact that tinnitus may be associated with considerable psychological distress such as anxiety, depression, irritability, and sleep disturbance. In most cases, it appears that these symptoms may be a result of tinnitus, but it is also possible that the awareness of tinnitus may be greater during environmental stress, or that tinnitus may be exacerbated by stress in some individuals (see Hallam, Rachman, & Hinchcliffe, 1984, for a discussion of these issues). House (1981) reports on the Minnesota Multiphasic Personality Inventory (MMPI) profiles of 132 tinnitus patients. The results indicated that 48 subjects could be categorized as depressive, 54 as presenting with conversion neurosis, and 30 as borderline personalities. On the other hand, Gerber, Nehemiks, Charter, and Jones (1985), found no evidence of abnormal MMPI profiles for tinnitus sufferers as a group, although a small subgroup (13%) had “typical psychosomatic or hysterical profiles” (p. 85). Stephens and Hallam (1985) found elevations on the anxiety and depression scales of the Crown-Crisp Experiential Index (Crown & Crisp, 1979). In general, these results suggest that tinnitus, like other chronic conditions, may be associated with psychological distress, particularly depression and anxiety.

A more detailed investigation of the psychological aspects of tinnitus has been reported by Jakes, Hallam, Chambers, and Hinchcliffe (1985), who found that emotional distress emerged as a separate factor in their factor analysis of tinnitus complaints. They subsequently developed a Tinnitus Effects Questionnaire (Hallam, Jakes, & Hinchcliffe, 1988), which was designed to assess complaints of tinnitus sufferers. This questionnaire is a fairly broad instrument in which several types of items are included, such as symptoms of distress (e.g., “I sometimes get very angry...”)
Table 1. Tinnitus Reaction Questionnaire items and their item-total correlations.

<table>
<thead>
<tr>
<th>Number</th>
<th>Item</th>
<th>Item-total correlation</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My tinnitus has made me unhappy.</td>
<td>.73</td>
<td>1.6</td>
<td>1.3</td>
</tr>
<tr>
<td>2</td>
<td>My tinnitus has made me feel tense.</td>
<td>.72</td>
<td>1.7</td>
<td>1.3</td>
</tr>
<tr>
<td>3</td>
<td>My tinnitus has made me feel irritable.</td>
<td>.69</td>
<td>1.7</td>
<td>1.2</td>
</tr>
<tr>
<td>4</td>
<td>My tinnitus has made me feel angry.</td>
<td>.67</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>5</td>
<td>My tinnitus has led me to cry.</td>
<td>.55</td>
<td>0.3</td>
<td>0.7</td>
</tr>
<tr>
<td>6</td>
<td>My tinnitus has led me to avoid quiet situations.</td>
<td>.44</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>7</td>
<td>My tinnitus has made me feel less interested in going out.</td>
<td>.61</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>8</td>
<td>My tinnitus has made me feel depressed.</td>
<td>.80</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>9</td>
<td>My tinnitus has made me feel annoyed.</td>
<td>.58</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>10</td>
<td>My tinnitus has made me feel confused.</td>
<td>.67</td>
<td>1.1</td>
<td>0.1</td>
</tr>
<tr>
<td>11</td>
<td>My tinnitus has &quot;driven me crazy.&quot;</td>
<td>.76</td>
<td>1.0</td>
<td>1.4</td>
</tr>
<tr>
<td>12</td>
<td>My tinnitus has interfered with my enjoyment of life.</td>
<td>.72</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>13</td>
<td>My tinnitus has made it hard for me to concentrate.</td>
<td>.66</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>14</td>
<td>My tinnitus has made it hard for me to relax.</td>
<td>.71</td>
<td>1.9</td>
<td>1.3</td>
</tr>
<tr>
<td>15</td>
<td>My tinnitus has made me feel distressed.</td>
<td>.81</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>16</td>
<td>My tinnitus has made me feel helpless.</td>
<td>.73</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>17</td>
<td>My tinnitus has made me feel frustrated with things.</td>
<td>.73</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>18</td>
<td>My tinnitus has interfered with my ability to work.</td>
<td>.61</td>
<td>2.0</td>
<td>1.3</td>
</tr>
<tr>
<td>19</td>
<td>My tinnitus has led me to despair.</td>
<td>.78</td>
<td>0.7</td>
<td>1.2</td>
</tr>
<tr>
<td>20</td>
<td>My tinnitus has led me to avoid noisy situations.</td>
<td>.51</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>21</td>
<td>My tinnitus has led me to avoid social situations.</td>
<td>.60</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>22</td>
<td>My tinnitus has made me feel hopeless about the future.</td>
<td>.78</td>
<td>0.9</td>
<td>1.2</td>
</tr>
<tr>
<td>23</td>
<td>My tinnitus has interfered with my sleep.</td>
<td>.51</td>
<td>1.9</td>
<td>1.5</td>
</tr>
<tr>
<td>24</td>
<td>My tinnitus has led me to think about suicide.</td>
<td>.61</td>
<td>0.3</td>
<td>0.9</td>
</tr>
<tr>
<td>25</td>
<td>My tinnitus has made me feel panicky.</td>
<td>.72</td>
<td>0.6</td>
<td>1.0</td>
</tr>
<tr>
<td>26</td>
<td>My tinnitus has made me feel tormented.</td>
<td>.75</td>
<td>0.9</td>
<td>1.3</td>
</tr>
</tbody>
</table>

The results were available from two administrations: a preliminary one obtained by mail, and a subsequent individual assessment in the clinic. Thus, this sample was used for the calculation of test-retest reliability. The mail-back version was used in the primary analyses. For 29 subjects in Sample 3, ratings made by a psychologist of each patient's coping ability were also available. The rating, made on a 5-point scale (scored 0-4), was based on information obtained during a 1-h initial interview. The psychologist was blind to the patient's score on the TRQ when making the rating.

Statistical Procedures

The TRQ was examined for a number of psychometric properties, including internal consistency (Cronbach alpha, item-total correlations), test-retest reliability, and construct validity (correlations with measures of psychopathology). A factor analysis with orthogonal rotation was also conducted to examine the factorial structure of the scale. Separate results are reported for each sample when relevant. Subjects with hearing loss were analyzed separately from those without hearing loss on a number of analyses in order to ensure that any findings could be attributed to the tinnitus rather than to hearing loss per se. A t test was conducted to examine differences between the hearing-loss and the non-hearing-loss samples on the TRQ.

Results and Discussion

Means and Standard Deviations

For Sample 1, the mean TRQ was 28.89 (SD = 20.62); for Sample 2, the mean was 31.78 (SD = 20.57), and for Sample 3, the mean was 36.12 (SD = 26.01). The overall mean for the collective sample on which the principal analyses to be reported in this paper were conducted (N = 156) was 32.49 (SD = 2.71). Thus, despite the differences in recruitment locations and procedures, there was good consistency among the three samples. There was no difference between the hearing-loss (M = 33.07) and non-hearing-loss (M = 32.03) samples. Although Sample 3 had a higher mean TRQ than the other two samples, this difference was not statistically significant. On the principal tests in common between Samples 2 and 3, means and standard deviations for Sample 2 were as follows: BDI (M = 11.57; SD = 7.44), State Anxiety (M = 38.07; SD = 14.01), and Trait Anxiety (M = 40.23; SD = 12.75). For Sample 3, they were as follows: BDI (M = 9.35; SD = 8.71), State Anxiety (M = 35.85; SD = 10.91), and Trait Anxiety (M = 38.73; SD = 12.18). There were no differences between subjects with or without hearing loss on any of these tests. Means on all three tests are about one standard deviation above the population mean. The cutoff for presence of depression on the BDI is a score of 10; thus the sample is best regarded as falling in the upper end of the nonclinical depression range. On the State and Trait Anxiety scales, the mean score would indicate mild anxiety.

Frequency Distributions

An inspection was made of the percentage of subjects who responded in each of the five categories for individual items. The items with very low endorsement rates (response of not at all for over 50% of the sample) were Item 4 (51.9%), Item 5 (80.1%), Item 6 (51.9%), Item 11 (52.6%), Item 19 (67.3%), Item 22 (53.8%), Item 24 (83.3%), Item 25 (66.0%), and Item...
when I think about having the noises”), self-statements and thoughts (e.g., “I am a victim of my noise”), and descriptions of the tinnitus itself (e.g., “Most of the time the noises are fairly quiet”). Thus, although the Tinnitus Effects Questionnaire is likely to be a very useful device in the psychological assessment of tinnitus patients, it is a fairly broad instrument that measures a number of potentially different constructs. Kuk, Tyler, Russell, & Jordan (1988) have recently developed an instrument called the Tinnitus Handicap Questionnaire that is also designed to measure the effects of tinnitus. Although there will inevitably be some overlap between these measures, there is a need for a measure that is designed specifically to measure psychological distress—such as tension, depression, and anger—that may be related to tinnitus.

The purpose of the present paper is to describe the development and psychometric properties of the Tinnitus Reaction Questionnaire (TRQ), which was designed to measure psychological distress that is related to tinnitus. The scale arose from a need for a reliable assessment tool to evaluate the effects of psychological interventions on the ability of people to cope with tinnitus (Ireland, Wilson, Tonkin, & Platt-Hepworth, 1985). Although it was developed independently of the other two scales mentioned above, there is some overlap of item content. In view of the recent emergence of interest in the psychological management of tinnitus (Borton, Moore, & Clark, 1981; Hallam & Jakes, 1985; Haralambous, Wilson, Platt-Hepworth, Tonkin, Hensley, & Kavanagh, 1987; House, 1978; Jakes, Hallam, Rachman, & Hinchcliffe, 1986; Kirsch, Blanchard, & Parnes, 1987; Lindberg, Scott, Melin, & Lyttkens, 1988; Scott, Lindberg, Lyttkens, & Melin, 1985; Wilson, Haralambous, Ireland, Platt-Hepworth, & Tonkin, 1987), it was thought that such a scale may provide a useful assessment device in clinical practice and in further research on psychological aspects of tinnitus. It may be useful as a screening instrument in the selection of distressed patients, as a means to distinguish tinnitus sufferers who cope with the problem from those who do not cope well, and as a measure of psychological distress before and after treatment.

In this paper, psychometric data on the TRQ are reported, including stability, internal consistency, item-total correlations, item-response frequencies, factorial structure, and construct validity (correlations with depression, anxiety, neuroticism, and independent clinician ratings of psychological distress).

Method

Subjects

Three samples were obtained from somewhat different sources: Sample 1 consisted of subjects referred by the audiology department of a large general hospital who had indicated willingness to participate in a study of the effects of electromyographic (EMG) biofeedback therapy and relaxation training \( n = 37 \); Sample 2 consisted of referrals for assessment to an audiology department of a veterans hospital \( n = 69 \); and Sample 3 consisted of 50 subjects, the majority of whom had responded to a radio program on tinnitus and had volunteered to participate in a psychological treatment program designed to help them cope with tinnitus. Thus, the full sample consisted of 156 subjects from various referral sources.

There were 105 men and 51 women in the sample. The mean age was 58.6 years (range = 24–80 years). The mean duration of tinnitus was 9.4 years (range = 3 months to 35 years). Bilateral tinnitus was reported by 105 subjects, with the remainder reporting unilateral tinnitus (37 in the left ear only and 14 in the right ear only). Hearing loss accompanied tinnitus in 114 subjects. In self-ratings of general severity of the tinnitus made on a 5-point scale with respect to an unspecified time period, 5 subjects described their tinnitus as mild, 125 as moderate, and 26 as severe.

Item Development

Items for the TRQ were constructed primarily using symptom categories described by Tyler and Baker (1983). Several items were added on the basis of experience obtained during interviews with tinnitus patients in a study on the efficacy of relaxation training in the management of tinnitus (Ireland et al., 1985). The 26 items that constituted the scale are presented in Table 1. Subjects were given the following instructions:

The questionnaire is designed to find out what sort of effects tinnitus has on your lifestyle, general well-being, etc. Some of the effects listed below may well apply to you, others may not. Please answer each question as you think it applied to you over the past week. Please ensure that you answer each question by circling the number that best reflects how your tinnitus has affected you over the past week.

Ratings for each item were made on a 5-point scale (scored 0–4), with the following labels: not at all, a little of the time, some of the time, a good deal of the time, and almost all of the time. It should be noted that there was no option for does not apply, although the not at all category would generally imply lack of applicability. The scoring procedure for the TRQ involves the simple addition of the number circled by the respondent for each of the 26 questions to obtain a total score with a potential range from 0 to 104. All items are scored in the same direction because they are all negative descriptors. Thus, a high score represents greater distress.

Assessment Procedure

In Sample 1, apart from the TRQ, subjects completed the Bendig-Taylor version of the Taylor Manifest Anxiety Scale (MAS) (Bendig, 1956) and the Neuroticism subscale of the Eysenck Personality Questionnaire (EPQ-N) (Eysenck & Eysenck, 1975). In Samples 2 and 3, subjects completed the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the Spielberger, State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, & Lushene, 1970). Subjects in Samples 1 and 2 were administered the TRQ and other scales in individual sessions with a psychologist. For a subset of 43 subjects from Sample 3, responses
The items with high endorsement rates (at least 20% responding at Level 3 or 4) were 1, 2, 3, 7, 8, 9, 12, 13, 14, 18, 20, 21, and 23. Thus, it appears that tinnitus patients in this sample judged that their tinnitus made them feel unhappy, tense, irritable, less interested in going out, depressed, and annoyed; interfered with sleep, enjoyment of life, ability to work, concentration, and relaxation; and led them to avoid noisy situations and social situations.

The frequency distribution for the full scale was inspected. Points on the scale that correspond to the 25th, 50th, 75th, 90th, and 95th percentiles were total scores of 15, 27, 47, 60, and 72.

### Reliability

The internal consistency of the TRQ was examined by Cronbach’s coefficient alpha, and by computing item-total correlations. The Cronbach alpha was found to be .96, indicating very high internal consistency. The Cronbach alpha was .95 and .97 for the hearing-loss and non-hearing-loss samples. Item-total correlations (corrected for exclusion of the item to be correlated) are presented in Table 1. These correlations varied from .44 (Item 6, “My tinnitus has led me to avoid quiet situations”) to .81 (Item 15, “My tinnitus has made me feel distressed”). Over half the correlations were in the range of .7 to .8. Given the relatively small number of items with low item-total correlations, a decision was made to retain all items in order to maintain adequate content validity. The test-retest correlation was .88 (SD = 43; retest period 3 days to 3 weeks, with the majority of subjects falling into the longer time period). Thus, it appears that the TRQ is a reliable instrument in that it possesses very good internal consistency and stability across time.

### Factor Analysis

A principal components factor analysis with orthogonal rotation was conducted on the full sample in order to investigate the factorial structure of the scale. A four-factor solution resulted from the imposition of the eigen-value-greater-than-one criterion, accounting for 66.4% of the total variance. Items with factor loadings above .4 are reported in Table 2.

Inspection of the pattern of loadings reveals that numerous items load heavily on more than one factor. Nevertheless, a factorial structure has emerged that can be reasonably well interpreted. Factor 1, which accounted for 50% of the variance, appears to consist of a set of items reflecting general distress (e.g., feeling angry, annoyed, helpless, despairing). Factor 2 (7.9%) involves items relating to interference with work and leisure activities. Factor 3 (4.6%) seems to consist of some items that overlap with Factor 2, plus a set of more severe signs of distress (crying, sleep difficulties, feeling that “tinnitus has driven me crazy”). Factor 4 (3.9%) consists of items that relate to avoidance of activities. Thus the factors might be termed General Distress, Interference, Severity, and Avoidance. Rotation to a two-factor solution was also undertaken given the small amount of variance accounted for by the four-factor solution. Most items loaded on Factor 1, but six items had low loading on Factor 1 and high loadings on Factor 2. These items were 7 (“My tinnitus has made me feel less interested in going out”), 12 (“My tinnitus has interfered with my enjoyment of life”), 13 (“My tinnitus has made it hard for me to concentrate”), 14 (“My tinnitus has made it hard for me to relax”), 20 (“My tinnitus has made me to avoid noisy situations”), and 21 (“My tinnitus has made me to avoid social situations”). Factor 2 clearly seems to represent an activity avoidance set of items. In general, the full scale appears to be rather homogeneous and will be sufficient for most purposes. The factorial structure suggests that scores on the separate groupings of items represented by the two-factor solution might be useful in describing some individual differences in patterns of response to tinnitus.

### Validity

Pearson product-moment correlations between the TRQ and various other assessment devices were examined. In Sample 1, a moderate correlation was found with the MAS (.66), but a low correlation was found with the EPQ-N (.27). In Sample 2 the TRQ was found to have moderate correlations with the BDI (.63), State Anxiety (.60), and Trait Anxiety (.58). In Sample 3, higher correlations were found with the BDI (.87), State Anxiety (.74), and Trait Anxiety (.71). Similar correlations were found for the hearing-loss and non-hearing-loss subsamples. In Sample 3, the correlation between an independent rater and the TRQ was .77 (for the mail-back version) and .67 (for the version administered at the assessment session). This slight discrepancy is most probably due to sampling error. Overall, the TRQ has moderate to high correlations with other indices of symptomatology such as...
depression and anxiety, but low correlations with neuroticism. Scores on the TRQ are consistent with those obtained from independent ratings of coping ability made by a psychologist.

Conclusion

The TRQ appears to have good psychometric properties, including a high degree of reliability as judged from evidence of its internal consistency and test-retest stability. The scale appears to be a valid device for the assessment of tinnitus-related psychological distress as revealed by the generally moderate to high correlations with measures of depression and anxiety. The moderate correlation with clinical ratings of coping ability is also encouraging. The TRQ may be a useful assessment device in the assessment of tinnitus patients and may provide a useful assessment device in clinical practice as a measure of psychological distress before and after treatment. It may also be useful as an instrument for the selection of distressed samples for future studies on the effects of psychological interventions as a means of coping with tinnitus.

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References


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