Cognitive self-consciousness – a predictor of increased anxiety following first-time diagnosis of age-related hearing loss

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This study tested prospective models of anxiety and depression following a first time diagnosis of age-related hearing loss, also known as presbycusis, which is one of the most common and disabling health problems in the world. The predictor of interest was cognitive self-consciousness (CSC; Cartwright-Hatton & Wells (1997). Beliefs about worry and intrusions: The Meta-Cognitions Questionnaire and its correlates. Journal of Anxiety Disorders, 11, 276–279.), or the tendency to closely attend to and monitor the content and process of one’s own thoughts. Sixty-seven older adults were assessed at a university-based audiology clinic at three timepoints: at the time of diagnosis (T1), six (T2), and 12 months later (T3). Measures of anxiety, depression, and CSC were collected. It was hypothesized that a subset of older adults with hearing loss would report increased CSC at T2. Additionally, the interaction of CSC and anxiety and depression symptoms at T2 was expected to predict significant variance in measures of anxiety and depression at T3, even after baseline levels of distress were controlled in regression models. Finally, it was hypothesized that consistent use of a hearing aid by T3 would act as a palliative to reduce distress in response to hearing loss at T3. Results were partially consistent with hypotheses and point to a new direction in preventing anxiety and depression following a first time diagnosis of presbycusis.

Keywords: presbycusis; sensorineural hearing loss; successful aging; adaptation to sensory loss; physical and mental health

Introduction

Age-related hearing loss (also known as presbycusis) is the most common type of hearing problem in older adults (Arnst, 1985; Heine & Browning, 2002) and one of the most widespread disabilities in the world (Tambs, 2004; Mathers, Smith, & Concha, 2000). Prevalence rate estimates suggest that 34 million older adults in America have trouble hearing normal, conversational speech, indicative of a serious and pervasive public health problem (Helzner et al., 2005; Pleis & Lethbridge-Cejku, 2006; Sloan & Dancer, 2001).

Psychological adaptation to hearing loss varies widely across older individuals; however, the majority of cross-sectional and prospective studies report elevated rates of psychological distress (e.g., anxiety, depression) in presbycusic adults (e.g., Heine & Browning, 2002; Kramer, Kapteyn, Kuik, & Deeg, 2008; Tambs, 2004), with some showing a clear linear relation of severity of hearing impairment and psychological distress (Ventry & Weinstein, 1982). Although it is common for an older adult to experience anxiety or depression in the context of medical conditions (Zarit & Zarit, 2007), several factors distinguish distress following hearing loss. First, older adults with compromised hearing are often concerned that missing portions of conversations, problems with communication, and decreased interaction with family and friends will cause them to appear ‘stupid’ or ‘crazy’ (Bess, Lichtenstein, Logan, Burger, & Nelson, 1989; Dalton et al., 2003). The focus of this anxiety is often more pertinent to negative evaluation by others than to the problems of hearing loss per se (Jones, Victor, & Vetter, 1984), and can eventually lead to avoidance of social activities and decreased confidence in social situations (Heine & Browning, 2002).

Surprisingly, Kramer et al. (2008) found lower self-efficacy, perceived social support, and mastery among older adults with presbycusis than those with acute conditions such as cancer, osteoarthritis, rheumatoid arthritis, diabetes mellitus, and several other chronic diseases.

Investigations focusing specifically on post-presbycusis anxiety have yielded mixed results. Thomas (1984) found that older adults with mild-to-moderate hearing loss were four times more likely to experience anxiety than those with normal hearing. Over time, those with hearing or vision loss may be more likely to experience increased anxiety than those without (DeBeurs, Beekman, Deeg, Van Dyck, & Van Tilburg, 2000), and surprisingly, more likely than those with anxiety pre-dating the diagnosis of hearing loss, whose levels of distress do not necessarily change following onset of presbycusis. Falconer (1989) estimated that 20–25%,
and Jones et al. (1984) estimated that 55% of presbycusic older adults respond to hearing loss with increased anxiety. Other investigations of anxiety following the diagnosis of hearing loss report mediated effects (e.g., Norris & Cunningham, 1981) or no association at all (Sloan & Dancer, 2001; Tambs, 2004).

Cross-sectional and prospective studies also indicate a positive relation between presbycusis and depression (Capella-McDonnall, 2005; Kramer et al., 2008; Seniors Research Group, 1999). Some have even suggested a common pathophysiologic of hearing loss and depression that involves the auditory nerve (Kalayam, Alexopoulos, Merrell, Young, & Shindledecker, 1991). Using an experimental manipulation that reproduced problematic situations for those with compromised hearing, Andersson, Melin, Lindberg, and Scott (1996) found the emergence of depressive symptoms only in specific situations, and showed that those adults with presbycusis who reported symptoms of depression also had more difficulty engaging in specific coping behaviors than those who did not. However, other studies find no association of hearing loss with depressive symptoms (Chou, 2008) and some a mediating effect of social isolation or functional disability (Arlinger, 2003; Heine & Browning, 2002, 2004).

In summary, although it is certainly not a positive experience to be diagnosed with presbycusis, the diagnosis is not in and of itself a reliable risk factor for increased anxiety or depression (Tambs, 2004), and there is no obvious link between hearing loss and psychopathology (Andersson & Hagnebo, 2003). Thus, the further identification of risk factors for distress related to presbycusis is needed.

The tendency to overattend to and closely monitor one’s own thoughts and internal events (e.g., mental images) is a known risk factor for anxiety and depression across a range of situations (e.g., Ingram, 1990; Wells, 1991). Excessive self-focus intensifies emotional states, reduces coping, and impairs task performance (Mansell, Clark, & Ehlers, 2003; Rapee & Heimberg, 1997). Given that presbycusis constrains an individual’s awareness of and orientation toward external cues (Naramura, Nakanishi, Tataro, Ishiyama, & Shiraishi, 1999), we posit that a subset of adults with compromised hearing might show increased attention to the content and process of thoughts and other internal events (e.g., mental images), a phenomenon known as cognitive self-consciousness (CSC; Cartwright-Hatton & Wells, 1997).

Cognitive self-consciousness and related constructs are implicated in general models of psychological distress. For instance, the Self Regulatory Executive Function Model (S-REF; Wells & Mathews, 1996), a model of distress etiology, posits that emotional disorders result from heightened self-focused attention, reduced cognitive efficiency, attentional bias, and activation of self-beliefs and appraisal. Resources available for processing corrective material are reduced or unavailable, thus precluding the use of viable emotion regulation strategies based on focusing and shifting attention. Similarly, Clark and Wells’ (1995) cognitive model of social phobia asserts that individuals with social anxiety shift attention off of external stimuli and instead deploy resources toward the detailed monitoring and observation of themselves when in evaluative social situations. This shift enhances awareness of anxious responses (e.g., fearful thoughts, blushing) and subsequently interferes with the accurate processing of relevant and corrective social cues. An additional literature implicating self-focused attention and mood disruption involves the concept of rumination, which can be construed as a variant of CSC that is specific to dysphoria. Rumination is the tendency to think repetitively and passively about symptoms, causes, and consequences of negative emotions (Nolen-Hoeksema, 1991), and has been studied extensively as a contributing and etiological factor in depression.

The consideration of CSC as a predictor of presbycusis-related distress is a novel approach to enhancing knowledge of the specific cognitive processes that contribute to negative emotional responses to hearing loss. Attention directed inward might lead to the discovery or enhancement of negative material (e.g., negative thoughts about hearing abilities or the self; negative memories or mental images) that would otherwise go unnoticed. Thus, CSC amplifies negative moods (Wells, 1991) and at the metacognitive level could foster overimportance of thought beliefs (Janeck, Calamari, Riemann, & Heffelfinger, 2003; Marker, Calamari, Woodard, & Riemann, 2006). Given the assumption that humans have a limited pool of attentional resources (e.g., Kahnemann, 1973), CSC might also demand resources that are necessary for maintaining concurrent external focus or lead to the subversion of external objective cues by subjective internal events. Those who are already challenged in monitoring the external world, such as presbycusic older adults, might then be at particular disadvantage if also prone to CSC. For example, CSC could interfere with processing corrective information through lip reading or monitoring the nonverbal cues of others (Arlinger, 2003; Garstecki & Erler, 1998; Heine & Browning, 2002, 2004).

The current investigation tested a prospective model of distress related to a first-time diagnosis of presbycusis. In addition to the longitudinal design, we aimed to track changes in CSC and mood by assessing participants at three different points: at the time of diagnosis of presbycusis (T1), 6 (T2), and 12 (T3) months thereafter. An objective standardized hearing test and both clinician-rated and self-report measures of anxiety and depression were used. It was hypothesized that a subset of older adults with hearing loss would report increased CSC (defined as a score increase of half of one standard deviation of T1 scores) in the 6-month period following diagnosis. Additionally, the interaction of CSC and anxiety and depression symptoms at T2 was expected to predict significant variance in measures of anxiety and depression at T3 (1 year post-diagnosis).
even after baseline levels of distress were controlled in regression models. Finally, it was hypothesized that consistent use of a hearing aid (i.e., ‘hearing aid used more than half the time’) by T3 would act as a palliative to reduce distress in response to presbycusis (Davis, 2003; Garstecki & Erler, 1998).

Method

Participants

A sample of 76 adults aged 65 or above with newly diagnosed presbycusis was recruited from an urban community in upstate New York through media ads and referrals from an audiology clinic. The sample was 49% female with an average age of 74.69 (SD = 5.32; range = 65–88), generally in good health (mean number of major health problems reported = 1.29, SD = 1.30; minor health problems reported = 1.79, SD = 1.47). Most were married (70%), retired (80%), Caucasian (97%), and had graduated high school (80%). The sample was mobile and high functioning, with a mean score of 27.65 (SD = 1.93) on the Mini Mental Status Exam (Folstein, Folstein, & McHugh, 1975) and 79% reporting that they are engaged in pleasant activities (e.g., walking, reading, gardening) on a weekly basis.

Measures

Anxiety measures consisted of the Hamilton Scale for Anxiety (Hamilton, 1960) and the Fears of Negative Evaluation Scale (FNE; Watson & Friend, 1969), the latter of which was chosen because its items tap socially-oriented fears related to hearing loss. Measures of depression were the Hamilton Scale for Depression (Hamilton, 1960) and the Beck Depression Inventory (Beck & Steer 1987). All measures demonstrated good to excellent internal consistency in the current sample, with α coefficients ranging from 0.87 to 0.95.

The expanded Cognitive Self-Consciousness Scale (CSCE; Janeck et al., 2003) of the Metacognitions Questionnaire (Cartwright-Hatton & Wells, 1997) was given as the measure of the predictor of interest. The scale has 14 items (e.g., ‘I become preoccupied with my thoughts’, ‘I pay close attention to the way my mind works’, I monitor my thoughts’) rated on a four-point Likert-type scale. The CSCE shows good psychometric properties in samples of adults (Marker et al., 2006). Internal consistency in the current sample of older adults was 0.91.

The hearing evaluation was conducted by two licensed audiologists and included standard indices of hearing level and hearing loss, and established whether hearing threshold levels indicated a sensorineural hearing loss as determined by the following criteria: at 250–500 Hz, 0–30 dB hearing loss; at 1000–2000 Hz, >25 dB hearing loss; and at 3000–8000 Hz, >40 dB hearing loss.

Assessors were Masters’ or higher level graduate students enrolled in a Ph.D. program in clinical psychology. All were required to train to reliability on the Hamilton scales by attending a didactic course for one semester, and matching within two points of the total score on three assessments as compared to a gold standard rater (J.M.).

Procedure

All participants completed the standard hearing test in a university-based audiology clinic. The test consisted of a comprehensive case history, otoscopy, pure tone air conduction thresholds, pure tone bone conduction thresholds, speech reception thresholds, speech discrimination scores, tympanometric measures, and acoustic reflex threshold patterns.

After the exam, the clinician conferred with the participant about the results of the exam, the use of hearing aids, and answered all participants’ questions. Every participant was given the opportunity to try hearing aids at a greatly reduced cost, however no attempts were made to persuade or dissuade the participants from doing so.

Next, participants were invited to take part in the research study. Those who gave written consent completed the clinician-rated measures and self-report scales, and agreed to return to the clinic at the designated time points for subsequent assessment and monitoring of hearing loss and mood by the audiologists and study staff. The latter two visits were highly similar to the initial visit; however an attenuated hearing test was administered. As in the previous visit, each participant was offered the opportunity to try hearing aids at a greatly reduced cost, with no attempts made by the audiologist to persuade or dissuade participants from doing so. At T2 and T3, participants who had accepted hearing aids were asked by the audiologist whether or not they were using the device consistently (i.e., more than half the time), and this information was recorded in medical charts. Participants were compensated $25.00 after each assessment.

Results

Nine individuals (12%) failed to complete participation due to death (n = 2), extended travel which precluded adherence to the assessment schedule (n = 2), lack of interest (n = 2) and unknown reasons (n = 3); four after the T1 and five after the T2 assessments, thus completion rate for the three assessments was 84%. There were no significant differences found on demographic (age, marital status, education, sex, number of reported health problems) or clinical variables (measures of anxiety, depression) between those who did and did not complete all three assessments. The full sample of 67 participants was comprised of those who completed the T1, T2, and T3 assessments.

Data were checked for outlying and missing values, of which there were none. Two sets of zero-order bivariate correlations were examined to assess the
degree of redundancy among hypothesized predictors. Correlations of each measure across the three assessment timepoints were mostly moderate, as shown in Table 1. Correlations across measures at T1 were also mostly moderate (Table 2), but indicated potential multicollinearity between the Hamilton scales, thus the HamD was omitted from subsequent analyses.

Hypothesis 1 predicted that a subset of participants would show increased CSCE scores from T1 to T2, ostensibly caused by hearing loss and a subsequent shift in attentional focus from external to internal cues. Sixty-five percent (n = 35) of participants showed no appreciable change on the CSCE from T1 to T2, 27% (n = 18) showed an increase of at least one half standard deviation of T1 CSCE scores (SD = 9.72), and 8% (n = 4) showed a decrease of at least one half standard deviation of T1 CSCE scores. Demographic (age, sex, marital and occupational status, number of other health problems) and clinical features (scores on psychiatric measures) of the group whose scores increased or did not change are shown in Table 3 and 4 and Figures 1–3.

Hierarchical regression analyses
Hierarchical regression models were tested for each of three outcome measures, two tapping symptoms of anxiety (HamA, FNE), and one tapping symptoms of depression (BDI). On the first step, T1 and T2 scores on measures of anxiety or depression and T1 CSCE scores were entered. On the second step, T2 CSCE scores were entered to account for the additive effects of increased CSC. On the third step, the interaction term of T2 mood and T2 CSCE was entered. And on the last step, the use of a hearing aid by T3 was entered (‘0’ = used hearing aid half the time or less; ‘1’ = used hearing aid more than half the time).

Cognitive Self-Consciousness Scale scores at each timepoint, as well as the interaction term, accounted for unique variance in each of the models of anxiety symptoms (T3 HamA, FNE). The full model of HamA at T3 was significant, \( F(6, 61) = 5.735, p = 0.001 \), adj. \( r^2 = 0.55 \). Significant individual predictors were T1 CSCE \((\beta = 4.456, p < 0.01)\), T2 CSCE \((\beta = 2.933, p < 0.01)\), and the interaction term \((\beta = 3.931, p < 0.01)\). The full model of FNE at T3 was also significant, \( F(6, 61) = 9.777, p = 0.001 \), adj. \( r^2 = 0.71 \), and individual predictors were T2 FNE \((\beta = 2.203, p < 0.05)\), T1 CSCE \((\beta = 3.085, p < 0.005)\), T2 CSCE \((\beta = 4.423, p < 0.001)\), and the interaction term \((\beta = 2.474, p < 0.05)\). The full model of BDI at T3 was significant, \( F(6, 61) = 8.111, p < 0.001 \), adj. \( r^2 = 0.61 \). Significant individual predictors were T2 BDI \((\beta = 2.617, p < 0.05)\) and T2 CSCE \((\beta = 4.723, p < 0.001)\), however the interaction term failed to predict significant variance in the model.

Because the consistent use of a hearing aid by T3 was not significantly related to distress at T3 in any of the models, alternative models were also tested in which perceived hearing aid effectiveness at T3, rather than use per se, was entered on the fourth step (‘1’ = those who reported that their hearing aid was effective, ‘0’ = all others). Regardless, there was no significant variance explained by either measure pertaining to hearing aids. Details of regression models can be found in Tables 3 and 4 and Figures 1–3.

Discussion
The current investigation tested a novel predictor (CSC) of distress following a first-time diagnosis of presbycusis. It was expected that a subset of participants would show a score increase of at least one half standard deviation on the CSCE from T1 to T2, which

<table>
<thead>
<tr>
<th>HamA</th>
<th>FNE</th>
<th>HamD</th>
<th>BDI</th>
<th>CSCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>0.387</td>
<td>0.790 **</td>
<td>0.515**</td>
<td>0.121</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>0.240</td>
<td>0.222</td>
<td>0.343</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.526**</td>
<td>0.109</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.298</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>


**p < 0.001.

Table 1. Scores on measures at T1 (the time of diagnosis of presbycusis), T2 (6 months later), and T3 (12 months later) with Pearson’s correlation coefficients.

<table>
<thead>
<tr>
<th></th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>r (T1–2)</th>
<th>r (T2–3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HamA</td>
<td>3.49 (4.90)</td>
<td>3.61 (4.86)</td>
<td>4.88 (3.31)</td>
<td>0.66***</td>
<td>0.46***</td>
</tr>
<tr>
<td>FNE</td>
<td>5.00 (7.34)</td>
<td>6.00 (7.73)</td>
<td>7.34 (6.31)</td>
<td>0.65***</td>
<td>0.59***</td>
</tr>
<tr>
<td>HamD</td>
<td>2.24 (1.90)</td>
<td>2.39 (4.02)</td>
<td>4.88 (4.94)</td>
<td>0.60***</td>
<td>0.53***</td>
</tr>
<tr>
<td>BDI</td>
<td>7.19 (5.15)</td>
<td>7.24 (4.44)</td>
<td>8.11 (5.70)</td>
<td>0.57***</td>
<td>0.64***</td>
</tr>
<tr>
<td>CSCE</td>
<td>30.23 (9.72)</td>
<td>35.71 (9.76)</td>
<td>–</td>
<td>0.52**</td>
<td>–</td>
</tr>
</tbody>
</table>


**p < 0.01; ***p < 0.005.
Table 3. Summary of regression models predicting anxiety scores (n = 67).

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>Δ Adj. R²</th>
<th>F</th>
<th>Δ Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ham-A, T3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ham-A T1</td>
<td>0.087</td>
<td>0.344</td>
<td>0.037</td>
<td>0.241</td>
<td>4.139**</td>
<td></td>
</tr>
<tr>
<td>Ham-A T2</td>
<td>1.070</td>
<td>0.396</td>
<td>0.437</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE T1a</td>
<td>0.689</td>
<td>0.143</td>
<td>0.754</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE T2a</td>
<td>0.495</td>
<td>0.131</td>
<td>0.520</td>
<td>0.210</td>
<td>2.395*</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE*HamA T2a</td>
<td>0.610</td>
<td>0.154</td>
<td>0.661</td>
<td>0.146</td>
<td>2.043*</td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hearing aid</td>
<td>-2.123</td>
<td>-2.398</td>
<td>-0.122</td>
<td>-0.015</td>
<td>0.082</td>
<td></td>
</tr>
<tr>
<td>Alt. model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>-3.367</td>
<td>-2.561</td>
<td>-0.074</td>
<td>-0.007</td>
<td>0.463</td>
<td></td>
</tr>
</tbody>
</table>

FNE, T3
Step 1
FNE T1 0.143 0.237 0.128 0.491 9.730**
FNE T2a 1.195 0.543 1.070 – –
CSCE T1a 0.424 0.514 0.675 – –
Step 2
CSCE T2a 0.726 0.164 0.830 0.125 2.182*
Step 3
CSCE*FNE T2a 0.055 0.020 1.153 0.180 2.233*
Step 4
Hearing aid | -1.595 | -2.403 | -0.079 | -0.006 | 0.612 |           |
Alt. model
Effectiveness | -2.736 | -2.050 | -0.158 | -0.016 | 0.837 |           |

aDenotes significant individual predictor.
*p < 0.05; **p < 0.01.

Table 4. Summary of regression models predicting depression scores (n = 67).

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>Δ Adj. R²</th>
<th>F</th>
<th>Δ Adj. R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI, T3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI T1</td>
<td>-0.118</td>
<td>0.160</td>
<td>-0.110</td>
<td>0.559</td>
<td>13.195***</td>
<td></td>
</tr>
<tr>
<td>BDI T2a</td>
<td>1.373</td>
<td>0.573</td>
<td>1.049</td>
<td>– –</td>
<td>– –</td>
<td></td>
</tr>
<tr>
<td>CSCE T1</td>
<td>0.040</td>
<td>0.078</td>
<td>0.065</td>
<td>– –</td>
<td>– –</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE T2a</td>
<td>0.261</td>
<td>0.145</td>
<td>0.421</td>
<td>0.041</td>
<td>3.816*</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSCE*BDI T2</td>
<td>0.013</td>
<td>0.015</td>
<td>-0.383</td>
<td>0.020</td>
<td>0.985</td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hearing aid</td>
<td>-1.433</td>
<td>-1.467</td>
<td>-0.109</td>
<td>-0.014</td>
<td>0.799</td>
<td></td>
</tr>
<tr>
<td>Alt. model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effectiveness</td>
<td>-0.758</td>
<td>-0.554</td>
<td>-0.059</td>
<td>-0.002</td>
<td>0.055</td>
<td></td>
</tr>
</tbody>
</table>

aDenotes significant individual predictor.
*p < 0.05; **p < 0.01.

Figure 1. Standardized regression plot, T3 HamA scores by interaction term, T2 CSCE x HamA.
was an arbitrary criterion. Indeed, 27% of the sample showed the predicted increase. In two previous studies of CSC and obsessive compulsive disorder (OCD), mean scores of 44.56 and 48.60 were found on the CSCE among younger OCD patients, 30.06 and 41.80 among adults with other anxiety disorders, and 30.50 among nonanxious controls (Goldman et al., 2008; Janeck et al., 2003). In each study, the authors concluded that CSC interfered with nonconscious processing and procedural learning. Thus, the present T2 mean score of 39.60 among those whose scores increased from T1 to T2 is likely to be clinically meaningful, possibly leading to problems with monitoring and learning from the external environment, although these specific effects were not tested here. Future investigations should include a monitoring or vigilance task to assess whether or not CSC indeed poses an obstacle to the processing of external cues.

As predicted, the interaction term of CSCE and each of the anxiety measures at T2 accounted for significant variance in anxiety at T3, both on a general clinician-rated measure of anxiety (HamA; Hamilton, 1959) as well as a self-report measure of social fears (FNE; Watson & Friend, 1969). This is consistent with prior findings that those with a propensity toward CSC are at risk for amplified anxious responding when faced with a stressor (Wells, 1991) such as sensory decline. Contrary to predictions, the interaction term did not predict depression at T3, suggesting that CSC may not amplify negative thoughts specific to dysphoria, such as thoughts pertaining to guilt or worthlessness. There may be other more reliable and robust predictors of depression following onset of presbycusis, such as loneliness, social isolation, quality of life, or functional limitation (Arlinger, 2003; Hawthorne, 2008; Seniors Research Group, 1999).

One question that remains is the chronic versus transient nature of post-presbycusis distress. An early review by Jakes (1988) concluded that mental health problems in response to hearing loss are most often transient, and easily mitigated through hearing rehabilitation. One important and surprising finding of the current investigation is that use of a hearing aid by T3 did not mitigate the change in mood at T3 experienced by those with increased CSC and anxiety at T2. This is consistent with the finding that hearing rehabilitation...
must extend beyond amplification alone (Heine & Browning, 2002). The present results are suggestive of an intractable attentional shift that is difficult to correct once it occurs, leading to distress regardless of the benefits afforded by hearing aids. Similar findings were reported by the Council on Aging; 22% of a large sample of presbycusic adults reported depressive symptoms even after accepting a hearing aid (Senior Research Group, 1999). If use of a hearing aid more than half the time fails to repair mood problems despite being effective in amplification, then perhaps CSC and other psychological phenomena are the driving forces behind distress related to presbycusis in a subset of adults with compromised hearing.

The current model has implications for prevention of anxiety and depression following presbycusis. Interventions could target attentional focus and CSC immediately following the diagnosis of presbycusis to prevent subsequent psychological distress. Mindfulness (Rejeski, 2008) and other exercises which train participants to focus attention on external cues might be particularly effective for mitigating CSC in older adults with hearing loss, which would be a strategy for preventing anxiety and depression. Such an intervention was developed by Wells and colleagues, and has been used successfully with individuals with panic disorder (Wells, 1990; Wells, White, & Carter, 1999), major depression (Papageorgiou & Wells, 1998), social phobia (Wells, White, & Carter, 1999), and hypochondriasis (Papageorgiou & Wells, 2000) in single-subject investigations striving to enhance external focus. Internet delivered CBT is efficacious for treating frustration and annoyance related to tinnitus (Andersson, Stromgren, Strom, & Lyttkens, 2002) and might also be effective for mood maintenance in presbycusic samples. Additionally, interventions for social phobia such as repeated exposure to social situations are also likely to be helpful, given the similarity of social anxiety to distress in response to presbycusis.

Limitations include a relatively small, Caucasian, high-functioning sample. Although media ads were used for recruiting, the majority of the sample was comprised of those who were already attending an audiology clinic, which could have biased results in several ways. For instance, perhaps those who obtain medical care for hearing problems are more likely to show increased CSC or to report anxiety or depression than those who do not. There are believed to be racial differences in risk factors for presbycusis, with Caucasians outnumbering African Americans despite the higher prevalence of established risk factors in the latter group. Emotional response to presbycusis is also believed to vary by ethnicity and race (Helzner et al., 2005). Thus, the study of members of minority groups may be an important future direction. The current sample did not include many individuals who became clinically distressed following the diagnosis of presbycusis, with 67 (FNE) to 81% (BDI) of scores falling in the ‘mild to moderate’ range on outcome measures at T3. Therefore, it is not known if CSC would also predict post-presbycusic distress in clinical populations. Two additional limitations pertain to measures used: an arbitrary criterion was used for classifying those with increases in CSC, and a crude self report measure of consistency of hearing aid use were employed, both of which could constrain predictive power of the models.

Despite these limitations, the present findings extend what is known about risk factors for poor psychological response to a first time diagnosis of age-related hearing loss. The goal of this investigation was to test prospective models of distress related to a first time diagnosis of presbycusis in a sample of older adults. Increases in CSC, the tendency to monitor and attend to the content and process of one’s own thoughts and other internal events (Cartwright-Hatton & Wells, 1997), were surprisingly common in the 6 months following diagnosis of presbycusis. Moreover, CSC had both additive and interactive effects on mood in the year following diagnosis in the current sample, and is thus an important target for early intervention. The consistent use of a hearing aid, even when perceived as effective, did not correct the disruption in mood found at T3. Results implicate the importance of psychological factors (e.g., attentional focus) in the experience and mitigation of presbycusis and call for the continued study of adaptation to sensory loss. Because rates of presbycusis are expected to increase significantly as the aging trend continues (Desai, Pratt, Lentzner, & Robinson, 2001; Wallhagen, Strawbridge, Cohen, & Kaplan, 1997), additional efforts should be made to identify mediators of anxiety and depression in response to first time diagnosis of presbycusis, a common and disabling disorder of later life.

References


