Examination of the Relationship Among Hearing Impairment, Linguistic Communication, Mood, and Social Engagement of Residents in Complex Continuing-Care Facilities

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Earlier evidence was not conclusive about whether hearing loss is associated with mood (i.e., depressive symptoms and anhedonia) and social engagement (i.e., reduced psychosocial involvement and reduced activity levels) in elderly residents living in complex continuing-care facilities. If hearing impairment results in poor mood and lower levels of social engagement, then remediating hearing impairment might result in a higher quality of life. **Purpose:** The purpose of this study was to determine if functional hearing impairment in continuing-care residents is associated with mood and social engagement. **Design and Methods:** This study included all residents in Ontario who were admitted to complex continuing-care facilities between April 2000 and March 2001. Through the Canadian Institute of Health Information, we gathered health information by using the Minimum Data Set 2.0 questionnaire. **Results:** The results were consistent with our hypothesized direct effect of functional hearing impairment on mood. Path analyses showed that hearing impairment impairs linguistic communication and that impaired linguistic communication is related to lower levels of mood and social engagement. **Implications:** This study adds to the literature supporting an association between hearing impairment and mood. It suggests that remediating hearing impairment may lower levels of poor mood in residents of complex continuing-care facilities. This, in turn, may reduce the negative effects of hearing impairment on social engagement and increase the quality of life for residents of these facilities. This study also suggests that questionnaires used to assess hearing, such as the Minimum Data Set 2.0, are suitable for early identification of hearing problems and may be used to refer residents to audiological services. **Key Words:** Hearing impairment, Function, Social engagement, Long-term care

Our purpose in the present research was to test a model of the direct and indirect associations of hearing impairment on linguistic communication, mood, and social engagement. The most parsimonious model assumes that hearing impairment has direct effects only on communication, with the latter affecting social engagement, which affects mood. There is ample evidence that hearing impairment directly affects communication. There are also presumptions that poor communication and low levels of social engagement have adverse effects on mood (Lampinen, Heikkinen, & Ruoppila, 2000; Weissman et al., 1996). What remains unresolved is whether the effects of hearing impairment on activity and mood are direct; mediated through communication; or due to correlated deficiencies (e.g., in cognitive or physical status). The most direct effect of hearing impairment is on linguistic communication. Humes and colleagues (1994) found that hearing impairment is the primary determinant of individual differences in speech recognition. Hopper, Bayles, Harris, and Holland (2001) found that institutional residents with functional hearing impairment have fewer linguistic
communication skills (understanding others and being understood by others) than do residents without hearing impairment. Such deficiencies hinder, among other things, the effective sharing of medical information between health care staff and residents with hearing impairment (Resnick, Fries, & Verbrugge, 1997).

Hearing impairment is associated with cognitive status. Although the symptoms of dementia may include communication disorder, the latter may make older people appear more cognitively impaired than they are (Uhllmann, Larson, Rees, Koepsell, & Duckert, 1989). Hearing impairment is a risk factor for acute confusion (Cacchione, Culp, Laing, & Tripp-Reimer, 2003) and is associated with poorer performance on mental status tests (Naramura et al., 1999; Raiha et al., 2001). In fact, early findings by Weinstein and Amsel (1986) showed a gain in mental status scores when seniors with hearing impairment wore hearing aids, suggesting that although level of hearing can have acute effects on cognitive status, issues about causality remain unresolved.

Hearing impairment also relates to social engagement. Weinstein and Ventry (1982) found an association between hearing impairment and social isolation among community-dwelling elderly individuals. Using a number of tests (i.e., pure-tone testing, speech discrimination testing, and self-assessed hearing handicap), Weinstein and Ventry reported that measures of subjective isolation are strongly associated with hearing impairment. Resnick and colleagues (1997) used data collected from 18,873 nursing home residents to show that moderate to severe hearing impairment is associated with low social engagement and low activity. They stated that "severe hearing impairment was associated with 42% greater prevalence of low levels of social engagement, and 30% greater prevalence of little or no time involved in activities" (p. S142). A similar study by Dalton and colleagues (2003) found that hearing impairment reduced the quality of life among community residents. These researchers found that a high percentage of individuals in their sample had mild to severe levels of hearing loss and that a higher level of the sample's hearing impairment was associated with difficulty communicating and a reduction in functioning. The relationship between hearing impairment and physical and social functioning is independent, and the dose-response pattern indicates that higher levels of hearing impairment are associated with lower levels of physical and social functioning (Strawbridge, Wallhagen, Shema, & Kaplan, 2000).

Finally, some researchers have identified hearing impairment as a contributing factor to mood disorder (Cacciatore et al., 1999; Kalayam et al., 1995). Mood disorder in older people includes an anhedonic social withdrawal profile (Gallo, Rabins, & Anthony, 1999) associated with the dysphoric symptoms measured by some depression scales (Burrows, Morris, Simon, Hirdes, & Phillips, 2000). Higher levels of social withdrawal attributed to hearing impairment are also reflected by increased loneliness and social isolation (Dugan & Kivett, 1994) and likely contribute to depressive symptoms. Kalayam and colleagues found that individuals with late-onset depression (i.e., first depressive episode after the age of 65) are more likely than individuals with early-onset depression to have impaired hearing. Cacciatore and associates reported a relationship between hearing impairment and scores on a depression scale in a large sample of older participants. Conversely, Sloan and Dancer (2001) failed to find this association among "affluent adults living in high amenity retirement settings" (p. 1254); they suggested that an environment that accommodates the needs of residents may reduce the deleterious effects of deafness.

These aforementioned studies have concluded that hearing impairment is negatively associated with linguistic communication (Hopper et al., 2001; Humes et al., 1994); cognition (Cacchione et al., 2003; Naramura et al., 1999; Raiha et al., 2001; Uhllmann et al., 1989); social engagement (Resnick et al., 1997; Strawbridge et al., 2000; Weinstein & Ventry, 1982); and mood (Cacciatore et al., 1999; Kalayam et al., 1995). However, we found no studies that incorporated all these effects into one comprehensive model. What remains unresolved is whether the effects of hearing impairment on activity and mood are direct; mediated through communication; or due to correlated deficiencies (e.g., in cognitive or physical status). Resolving this dilemma will provide a better understanding of the full effects of hearing impairment.

Our purpose in the present study was to test a model of the direct and indirect associations of hearing impairment on linguistic communication, social engagement, and mood (see Figure 1). Our

Figure 1. Visual representation of the hypothesized model (1 = estimate fixed at 1; 2 = associated value of t < 2).
hypothesized model also has the added benefit of incorporating physical and cognitive status into it, thus allowing the researchers to control for correlated deficiencies.

To test the model, in the present study we used structural equation modeling applied to a large sample of elderly residents from complex continuing-care facilities. The data were from the Minimum Data Set (MDS) 2.0 questionnaire, administered as part of the admission protocol and periodically thereafter. The main measures that we used were functional hearing impairment, communication skills, functional status (i.e., cognition and activities of daily living, or ADLs), social engagement, and mood. Our analysis of the model proceeded in two stages: an exploratory stage of model testing and a cross-validation of the final model.

Methods

Participants

Our sample included all residents in complex continuing-care facilities in Ontario who were admitted between April 2000 and March 2001. Continuing-care hospitals include freestanding facilities and units or beds in acute-care hospitals that provide long-term complex medical care, geriatric assessment and rehabilitation, psychogeriatric care, palliative care, and respite care.

The full sample consisted of 16,937 residents before the application of exclusion criteria. These criteria excluded residents who were comatose (366), without speech (2,578), or missing information on measures of functional hearing impairment and hearing aid use (909). In this study we were primarily concerned with older adults in complex continuing-care facilities because they are at increased risk of hearing impairment. Therefore, additional exclusion criteria included residents who were younger than 65 years of age (3,093).

After we applied the exclusion criteria, we found that data from 12,254 residents living in complex continuing-care facilities throughout Ontario were available for further analysis. The sample consisted of 5,121 men (42%) and 7,133 women (58%). The average age of the participants was 80.72 years (SD = 7.54 years). All of the following measures were from the MDS 2.0 questionnaire administered on admission (10,046), annual assessment (1,741), or after significant change or correction (467).

Measures

The MDS 2.0 questionnaire is a wide-ranging instrument that measures the health and well-being of institutionalized residents in such areas as mood, behavior, communication ability, disease, and mobility. Front-line staff members trained to use this tool initially gather the information. Its use of standardized definitions allows for accurate comparisons among residents and across facilities. The MDS 2.0 was designed to be the minimum set of items required to complete a needs assessment. It can then be used to identify problem areas requiring further consideration.

Resident-assessment protocols are built into the MDS 2.0 and are used to facilitate the formulation of a specific care plan for each resident. The occurrence of a problem triggers a resident-assessment protocol, which alerts health care professionals to the specific area requiring further assessment. Although the impetus to identify problems remains on the health care professional, a resident-assessment protocol can be used as either a primary or a secondary source of information.

An important aspect of the MDS 2.0 assessment procedure is that residents are observed over long periods. A full assessment is initially carried out when a resident enters a complex continuing-care facility, and the questionnaire is readministered on an annual basis. Supplementary assessments are carried out quarterly or when a significant change in the resident’s condition has occurred. This method provides an accurate and comprehensive case history for each resident.

The MDS 2.0 questionnaire helps to gather information on a resident’s strengths and needs, and it places that information into an individualized care plan. It contains measures of cognition, functional status, communication, vision, psycho-social well-being, mood, disease diagnoses, continence (urinary and bowel), skin condition, health conditions, activity level of preferences, medications, and treatments or procedures.

The MDS 2.0 has been mandated for use in all Ontario complex continuing-care facilities since July 1996 (Joint Policy and Planning Committee, 1999). In Ontario, all health information from these facilities is gathered by the Canadian Institute of Health Information (CIHI). This agency accumulates data from a variety of sources and provides an analysis of Canada’s health care system. The CIHI monitors the health of Canadians and the achievements of the Canadian health care system through the dissemination of reliable and timely health information. Data for this study were provided by the CIHI.

Functional hearing impairment.—Functional hearing impairment (FHI) is a single item on the MDS 2.0 questionnaire that uses a 4-point Likert scale: 1, hears adequately normal talk, TV, and phone; 2, has minimal difficulty when not in a quiet setting; 3, hears in special situations only; speaker has to adjust tonal quality and speak distinctly; and 4, is highly impaired; has an absence of useful hearing. The item measures hearing ability (i.e., with a hearing aid, if one is used) during the preceding 7 days. Instructions to the assessors are to consult

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with the resident’s family, staff members, and, if appropriate, speech or hearing specialists. The assessors also receive training on possible signs of a hearing problem (e.g., the resident’s use of gestures, the resident’s need to see the assessor’s face, how quiet the room must be to conduct the interview, or how loudly the assessor must speak).

Using the Spearman–Brown intraclass correlation coefficient, two earlier studies showed acceptable reliability of the MDS 2.0 measures of FHI. Hawes and colleagues (1995) reported a reliability of .66 for the combined items, and Sgadari and associates (1997) determined an average coefficient of .69 across seven countries.

**Hearing-loss intervention.**—The first item on hearing-loss intervention determines whether a hearing aid is available and used regularly by the resident. The second measure asks whether the resident has a hearing aid but does not use it regularly. A hearing aid may be available, but not used regularly, for example, if a resident has a hearing aid that is broken. Both hearing-loss intervention measures examine hearing-aid use over the previous 7 days and record hearing-loss intervention dichotomously (yes or no).

**Linguistic communication.**—Two items measures linguistic communication on a 4-point Likert scale. The first examines the resident’s ability to comprehend the speaker’s message. The response categories are 1, understands; 2, usually understands; 3, sometimes understands; and 4, rarely or never understands. The second measure of linguistic communication examines the ability to make oneself understood. The response categories are 1, understood; 2, usually understood; 3, sometimes understood; and 4, rarely or never understood. Both measures examine communication during the preceding 7 days. Hawes and colleagues (1995) reported an intrarater reliability between assessors of .84, and Sgadari and associates (1997) reported a range of coefficients from .49 to .89 across seven countries.

**Cognitive status.**—We derived cognitive status from the MDS 2.0 questionnaire by using the Lawton Cognition Scale (Lawton, Casten, Van Haitsma, Corn, & Kleban, 1998). The scale includes seven items: short-term memory, long-term memory, knowledge of current season, location of own room, recollection of staff names or faces, knowledge that the resident is in a complex continuing-care facility, and the ability to make decisions about everyday tasks, or ADLs. Items 1 through 6 are measured dichotomously (yes or no), whereas Item 7 is measured on a 4-point Likert scale: 1, independence; 2, modified independence; 3, moderate impairment; and 4, severe impairment. Casten, Lawton, Parmelee, and Kleban (1998) reported a correlation between MDS 2.0 assessors of .80 and a kappa value of \( \kappa = 0.63 \). Sgadari and colleagues (1997) reported a range of coefficients from .64 to .88 across seven countries.

**Activities of daily living.**—In this study we used the Activities of Daily Living—Short Form (Morris, Fries, & Morris, 1999) to measure ADLs. The items include 1, personal hygiene; 2, toilet use; 3, locomotion on the residential unit; and 4, capacity to eat. Each item was measured on a 5-point Likert scale for performance over the past 7 days: 1, independence; 2, supervision; 3, limited assistance; 4, extensive assistance; and 5, total dependence. Morris and colleagues reported a Cronbach alpha reliability of \( \alpha = 0.90 \).

**Activity level.**—The Activity Pursuit Patterns Index is a single item that measures the amount of time involved in activities (i.e., apart from time involved in nursing care, treatment, or ADLs). The measure uses a 4-point Likert scale: 1, most, that is, more than two thirds of the time; 2, some, that is, from one third to two thirds of the time; 3, little, that is, less than one third of the time; and 4, none of the time.

**Psychosocial involvement.**—Mor and colleagues (1995) developed an index of psychosocial involvement consisting of the following five items: 1, at ease interacting with others; 2, at ease doing planned or structured activities; 3, at ease doing self-initiated activities; establishes own goals; 4, pursues involvement in life at the facility; and 5, accepts invitations into most group activities. Measures of social engagement are measured dichotomously (yes or no). Mor and associates reported a Cronbach alpha reliability of \( \alpha = 0.79 \).

**Withdrawal.**—Stones and Kirkpatrick (2002) described an index of withdrawal thought to reflect an anhedonic condition. The items include withdrawal from activities of interest and reduced social interaction. They are measured on 3-point Likert scale: 1, indicator not exhibited in the past 30 days; 2, indicator of this type exhibited up to 5 days a week; and 3, indicator of this type exhibited daily or almost daily, 6 to 7 days a week. Stones, Clyburn, Gibson, and Woodbury (in press) reported a Cronbach alpha reliability of \( \alpha = 0.89 \) for the scale, which showed structural distinctiveness from the MDS 2.0 Depression Rating Scale.

**Depressive symptoms.**—The MDS 2.0 Depression Rating Scale contains seven items: 1, negative statement; 2, persistent anger with self or others; 3, expression of what appear to be unrealistic fears; 4, repetitive health complaints; 5, repetitive, anxious
complaints; 6, sad, pained, worried facial expressions; and 7, crying, tearfulness (Burrows et al., 2000). These items are measured on a 3-point Likert scale: 1, indicator not exhibited in the past 30 days; 2, indicator of this type exhibited up to 5 days a week; and 3, indicator of this type exhibited daily or almost daily, 6 to 7 days a week. Burrows and colleagues reported a Cronbach alpha reliability of \( \alpha = 0.75 \), convergent validity with other depression scales, and a sensitivity of 91% against psychiatric diagnosis.

**Data Analysis**

The main analyses evaluated path models with latent variables to test the direct and indirect effects of FHI and other effects (i.e., LISREL 7; see Jöreskog & Sörbom, 1989). To facilitate interpretation, the measures that we analyzed were standard scores calculated by LISREL. We set the scores to indicate that higher values denoted the less favorable pole. The independent variables that we used were the three measures of function: MDS-FHI, the Lawton Cognition Scale, and ADLs. The dependent variables that we used were three latent variables, each with two linkages: (a) a communication variable linked to comprehension and expression items, (b) a social engagement variable linked to psychosocial involvement and activity level, and (c) a mood variable linked to depressive symptoms and anhedonia. Our identification of each latent variable was through a fixed linkage of value 1, with the other linkage free to vary. On the basis of evidence already cited, the most parsimonious model (see Figure 1) allowed additional free linkages only from (a) cognition to communication, (b) cognition to social engagement, (c) ADL to social engagement, (d) hearing impairment to communication, (e) communication to social engagement, and (f) social engagement to mood. Our evaluation proceeded in stages of exploratory testing and cross-validation, with the sample randomly divided into two subsamples, that is, A and B. We used Subsample A in the first stage, and we used Subsample B in the second stage.

The statistics to interpret goodness of fit included the total coefficient of determination for the dependent variables (CD-Y), the total coefficient of determination for the structural equations (CD-SE), chi-square relative to the degrees of freedom (\( \chi^2/df \)), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), and the root mean square residual (RMSR). Recommended levels for good fit are \( \chi^2/df < 3, \text{GFI} > .95, \text{AGFI} > .9, \) and \( \text{RMSR} < .05 \) (Tabachnick & Fidell, 2000).

A problem in evaluating fit with large samples is that a large total number in a sample can increase the chi-square value beyond expectations as a result of a specification error in the model (Jöreskog & Sörbom, 1989). Because the sizes of Subsamples A and B (\( n > 6,000 \)) considerably exceeded the recommended size for models with two measures per latent variable (Tabachnick & Fidell, 2000), we took steps to resolve this problem, including the following: First, we set the required level for significance for model modification at the exploratory stage high at \( p < .001 \) to minimize the number of modifications made. Second, retesting of the final model with smaller groups randomly drawn from Subsample A enabled us to make an evaluation with sample sizes closer to the recommended level. Third, a random division of Subsample B into subgroups enabled us to make multiple cross-validations with a sample size closer to the recommended level.

**Results**

**Preliminary Analyses**

In our preliminary analyses we evaluated the reliability of the measures and the relationship between functional hearing loss and hearing-aid use. Cronbach alpha coefficients were \( \alpha = 0.88 \) for the Lawton Cognition Scale, \( \alpha = 0.82 \) for ADLs, \( \alpha = 0.80 \) for psychosocial involvement, \( \alpha = 0.90 \) for withdrawal, and \( \alpha = 0.75 \) for the depressive symptom measure. The intraclass correlation coefficient for two linguistic communication items was \( \alpha = 0.86 \). These findings showed that the measures had good reliability.

More than 70% of the residents participated in the MDS 2.0 assessment, whereas family, friends, and significant others participated in 44.1% of the assessments. The proportion of residents without hearing impairment was 64.7%, compared with 23.1% of residents who showed mild impairment and 12.2% who manifested moderate or severe impairment. Only 4% of residents without FHI regularly wore hearing aids, compared with 21.8% of residents with mild impairment and 45.3% with more severe impairment. These findings showed that, although just over 33% of residents had some level of FHI, less than 33% of them wore hearing aids.

**Main Analyses**

Our exploratory analysis of the initial model using Subsample A showed a value of \( \chi^2(20) = 364.84 \). Our use of LISREL’s modification index suggested that freeing the linkage from ADLs to the communication latent variable would improve fit the most; that is, there would be a reduction of \( \chi^2(1) = 219.86, p < .001 \). This modification allowed LISREL to calculate a regression coefficient for that path. This modification appeared reasonable because the content of the ADL measure includes a deficiency correlated with cognition but not measured by the Lawton Cognition Scale. With this modification made, retesting of
the model provided no further evidence that freeing any linkage would improve fit at the \( p < .001 \) level.

Statistics to evaluate the modified model generally showed good fit. The goodness-of-fit statistics were as follows: A total CD-Y of .970; a total CD-SE of .692; a value of \( \chi^2(19) = 144.98 \); a GFI of .995; an AGFI of .988; and an RMSR of .017. The CD-Y and CD-SE values showed that the model explains substantial proportions of the covariance matrices. The GFI, AGFI, and RMSR values all exceeded recommended levels for good fit. In addition, the LISREL (maximal likelihood) free linkage estimates were all in the expected direction and of significant magnitude (with \( t \) values ranging from 12.38 to 60.33). The only measure outside the recommended level for good fit was the chi-square value, and this was probably due to the large sample size.

Retesting of the modified model with groups of \( n = 1,000 \), \( n = 750 \), and \( n = 500 \) randomly drawn from Subsample A showed the effect of sample size on the chi-square value. The respective values were \( \chi^2(19) = 62.1 \), \( \chi^2(19) = 39.8 \), and \( \chi^2(19) = 27.56 \) (\( p > .05 \)). These findings suggested that the model provided good fit at the recommended level with \( n \approx 750 \) or lower.

A random division of Subsample B into eight groups each with \( n \approx 765 \) (i.e., Subsamples B1–B8) provided the data we used in our cross-validation. The values had ranges as follows: CD-Y = .966–.986, CD-SE = .672–.731, \( \chi^2(19) = 17.61–65.18 \), GFI = .981–.995, AGFI = .955–.988, and RMSR = .016–.027. All of the indexes indicated good fit, with the exception of \( \chi^2 = 65.18 \) for Group B2, which was minimally outside the recommended level. Consequently, the findings suggested that the cross-validation was successful.

Table 1 shows the maximal likelihood estimates. All were significant, except for linkages from communication to activity in 50% of the analyses and communication to mood in 25% of the analyses. The association between FHI and communication was significant in every analysis, with modification indexes indicating that the linkages from hearing impairment to activity and mood were nonsignificant if freed; that is, \( \chi^2(1) \) was associated with \( p < .05 \) in 94% of the instances. Figure 1 provides a visual representation of the hypothesized model. Consequently, the findings confirmed that the hypothesized direct effects of FHI are on communication. Figure 1 shows no direct effect of communication on social engagement; however, there was a strong association between communication and mood, and also social engagement and mood. Figure 1 also shows a strong relationship between FHI and cognition, communication, and social engagement. Social engagement scores were also highly associated with ADL impairment and cognitive functioning. Even though the association between ADL impairment and communication was lower, it remained significant. This likely reflected a subsample of complex continuing-care residents who suffered from concurrent cognitive and ADL impairment.

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<table>
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<th>Linkage</th>
<th>From</th>
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<th>B3</th>
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<th>B7</th>
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Notes: FHI = functional hearing impairment.

\(^a\) Estimate fixed at 1.

\(^b\) Associated value is \( t < 2 \) (values represent standardized regression weights).
Supplementary Analyses

The preceding analyses specified FHI, the Lawton Cognition Scale, and ADL as independent variables, but they did not test their relationships. Because any effects of FHI on cognition and ADL are plausibly mediated through impaired communication, partial correlation with control of the communication items provided a test of any independent relationship. Our analyses using Subsamples B1 to B8 found significant partial correlations (i.e., at \( p < .05 \)) between FHI and the Lawton Cognition Scale in three out of eight analyses and between FHI and ADL in one out of eight analyses. Consequently, the findings failed to provide consistent evidence of independent relationships.

Discussion

Identifying hearing impairment is important because of the possible negative outcomes associated with it. Our purpose in this study was to determine if hearing impairment, as determined by the MDS 2.0 instrument, is associated with mood and social engagement in elderly residents of complex continuing-care facilities in Ontario. The MDS-FHI method uses subjective judgments about the extent of hearing impairment and may provide a high level of sensitivity in a sample of individuals with high levels of hearing impairment.

In the present research we examined the effects of hearing impairment on mood and social engagement after we controlled for measures of cognitive and physical function (see Figure 1). Measures of mood included depressive symptoms and anhedonia. Measures of social engagement included psychosocial involvement and activity levels. The strengths of the design included the large sample size and a comprehensive array of reliable measures. Limitations included the cross-sectional nature of the data, with inferred causation determined by correlations or their equivalent and issues about the generality of the findings beyond the confines of complex continuing-care facilities in Ontario.

Earlier studies have found that hearing impairment is negatively associated with linguistic communication, cognition, social engagement, and mood. To our knowledge, this is the first study to incorporate all these effects into one comprehensive model. The hypothesized model shows that hearing-impaired residents are more likely to experience poor mood, with the severity of hearing impairment associated with higher levels of depressive symptoms and anhedonia. These findings add to earlier studies that measured hearing loss with pure-tone hearing tests (Cacciatore et al., 1999; Kalayam et al., 1995). The results implied that making a reduction in the levels of hearing impairment may result in lower levels of depressive symptoms or anhedonia. In addition to mood, we examined two measures of social engagement: psychosocial involvement and activity level. The results were consistent with those of Weinstein and Ventry (1982) and Resnick and colleagues (1997) in that they showed that higher levels of FHI are associated with lower levels of social engagement.

The present research confirmed all of the associations reported by earlier studies, but it placed those associations in a comprehensive model. The hypothesized model (see Figure 1) suggests that hearing impairment affects mood through the following sequence: (a) hearing impairment impairs communication, (b) impaired communication lowers mood, and (c) lower mood results in lower levels of social engagement.

Implications of the findings extend to the possible benefits of aggressive hearing-improvement programs for elderly individuals. Improving the ability to hear and communicate more effectively may reduce errors and facilitate the effectiveness of other treatment regimens. It is also possible, based on the present findings, that hearing-improvement programs may indirectly enhance mood. Unfortunately, geriatric hearing-improvement programs appear to be a low priority in complex continuing-care facilities, as indicated by the low number of hearing-impaired residents who receive such intervention.

Earlier research by Ciurlia-Guy, Cashman, and Lewsen (1993) and the Canadian Task Force on the Periodic Health Examination (1979) recommended that all individuals be assessed for hearing impairment during clinical visits. However, Kalayam and associates (1995) reported that a high percentage of older residents who experience some level of hearing impairment do not use hearing aids. The results of this study found that few complex continuing-care residents use hearing aids, despite the various services and programs that are available to aid in remediation. Programs such as Ontario’s Assistive Devices Program, implemented in 1999, offer financial assistance to offset the cost of hearing aids. Similar programs exist elsewhere through government policy and insurance programs.

Table 2. Indirect Effects of FHI on Social Engagement and Mood in Subsamples B1–B8

<table>
<thead>
<tr>
<th>Subsample</th>
<th>FHI on Social Engagement</th>
<th>FHI on Mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>.022 (.007)</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>.009 (.004)</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>.024 (.009)</td>
<td>.020 (.007)</td>
</tr>
<tr>
<td>B4</td>
<td>.011 (.005)</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>.023 (.006)</td>
<td>.014 (.006)</td>
</tr>
<tr>
<td>B7</td>
<td>.014 (.006)</td>
<td>.020 (.007)</td>
</tr>
<tr>
<td>B8</td>
<td>.016 (.008)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: FHI = functional hearing impairment. Associated standard errors are shown in parentheses. The FHI columns show only those estimates that are twice the standard error in magnitude.
Hearing aids may not be the only option for hearing-impaired residents of complex continuing-care facilities. Other methods may be available to aid with communication. If hearing impairment is related to mood and social engagement through its relationship with communication, then it should also be possible to improve mood and levels of social engagement by improving communication through the use of alternative techniques. Residents who are cognitively intact and physically able, for example, could improve their communication with others by using existing technologies. This would allow residents whose hearing impairment is unable to be corrected through hearing-aid use to communicate their needs more efficaciously.

Identifying andremedying hearing impairment in residents of complex continuing-care facilities may reduce the need for antidepressants by reducing depressive symptoms associated with hearing impairment. This would provide a nonpharmacological approach to reducing depressive symptoms in a population frequented by polypharmacological problems. In addition, allowing health care professionals to develop a care plan that includes hearing-supportive services may have a positive impact on psychosocial outcomes. Use of a hearing aid may reduce the negative effects of hearing impairment on the ADLs of residents of complex continuing-care facilities. One positive aspect of the hypothesized model is that improvements in hearing abilities or communication abilities should have a positive result on the residents’ quality of life. Residents who are able to communicate more effectively may become more socially engaged with family, friends, and other residents, and they may also realize a higher quality of care.

Current policies may not identify many of the residents of complex continuing-care facilities who need hearing support. Mandating hearing tests as standard practice by the use of the MDS-FHI is an economical alternative to determine levels of hearing impairment of residents in complex continuing-care facilities. Residents who are identified as needing hearing support can then be referred to an audiologist.

Environmental modifications can be made to minimize the effects of hearing impairment of residents in complex continuing-care facilities. For example, areas used for socialization, such as dining rooms and common rooms, could be refurbished with drapes and rubber-tipped chairs to minimize reverberations and echoes from hard surfaces. Smaller round or square tables, rather than long, rectangular tables, allow residents to interact more directly with others.

To conclude, there is a relative absence of research on the relationships between different measures of hearing impairment. Only one study that focused primarily on residents with dementia compared the MDS-FHI measure with other measures (Hopper et al., 2001). The next step in this line of research will be to validate MDS-FHI scores against traditional methods of hearing assessment and in other populations. It may be important to reexamine the usefulness of pure-tone screening tests in the frail elderly population or to adjust scores to provide an appropriate baseline, allowing the door to open for future research into FHI.

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