Hearing Health Knowledge of Aging Adults

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Hearing loss is common among aging adults, yet little is known about an aging adult's understanding of hearing and hearing health. A select group of adults was surveyed in regard to knowledge about hearing assessment, impact of hearing loss, factors known to contribute to hearing loss, and approaches to treatment of hearing loss. Results demonstrated significant differences between expected and observed responses, suggesting subjects were uninformed of the relationship between hearing loss and other sensory functions, common medications and ear disease. Respondents were not well-informed of the advantages of binaural amplification and speechreading. Implications for future research and educating aging adults in regard to hearing and hearing health are discussed.

By the year 2050, it is estimated that 60% of all Americans over age 65 years will have impaired hearing (Fein, 1983). The majority of these people will learn to accept hearing loss in stages (Kyle, Jones, & Wood, 1985). Initially, before they may acknowledge hearing loss, they will compensate by mechanical means (e.g., increasing volume on radios, televisions, telephones, etc.) and through social manipulation (e.g., asking others to rephrase and repeat). Then, after fully acknowledging hearing loss, professional resources will be sought for medical, surgical, and prosthetic intervention along with information, support, and guidance for self-managing hearing loss. Beyond a brief period of direct professional intervention lies life-long adjustment to hearing loss. Given the above, overall success in managing hearing loss is dependent to a degree upon personal knowledge of hearing and hearing health care and personal ability to identify and take advantage of available resources.

Brownell and Singer (1981) reported that adults lack information regarding hearing health care and often hold misconceptions concerning hearing aid use, communication with hearing-impaired individuals, and the influence of drugs, noise, and disease on hearing. These findings were confirmed in a follow-up

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study of young and old adults (Singer & Brownell, 1984) revealing significant differences resulting from subject age, education and examiner profession. Young college graduates who were examined by audiologists out-scored older and/or less educated adults tested by physicians and nurses. Younger college graduates out-scored others on questionnaire items addressing hearing aids and communication with hearing-impaired individuals. Older subjects out-scored younger adults on items relating to knowledge of medications, diseases, and disorders that may affect hearing. On items relating to general hearing health, such as the effect of noise on hearing, hearing assessment, and ear hygiene, younger adults out-scored older adults, better-educated out-scored less educated adults, and normal hearing out-scored hearing-impaired subjects and those who had no formal knowledge of their hearing sensitivity.

Pioneer studies yielded important information about hearing and hearing health knowledge in the general aging adult population, without regard to hearing, age, education, and examiner variables. It is expected that generally well-educated aging adults with essentially age-normal hearing and no major physical, psychological or financial problems, who voluntarily take advantage of hearing clinic services, would have more knowledge about hearing and hearing health than the general population. The purpose of the present study was to examine hearing health knowledge in adults expected to demonstrate above average potential for understanding hearing and hearing health issues.

METHOD

Subjects

Twenty adults, 11 males and nine females, aged 65 to 79 years (mean age 73.3 years) were selected from Northwestern University Hearing Clinic files. Selection criteria included: (a) interest in hearing health; (b) essentially age-normal hearing; (c) less than maximal self-perceived hearing handicap; (d) physical fitness; (e) psychological control over health matters; (f) formal educational accomplishment; and (g) an income sufficient to support hearing health care needs.

Interest in hearing health was demonstrated by willingness to volunteer for this study. Hearing acuity was determined by audiometric testing. Average pure-tone thresholds and standard deviations are presented in Figure 1, along with the range of mean pure-tone thresholds for men and women within the age span incorporated in this study according to a report by Harford and Dodds (1982). Hearing handicap was measured using the Hearing Handicap Inventory for the Elderly (Ventry & Weinstein, 1982). The group mean score was 13.6 (SD = 8.6; range = 0-32) where a score of zero suggests no handicap and 40 represents maximum handicap. Each subject's physical health was surveyed and 13 rated themselves to be in good or excellent health and seven in fair health on a four-step range from poor to excellent. Psychological control over health problems was estimated from results on a health locus of control scale developed by Wallston, Wallston, Kaplan, and Maides (1976). The average score was

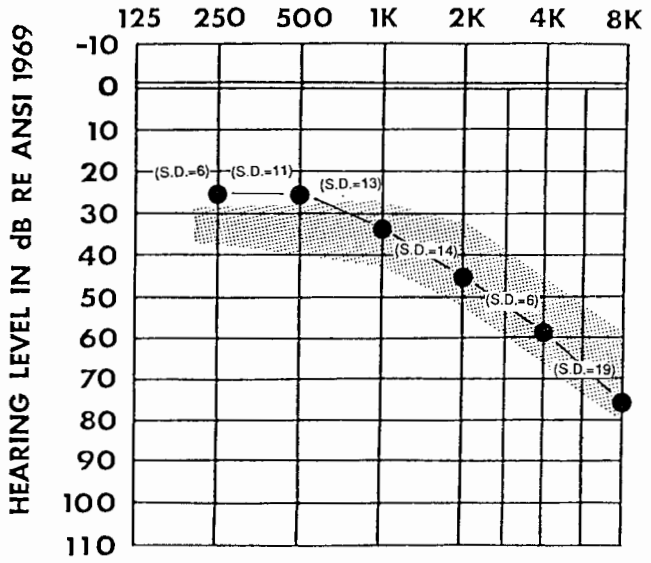

Figure 1. Average pure-tone air conduction thresholds with standard deviations for each subject's (n = 20) better ear and the range of mean pure-tone air conduction thresholds for men and women between the ages of 60 and 80 years according to Harford and Dodds (1982).

39.5 (SD = 3.8; range = 33-49) where a score of 11 suggests strong personal control over health related matters and a score of 66 suggests weak control. Educational accomplishment was measured by survey of academic background. Sixteen subjects had some college-level coursework, with 10 subjects holding an undergraduate degree and seven of these subjects also holding a graduate degree. Three subjects earned high school diplomas and one graduated from elementary school. Finally, ability to meet the cost of common health care expenses was determined through a survey of annual household income. Sixteen subjects reported annual incomes exceeding $40,000. Of these subjects, six reported incomes exceeding $80,000 annually. Annual income for the remaining four subjects averaged greater than $25,000.

Materials and Procedures

Part II of the Hearing Health Inventory (Singer & Brownell, 1984) was selected for use in this study (see Appendix). The inventory consists of 35 correct and incorrect statements relating to hearing and hearing health. Statements are written in simple language and the inventory requires about 20 minutes to complete. Respondents must indicate whether they agree, disagree, or are undecided about each item. Inventory items were categorized into four topical areas for purposes of this study.

Hearing assessment. Items 23 and 35 relating to benefit and comfort of hearing assessment.

Impact of hearing loss. Items 12, 17, 18, 21, 22, 24, 33, and 34 relating to hearing loss and vision, tinnitus, educational progress, psychological well-being, speech understanding, and speech production; and relating unilateral with bilateral impairment and hearing aid use with progression of hearing loss.

Contributing factors. Items 1, 3, 4, 5, 6, 7, 11, 14, 19, 26, 27, 28, 29, 30, and 31 relating hearing loss with use of antacids, antibiotics, aspirin, and Valium; relating hearing loss to viral and bacterial infection and diabetes; relating ear infection, ear trauma, or hearing loss to use of hair spray, hair dye, cotton swabs, flying, scuba diving, noise, blows to the head, and aging.

Treatment measures. Items 2, 8, 9, 10, 13, 15, 16, 20, 25, and 32 relating to medication, surgery, hearing aids, and special communication strategies for treatment of problems related to hearing loss.

Subjects meeting selection criteria were asked to complete the Hearing and Health Inventory as part of a battery of questionnaires for a related study of health locus of control. Subjects completed the inventory in the clinic setting without assistance from the examiner or any other person.

RESULTS AND DISCUSSION

As noted, each inventory item offered a three-choice response: agree, undecided, and disagree. Agree and disagree items were randomly distributed. Fifteen items are correctly answered with "agree"; 20 items are correctly answered with "disagree." To examine the relationship between expected and observed responses, a chi-square analysis was conducted and the result revealed a statistically significant difference at the $p \leq .001$ level of confidence. To determine the reason for these differences, responses to individual inventory items were analyzed after the raw scores (the number of respondents for each response choice) were converted to a percentage of the total number of responses for each item. The maximum score for each item was 100%. For example, on item #1, nine respondents (45% of the total group of 20 subjects) agreed with this statement, eight respondents (40%) disagreed, and three respondents (15%) were undecided. These results will be discussed by item category.

Hearing Assessment

Each subject reported individuals over age 65 years benefit from a hearing test (#35). All subjects except one indicated this was a painless procedure (#23). Since all subjects were volunteers, these results were fully expected. That is, they would not be expected to volunteer for this study if they did not consider a hearing test to be beneficial.

Impact of Hearing Loss

Forty percent of all subjects were uncertain about the relationship between hearing loss and vision (#17) and the influence of a hearing problem in one ear

on hearing in the opposite ear (#18). Twenty percent believed that failing to aid an impaired ear would create additional loss in that ear; another 20% were undecided about this possibility. These findings suggest there are misconceptions about hearing loss, even among educated adults. The advantages of combined auditory-visual speech perception are well-documented (Garstecki, 1988) and this phenomenon should not be mistaken by hearing-impaired individuals as a change in visual acuity or visual perception.

A second misconception relates to the assumption that failing to aid an impaired ear will tax the long-term ability of the better ear. There is no known 'workload' effect on the auditory system. There is, however, an advantage to binaural hearing as it relates to efficiency of auditory processing. A binaural system enhances detection of interaural differences in signal intensity, time, and phase as these properties relate to sound localization. Binaural hearing helps to suppress background noise and it provides increased loudness with less intensity (Mueller & Grimes, 1987).

A third misconception relates to decline in auditory sensitivity due to non-stimulation, a 'use it or lose it' issue. While differences in sensory capability associated with hearing aid use and non-use are not commonly understood, it may be possible that with long-term non-stimulation neural topography of the auditory system may change. This has been demonstrated in auditory deprivation studies with animals (Webster, 1983) and with young children (Marcotte & LaBarba, 1985). However, it is not clear what effect, if any, such a change in neural topography might have on auditory processing or learning. So, for the present, this assumption is best considered another misconception about hearing loss.

Thirty percent of the subjects did not associate hearing difficulty with problems in both speech production (#34) and speech understanding (#24). Most surprising is the lack of understanding of the relationship between hearing and speech perception. This makes sense intuitively and, particularly among the age peers of the subjects of this study, problems in speech recognition may be unusually high, a condition referred to as 'phonemic regression' (Pestalozza & Shore, 1955). However, because many older adults develop speech understanding problems in the presence of relatively minor hearing loss, this subject group may not have associated one condition with the other.

Fifteen to 20% of all subjects were undecided about the relationship between hearing loss and tinnitus (#33), the impact of hearing loss on educational achievement (#22), and the impact of hearing loss on one's psychological well-being (#21). In regard to tinnitus, it is interesting to note that while the etiology often is uncertain, the majority of individuals who experience this condition demonstrate sensorineural hearing loss (Nissen, 1987). The impact of hearing loss on education should be apparent from the popular press. The achievement gap between hearing-impaired and normally-hearing children has led to federal legislation resulting in nationwide efforts to identify hearing-impaired children and provide them and their families with multi-faceted educational and personal support programs (DeConde Johnson, 1987). Finally, while this may not be

common knowledge, the fact that hearing loss may lead to depression, withdrawal, loneliness, isolation, nervousness, and fatigue is well-documented in the psychological profiles of hearing-impaired individuals (Meadow-Orlans, 1985).

Contributing Factors

Four questions addressed the relationship between medications (e.g., aspirin, antibiotics, antacids, and Valium) and hearing loss (#3, 5, 14, 29). Fifty to 75% of the subjects were undecided about the possibility of a relationship. In addition, 60% were undecided and 20% disagreed on the potential impact of streptomycin and neomycin on hearing sensitivity (#29). The importance of these findings is underscored by the fact that older adults tend to demonstrate high use of aminoglycosides, diuretics, and aspirin which may make them more prone to the effects of ototoxicity. According to Brummett and Jackson (1984), there are many drugs that are administered for a variety of conditions experienced by older adults that are known to be ototoxic. These include: aspirin, capreomycin, chloroquine, cisplatin, dibekacin, dihydrostreptomycin, erythromycin, ethacrynic acid, furosemide, gentamicin, hydroxychloroquine, indomethacin, kanamycin, mechlorethamine, neomycin, netilmicin, quinidine, quinine, reserpine, sisomicin, streptomycin, tobramycin, vancomycin, and 6-aminonicotinic acid. Forty to 60% of the subjects were undecided about the influence of bacterial and viral infection and diabetes on hearing sensitivity (#6, 11, 28).

Fifty percent of the subjects were undecided about the risk of otitis externa from hair spray and dye (#26) and 30% perceived greater benefit than risk in using cotton swabs for ear hygiene (#30). In older adults, skin in the external ear and ear canal has a greater tendency to become dry and scaly than skin in the ears of younger adults. In this state, chemical agents found in strong soaps and shampoos may irritate the skin or exacerbate irritation and drying. Then, sharp objects, such as cotton swabs, bobby pins, and toothpicks placed in the ear canal may create an itch-scratch-itch cycle (Anderson & Meyerhoff, 1982) and intensify the possibility of nagging skin infection.

Forty-five percent of the subjects agreed that aging (#1) and 50% agreed that flying or scuba diving (#4) could affect hearing sensitivity, whereas an 80%-majority agreed that blows to the ear could endanger hearing (#27). Blows to the head will result in hearing loss in approximately 75% of those individuals encountering temporal bone fracture. In skull fractures without temporal bone involvement, 45% may experience hearing loss. Eighteen percent may experience hearing loss in head trauma without skull fracture (Proctor, Gurdjian, & Webster, 1956). And, 50% of those experiencing head trauma resulting in loss of consciousness will experience hearing loss (Schuknecht & Davidson, 1956).

Almost every subject (85% and 95%) agreed that noise exposure could result in hearing loss (#19 and 7, respectively), yet only 20% considered cotton to be relatively ineffective in attenuating high intensity noise (#31). Of all possible types of ear protectors, cotton provides little, if any, noise attenuation and should

not be recommended. Circumaural ear protectors, while sometimes costly and uncomfortable, typically provide the best noise attenuation (Sataloff, 1966).

Treatment Measures

Three approaches to treatment of hearing loss were surveyed: medication and ear surgery, use of hearing aids, and development of special communication strategies. Seventy percent agreed that medical and surgical treatment was of limited benefit in dealing with age-related hearing loss (#32). There is no known drug therapy or surgical procedure for successfully dealing with hearing loss related primarily to the aging process (Fisch, 1978). Hearing aids remain the treatment of choice, both for presbycusis and accompanying tinnitus (White & Starsfield Regan, 1987).

Seventy-five percent of the subjects felt that hearing loss could be helped by hearing aids (#25) and 90% indicated hearing aids could improve speech understanding (#2). However, 60% disagreed on the importance of binaural amplification (#9) and forty percent associated higher hearing aid costs with increased benefit from use (#10). Benefit from use is not cost-dependent, but a factor of how well the characteristics of the hearing loss are compensated for by the electroacoustic properties of the hearing aid-earmold. Hearing aid price variance is best explained by a combination of unit cost and dispenser mark-up (Rezen & Hausman, 1985).

Finally, while 75% agreed that it may not necessarily be of benefit to speak very loudly to the hearing aid user in order to be understood (#15), 40% agreed it is important to speak very loudly to hearing-impaired people who do not use amplification (#16). Seventy percent of the subjects agreed it was easier to understand when the speaker's face is visible (#8), yet 55% disagreed on the importance of lipreading in compensating for communication problems related to any hearing loss (#13). Sixty-five percent agreed that speaking directly into a hearing-impaired person's ear will not necessarily result in improved message understanding (#20). Facial expression, body gesture, and situational cues may support lipreading (Garstecki, 1979).

IMPLICATIONS

Several implications can be drawn from this study. First, the significant difference between expected and observed responses to an inventory tapping common knowledge concerning hearing health in a group generally biased toward having such information suggests the desirability of extending this study to other populations who may benefit from hearing health knowledge and care. The importance of such information is highlighted by the need to address hearing health care needs for increasing numbers of older adults. Next, even with these initial findings, it is apparent that greater emphasis must be directed toward educating the general aging population in regard to the potential impact of hearing loss on other sensory functions. Knowledge of the relationship between hearing loss, speech production, and speech understanding may need to be increased.

Further, there appears to be a need for general education in regard to the influence of selected drugs, diseases, and chemical agents and objects used in the ear for health and beauty purposes that may cause or exacerbate hearing loss. Finally, there appears to be need for more information concerning the benefits of binaural amplification and speechreading. Overall, these findings suggest the need for improved public education in matters relating to hearing and hearing health as this may impact on the prevention of self-perceived hearing handicap in aging adults.

ACKNOWLEDGEMENTS

The author gratefully acknowledges the assistance of Alison Brett and Meryl Kobrin in data collection and the Hugh Knowles Leadership Fund for financial support for this project.

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APPENDIX

HEARING AND HEALTH INVENTORY

The following questionnaire was developed by Singer and Brownell (1984) as the second part of a two-part survey of knowledge of hearing and health. Respondents are instructed to read each statement and check the appropriate box following each item indicating they agree, disagree, or are undecided about the statement. [Correct answers, agree (A) or disagree (D), are noted in parentheses following each item.]

1. The aging process has minimal effect on hearing for most people. (D)
2. A good hearing aid can dramatically improve one's ability to understand speech. (D)
3. Aspirin may produce a temporary change in your ability to hear. (A)
4. Flying in an airplane or scuba diving can affect your ability to hear. (A)
5. Repeated use of Valium can reduce your ability to hear. (D)
6. Bacterial infections such as streptococcus, staphlococcus, and pneumonococcus can reduce your ability to hear. (A)
7. Prolonged exposure to loud noise can reduce your ability to hear. (A)
8. It is easier to understand speech if you can see the speaker's face. (A)
9. Since you have two ears, you really need two hearing aids when you have a hearing loss. (D)
10. The more expensive the hearing aid, the more beneficial it will be to the wearer. (D)
11. Diabetes can produce hearing loss. (A)
12. If you have a hearing loss and do not get a hearing aid, your hearing will get worse. (D)
13. People can be trained to lipread well enough to compensate for any hearing loss. (D)
14. Antacids may produce a hearing loss. (D)
15. If you talk to someone who is wearing a hearing aid, it is important to speak very loudly, so he/she can understand more clearly. (D)
16. If you talk to someone with a hearing loss who is *not* wearing a hearing aid, it is important to speak very loudly so he/she can understand more clearly. (D)
17. Your hearing may improve if you lose your sight. (D)
18. If a person has one good ear and one bad ear, the bad ear may get worse because the good ear is doing most of the work. (D)
19. Noise will not affect your hearing if you can ignore or get accustomed to it. (D)
20. If you are talking to an older adult with a hearing loss, speak directly into the person's ear to be understood clearly. (D)
21. Hearing loss can have a negative psychological impact on an individual. (A)

22. Hearing loss can retard your educational progress. (A)
23. Hearing tests are likely to be physically painful. (D)
24. It is common for older people with hearing loss to have more difficulty understanding the speech of women and children. (A)
25. All types of hearing loss can be helped by hearing aids. (D)
26. Foreign substances such as hair spray and hair dye in the ear canal increase the chance of infection. (A)
27. A blow or slap to the ear can damage your eardrum. (A)
28. Influenza, chicken pox, and mononucleosis may produce sudden hearing loss. (A)
29. Streptomycin, neomycin, and some other antibiotics may reduce ability to hear. (A)
30. There is probably more risk than benefit to using a cotton swab in the ear. (A)
31. Cotton in the ears will effectively reduce the intensity of loud noise. (D)
32. Most hearing problems experienced by adults can be resolved by medication or surgery. (D)
33. Ringing in the ears is primarily a psychological phenomenon. (D)
34. The ability to hear is essential to learn how to speak. (A)
35. There is little to be gained by testing the hearing of individuals younger than five or older than 65 years of age. (D)