# SPEECH COMMUNICATION PROFILES ACROSS THE ADULT LIFESPAN: PERSONS WITHOUT SELF-IDENTIFIED HEARING IMPAIRMENT

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## ABSTRACT

A sample of 209 adults ranging from 20 to 79 years of age were studied to measure speech communication profiles as a function of age in persons who did not identify themselves as hearing impaired. The study was conducted in order to evaluate age-related speech perception abilities and communication profiles in a population who do not present for hearing assessment and who are not included in census statistics as having hearing problems. Audiometric assessment, demographic and hearing history self-reports, speech reception thresholds, consonant discrimination perception in quiet and noise, and the Communication Profile for the Hearing Impaired (CPHI) were the instruments used to develop speech communication profiles. Hearing performance decreased with increased age. However, despite self-reports of no hearing impairment, many subjects over age 50 had audiometric thresholds that indicated hearing impairment. The responses to the CPHI were correlated to audiometric thresholds, but also to the age of the respondent, when hearing thresholds had been controlled statistically. A comparison of CPHI responses from this study and that of two other samples in clinical populations revealed only slightly different patterns of behaviour in the present sample when confronted with communication difficulties.

## 1. BACKGROUND

A pervasive characteristic of aging is a decline in hearing sensitivity.[1-3] Hearing impairment is the third most prevalent chronic health disability identified by the aged in North America.[4] Presbycusis, the decline of sensitivity caused by aging, is a progressive sensorineural hearing loss that is bilateral and symmetrical, with the largest losses occurring in the higher speech frequencies.[5,6] Reports of the prevalence of presbycusis are extremely varied, with the highest rates observed in persons who are in poor general health and when hearing thresholds are tested using standard audiometric procedures and the lowest rates observed when questionnaire data are used.[7]

The disability stemming from hearing loss is greater than predicted by hearing thresholds alone in older persons.[8-12]. Communication of older persons with presbycusis is more negatively affected by adverse listening conditions, such as in reverberation or noisy backgrounds, than their younger counterparts with similar hearing thresholds.[13,14]

Personal attitudes towards the impairment play a role in decinding if one is disabled or handicapped. The discrepency between audiological threshold elevation and self-reported hearing loss is clear. Using threshold measures only, Moscicki et al.[15] indicated that 83% of those over 57 years of age are hearing impaired, yet only 10-12% of the Canadian population over 65 years of age report having hearing problems. [16]

Although there is clear evidence to support poorer speech perception, word discrimination, and puretone thresholds with age, older listeners report less handicap than younger persons with the same hearing loss.[17] This may be because the elderly may accept changes in their hearing acuity as part of the normal process of aging and have decreased expectations for communication performance.[17,18] Hearing thresholds increase only at approximately 1 dB per year[19] and aging listeners may be unaware of the changes to their communication ability. Other possible explanations for the observed decrease in handicap perceived by older persons may include being relatively uniformed about one's hearing health[20], or changes in communication needs ot the communication environments of the elderly.[21]

Whereas much effort has been expended to examine the self-assessment of those who seek auditory rehabilitation and hence, presumably report their hearing loss, no studies have been found that evaluate those individuals who have presbycusis threshold shifts yet report no hearing impairment. The present study was designed to quantify aspects of communication performance with a sample of such persons. Measures of communication performance reported here are an audiological assessment, three speech perception tasks, and a self-report communication performance questionnaire designed for use with persons who have hearing loss.

## 2. METHODS

### 2.1 Subjects

Subjects were solicited by television, newspaper and poster advertisements. Two hundred and nine subjects, each of whom reported having no hearing impairment, participated in the study.. The only other criterion for inclusion was the willingness and ability to come to the audiology laboratory for testing and complete several hours of testing.

## 2.2. Procedures

**Communication Profile for the Hearing Impaired**. Subjects completed the Communication Profile for the Hearing Impaired (CPHI)[22,23] prior to attending the speech and hearing test session. The CPHI is comprised of 145 questions that assess the areas of communication performance, communication importance, communication environment, communication strategies, and personal adjustment. Subscales of the test allow further distinction of what areas may pose difficulty, or be strengths for the respondent.

**Audiometric testing**. Cursory otoscopic examination, screening impedance measures, and standard pure tone audiometry were completed bilaterally.

**Speech reception thresholds**. Adaptive speech reception thresholds were obtained bilaterally using an automated procedure described by Cheesman.[24]

**Consonant identification tasks**. Speech perception performance was measured using a 21-item nonsense word identification task (UWODFD).[25] The test consists of digitally-recorded nonsense words spoken in the same fixed word medial context /ʌCɪ/, in which C was one of /b,ʧ, d, f, g, h, ʤ, k, l, m, n, p, r, s, ʃ, t, ϑ, v, w, y, z/. The 21 test words were spoken by four talkers, two male and two female, creating a total of 84 test items. The listener's task is to select from one of the 21 words orthographically presented on a video monitor, using a mouse pointer. Following a practise session, the UWODFD test was administered binaurally at a 80 dB HL level twice. The first administration was conducted in a silent background; the second administration was done in a background of 80 dB HL speech-weighted noise generated by a GSI-16 audiometer.

# 3. RESULTS

All statistical analyses were conducted using a mixed design analysis of variance with a probability value of 0.05, unless otherwise specified.

## 3.1. Listening tests

Audiometric testing revealed a significant effect of age on better ear mean threshold measured by air conduction at 1000, 2000, 3000, and 4000 Hz (Figure 1). Thresholds increased with increasing age. A significant age effect was also found for the UWODFD presented in a noise background and the adaptive speech reception thresholds, with poorer performance evident with increasing age (Figures 2 and 3). There was no effect of age on the UWODFD in the quiet background, nor were there any effects of gender on any of the listening tasks.

## 3.2. CPHI questionnaire

In the scoring of the CPHI, response scales are adjusted such that a high value always represent a desirable response for a person with a hearing impairment (Figures 4-8; filled circles and solid lines). An analyses of variance for the CPHI scale scores did not reveal a significant effect of gender. The results were analysed further to explore the effect of age, when the effects of the hearing thresholds had been statistically controlled, using multiple regression techniques. Many of the possible 25 subscale results indicated significant age effects when the effect of puretone thresholds was controlled. These include (* indicates older persons performed better than younger):

- importance of communication at work
- importance of communication at home
- communication performance under adverse conditions

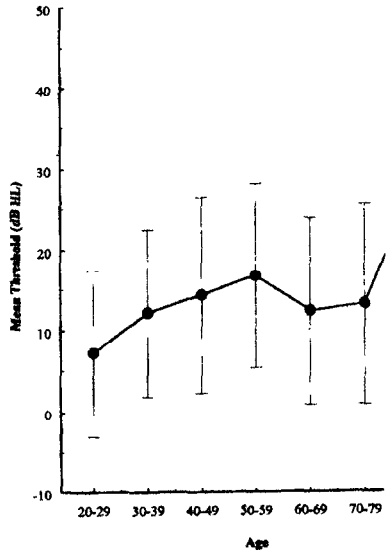


**Figure 1**: Better ear mean threshold measured at 1000, 2000, 3000, and 4000 Hz by age.

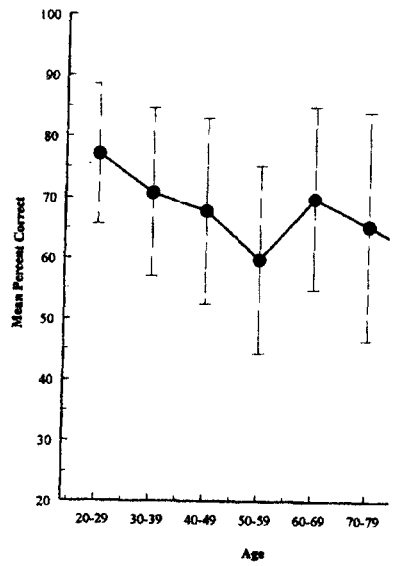


**Figure 2**: UWODFD performance in noise by age.

- communication need *
- physical characteristics of the environment *
- behaviour of others *
- maladaptive behaviours
- use of verbal communication strategies
- displacement of responsibility
- discouragement
- withdrawal

To assess the generalizability of the CPHI to different populations, the data from the present study were compared to the results from the Otologic Function Unit (OFU) conducted at Mt. Sinai Hospital, Toronto[26] and Walter Reed Army Medical Center (WRAMC).[27] Subjects who participated in the OFU study (n=318) were receiving audiological services for hearing impairment and those at the WRAMC (n=433) were participants in an aural rehabilitation program.

Response patterns of the three studies are similar, given the sample differences. The communication strategies scale demonstrates that our subjects report using fewer verbal and non-verbal strategies than other two groups and fewer maladaptive strategies in order to communicate effectively (Figure 7).

A similar pattern of responding is also seen on the personal adjustment scales (Figure 8). Only the denial and problem awareness scales show a poorer score for the present test group. This is not surprising given that many of the respondents had normal hearing and all reported having no hearing impairments.

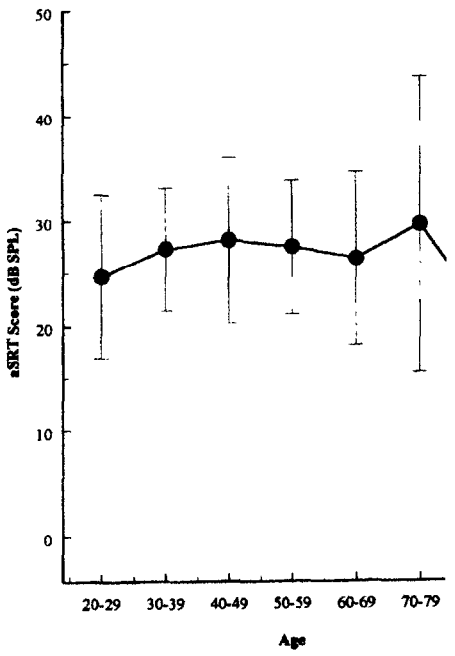


**Figure 3**: Adaptive speech reception thresholds by age.

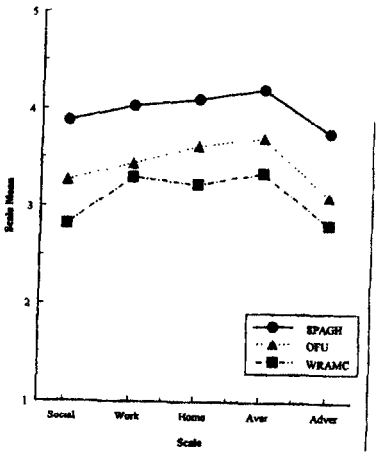


**Figure 4:** Communication performance scale scores for the three studies.

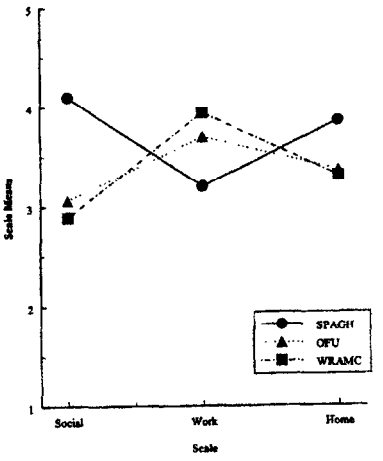


**Figure 5:** Communication importance scale scores.

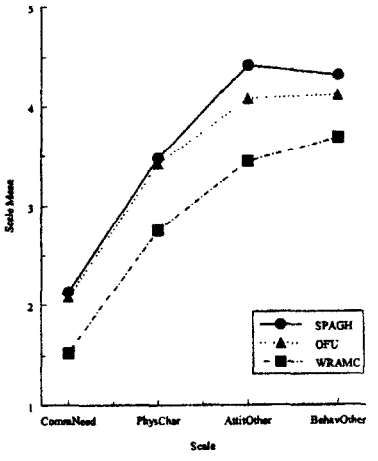


**Figure 6**: Communication environment scale scores.

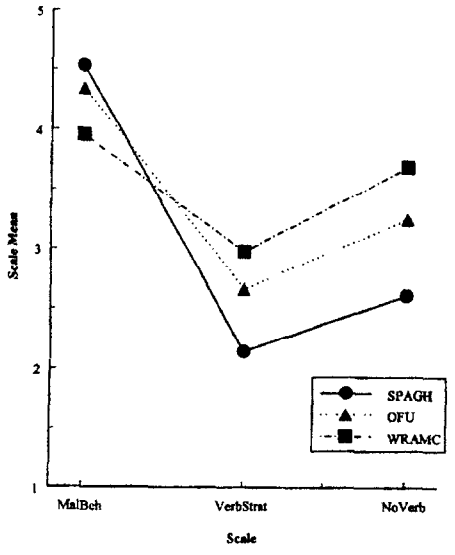


**Figure 7**: Communication strategies scale scores.

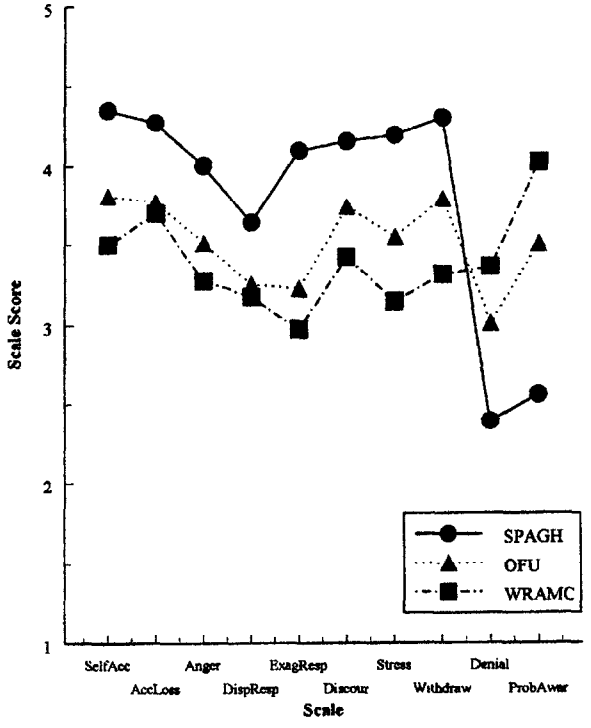


**Figure 8**: Personal adjustment scale scores.

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## 5.0 Acknowledgment


This research was supported by the Natural Sciences and Engineering Research Council of Canada.