

A RESEARCH REPORT:

## **Assessment of Hearing Handicap by Nursing Home Residents and Staff**

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*Two new hearing handicap measures were designed for and tested in nursing home settings. These indices, one for resident use and one for staff use, were administered to 105 residents and members of the staff of four different nursing homes in conjunction with pure tone tests given these same residents. Staff assessments of handicap correlated better with best pure tone average ( $r = .62$ ) than did assessments by the resident ( $r = .49$ ). Regular use of pure tone tests and hearing handicap assessment is urged for nursing home residents. Pure tone averages of 40 dB or greater and hearing handicap scores of 40% or greater are suggested as indicating substantial difficulty in the nursing home setting.*

Since the publication of the Hearing Handicap Scale (HHS), by High, Fairbanks and Glorig (1964), there has been a steadily increasing interest in self assessment of hearing difficulty. Blumenfeld, Bergman, and Millner (1969), Speaks, Jerger, and Trammell (1970), Berkowitz and Hochberg (1971), McCartney, Sorenson, and Maurer (1974) and Peters and Hardick (1974), have all reported on use of the HHS. Several attempts have been made to develop improved handicap scales or refine the original HHS (Noble and Atherley, 1970; Giolas, 1970; Koniditsiotis, 1971; Alpiner, Chevrette, Glascoe, Metz and Olsen, 1971; Ewertsen and Nielsen, 1973; Allen and Rupp, 1975; Sanders, 1975). Nobel and Atherley's (1970) instrument, the Hearing Measurement Scale (HMS),

involves an extensive interview process and was proposed for use with the patient having sensorineural loss. The authors of this scale suggest it is better for this purpose than the original HHS which was initially used mainly for mixed or conductive losses. However, McCartney, Maurer and Sorenson (1975) have shown that these two scales give reasonably correlated ( $r = .67$ ) results on the same presbycusis population. The HMS involves 42 items and thus many more than the 20 questions of each form of the HHS. The Denver Scale of Communication Function (DSCF) (Alpiner, et al., 1971) also involves a greater number of items than the HHS (25 items instead of 20) but involves a similar scaling technique. Other revisions have been made in an attempt to reduce the number of items in the scale. Koniditsiotis (1971) proposed a scale with seven items and Allen and Rupp (1975) have found that there are 12 items from form B of the HHS which are more effective than the others in measuring hearing handicap.

In working with the institutionalized nursing home resident in an aural rehabilitation program, the present investigators determined the presence of hearing loss through pure tone testing, but a measure of hearing handicap, or the extent of disability imposed by the loss was also viewed as being important to measure.

Accordingly, the HHS was first used with these residents, but it soon became apparent that the 20 items of the HHS made the test too long and further, the wording of the questions was not appropriate to their living situation. Alpiner, et al. (1971) also acknowledge that the Denver scale is not appropriate for the nursing home resident.

The purpose of the present study was to bring together a series of items that would be more appropriate for measuring hearing handicap of the nursing home resident and to compare the scores on this new measure with pure tone average for a sample of nursing home residents.

## METHOD

### *Development of New Hearing Handicap Index*

A preliminary selection of items was made for the index from a list of questions found to discriminate maximally between normal hearing and hearing impaired subjects (Tannahill and Schow, 1975). These items were similar to those used in the HHS, the HMS, and the DSCF. The present investigators then simplified the wording of the questions and made two versions of the index; one version was designed to be answered by the resident himself, while the other version was worded so as to be appropriate for answering by a member of the staff who was well acquainted with the resident. A five point scale similar to the one used in the HHS was used to obtain responses on the index and produced scores

for each version between 20 and 100. The higher the score, the greater the handicap. The measure was designated the Nursing Home Hearing Handicap Index (NHHI), and is contained in Appendix A. The first ten items are for questioning of individuals and are referred to as the self version, while the remaining ten items are designated as the staff version of this index.

### *Subjects*

In order to provide a representative sample on which to evaluate this new index, 105 residents of four nursing homes located in three different Idaho communities were used as subjects for the study. There were 22 men and 83 women in the sample resulting in a 79% proportion of women. This is only a slightly higher percentage than the 75% female preponderance found among the total resident population of these homes. The average age for the subjects was 80 years which is quite close to the mean age of 77.3 years for nursing home residents found in the National Health Survey (Wunderlich, 1965). Patients willing to undergo testing were evaluated in each facility without regard to whether or not they were aware of any hearing loss. There was no exclusion of subjects who had a history of middle ear infections, noise exposure or familial hearing loss. Specifically, the intent was to sample a cross section of nursing home residents with a variety of hearing loss etiologies. Nevertheless, the majority of hearing losses in this sample were assumed to be sensorineural and presbycusis in nature. No generalized condition such as widespread flu was present in the homes at the time of testing. All testing was done in March, April and May.

### *Procedure*

In each home, the quietest available area was used for testing purposes. Noise levels were judged to be sufficiently low to allow accurate measurement of thresholds, and in fact, the shape of the mean frequency data was consistent with findings in a study where ambient noise was carefully controlled (Goetzing, Proud, Dirks, and Embrey, 1961). A portable audiometer (Maico, Model 2B) calibrated to current standards (ANSI S3.6-1969) was used in all testing. Thresholds were obtained in both ears of subjects at 500, 1000 and 2000 Hz through use of the Carhart and Jerger (1959) method or a slight modification thereof in difficult-to-test cases. Thresholds for the better ear at each frequency were used for computation of a best pure tone average (PTA). The self version of the NHHI was administered prior to pure tone testing. Often residents required some help in completing the index, but care was taken to avoid leading the subject. One staff version of the index was given to a member of the nursing home staff for each resident tested. Only a staff person familiar

with the resident was invited to fill out such a form. Scoring of each version of the index was handled in an almost identical fashion as is used for the HHS. The only exception was that each version of the NHHI has ten items whereas the HHS has twenty items. Therefore, the NHHI scores were multiplied by two to make them equivalent. Scores on each item of the NHHI ranged from one to five. After multiplication, therefore, the total score on each index could range from 20 to 100 with greater handicap signified by higher scores. Statistics were based on these scores but conversion was subsequently made to percentages as is done with the HHS, and percentage scores (0-100%) appear in the tables of this study.

## RESULTS

Mean best PTA's, Staff NHHI and Self NHHI scores are shown for residents from each nursing home in Table 1. This table also shows the Pearson correlation coefficient ( $r$ ) found between the two types of NHHI scores and the  $r$  associated with each NHHI score and best PTA.

*Table 1.* Best pure tone average (PTA) in dB, mean Staff and Self Nursing Home Hearing Handicap (NHHI) scores in percent, and correlations between measures for each nursing home of study.

| Nursing Home | N   | PTA<br>$\bar{X}$ dB | Staff<br>NHHI<br>$\bar{X}$ % | Self<br>NHHI<br>$\bar{X}$ % | Staff &<br>PTA<br>$r$ | Self &<br>PTA<br>$r$ | Staff &<br>Self<br>$r$ |
|--------------|-----|---------------------|------------------------------|-----------------------------|-----------------------|----------------------|------------------------|
| A            | 32  | 39.8                | 32.4                         | 39.8                        | .43*                  | .45*                 | .14                    |
| B            | 26  | 42.7                | 41.5                         | 42.8                        | .75*                  | .63*                 | .53*                   |
| C            | 28  | 39.5                | 27.0                         | 38.8                        | .62*                  | .38*                 | .42*                   |
| D            | 19  | 38.8                | 46.8                         | 36.0                        | .82*                  | .57*                 | .43*                   |
| TOTAL        | 105 | 40.0                | 35.8                         | 39.5                        | .62*                  | .49*                 | .36*                   |

\*Significant at the .01 level

The mean best PTA in each nursing home was quite close to the overall mean for all subjects. The Staff NHHI Mean scores, however, reveal more variation from home to home. These staff mean values reveal something about the view of the staff members who filled out the scale. Since higher scores indicate greater handicap, it is obvious that personnel from homes B and D feel their residents have more hearing problems than the personnel from homes A and C feel their residents do. This occurs despite the fact that the actual mean PTA loss in all homes is about the same. It is interesting that the best correlations in Staff NHHI and PTA are also found in nursing homes B and D. Apparently those personnel who judge

the handicap to be greater are also the ones who have the clearest perception of which residents have a loss and which ones do not. Of course it must be remembered that while correlations between hearing handicap scores and PTA are generally higher than with other audiometric measures they are by no means expected to be perfectly correlated. Past studies show  $r$  values of about .5 to .75 (High, Fairbanks, and Glorig, 1964; Speaks, Jerger and Trammell, 1970; McCartney, Maurer and Sorenson, 1974). It is apparent that all communication problems are not related to hearing sensitivity. Nevertheless, higher correlations are appropriately taken as a positive indication of staff awareness of hearing problems in their residents.

Self NHHI scores show less variability and therefore, cluster closely about the overall mean. In addition, they are quite similar numerically to the mean best PTA's. This was not true for the staff scores. The correlations between the Self NHHI scores and the best PTA's were highest in the same nursing homes (B and D) where the staff correlations were high. This may suggest that where the residents have a clearer perception of the extent of their handicap, then so do the members of the nursing home staff. Nevertheless, in all but one case the Staff NHHI-PTA correlations were higher than the Self NHHI-PTA correlations. This is shown in the overall  $r$  of .62 for the staff correlations and .49 for the self correlations. Not surprisingly then, members of the staff are apparently more objective about and more aware of the handicap resulting from the hearing loss than the residents are themselves. The relation between staff and self perceptions of hearing handicap are shown in the last correlation column. Again, nursing homes B and D have the highest  $r$ 's. This substantiates the assumption that accuracy of self perception is related to the accuracy of staff perceptions. These correlations are generally the weakest of any with an overall  $r$  of .36. It is also in this area that the only nonsignificant correlation (.14 in home A) is found. Individual cases show that members of the staff and the person himself may take very different views about the seriousness of the handicap and the low correlation here bears this out on a general basis.

Table 2 shows the mean best PTA's, the mean Staff NHHI and the mean Self NHHI scores associated with different ranges of hearing loss. Without exception the mean Self NHHI scores closely approximate the mean best PTA's. Generally, then, these data indicate an orderly correspondence between the hearing loss as shown by PTA and the self hearing handicap scores. As hearing loss gets greater, the perception of handicap is found to be greater and the increment is similar even though measured in different units. There are some exceptions to such a general trend in the staff NHHI scores. This deviation suggests several observations. First, assuming the staff member is the more objective observer his

Table 2. Mean best pure tone average (PTA) in dB and mean Staff and Self Nursing Home Hearing Handicap Index (NHHI) scores in percent for subjects grouped in different ranges of best PTA.

| PTA Range (dB) | N  | PTA $\bar{X}$ dB | Staff $\bar{X}$ % | Self $\bar{X}$ % |
|----------------|----|------------------|-------------------|------------------|
| 0-25           | 23 | 17.0             | 9.8               | 19.5             |
| 26-39          | 26 | 31.6             | 31.4              | 29.9             |
| 40-54          | 32 | 46.7             | 44.5              | 46.5             |
| 55-69          | 17 | 59.0             | 47.2              | 55.3             |
| 70-90          | 7  | 73.7             | 70.8              | 70.4             |

scores indicate that the resident with normal hearing (0-25 dB) has few communication problems as signified by a low, 9.8% mean NHHI score. The resident himself, on the other hand, may overexaggerate his hearing problem as shown by a 19.5% mean NHHI score. The resident with slight loss (26-39 dB) and the staff person observing him tend to agree on the magnitude of handicap, but as the loss gets greater reaching the mild (40-54 dB) and moderate (55-69 dB) loss range the staff person tends to perceive handicap in these two groups as similar even though the loss is greater in the moderate group. Only when the loss reaches the severe range (70-90 dB) does the observer notice a distinctly greater handicap.

#### DISCUSSION

One important reason for making an assessment of hearing handicap is that the handicap associated with a given loss may vary from person to person. In a nursing home particularly, the life style and the demands on hearing change, and it is important to take such factors into account in aural rehabilitation procedures. A hearing loss in a nursing home resident will in most cases need to be handled differently than the same hearing loss found in a person outside the nursing home setting.

The present data provide some insight on a group basis as to the magnitude of this handicap difference. It is of interest in this connection to compare the present data with handicap scores obtained in several other studies. In Table 3, mean ages, PTA's, and hearing handicap scores are listed for several studies. Correlations between PTA and hearing handicap scores are also shown and indicate similar values of  $r$  for all studies. While the present study did not use the same specific items nor as many items as the HHS form used in the remainder of the studies, the present NHHI form was composed of rather similar items and was scored

Table 3. Mean ages, mean pure tone averages (PTA's), mean Hearing Handicap Scores (HHS) and correlations (r) for subjects in various studies.

| Study                | Age<br>$\bar{X}$ | PTA<br>$\bar{X}$ dB | HHS<br>$\bar{X}$ %          | PTA-HHS<br>(r) |
|----------------------|------------------|---------------------|-----------------------------|----------------|
| High, et al.         | 49               | 30.4                | 44.4                        | .65            |
| Speaks, et al.       | 59               | 34                  | 42                          | .72            |
| Berkowitz & Hochberg | 70               | 36.1                | 45.3                        | .57            |
| McCartney, et al.    | 74               | 44.4                | 45.2                        | .66            |
| Schow & Nerbonne     | 80               | 40.0                | 39.5 (Self)<br>35.8 (Staff) | .49<br>.62     |

nearly identical. This table reveals that only in the present study and in the study by McCartney, et al. (1974) were scores of hearing handicap nearly equal to PTA. All other HHS scores substantially exceeded mean PTA. An examination of the subject selection process for the other studies reveals that subjects were drawn from clinical populations in all except the McCartney, et al. and the present study. In these latter investigations, subjects were tested randomly in geriatric populations and were not seeking hearing help as in the other clinical studies. Only in the present study were hearing handicap scores lower than the PTA. Thus, the present scores indicate, as expected, that the subjects in a nursing home setting have milder degrees of hearing handicap than any other group even though they have as much as a 10 dB poorer mean PTA. This finding provides face validity for the adequacy of the present new handicap measure.

Furthermore, whereas 30 dB is recognized as a level of handicapping impairment in the general population, these handicap scores suggest that 40 dB is the general level for handicap in the nursing home setting. While this inference is admittedly speculative, it is confirmed by the general practice of using 40 dB as a screening level in nursing homes (Hull and Traynor, 1975) and is further supported by the observation made by Schow and Tannahill (1976) that HHS scores in excess of 40% are typical of subjects requiring amplification and auditory rehabilitation. Table 3 shows that the means for clinical subjects all exceeded this level, while Table 2 reveals that in nursing home subjects only those with 40 dB or greater loss had such a mean handicap value.

#### SUMMARY

The present study reported on two new hearing handicap measures, the Self and Staff Nursing Home Hearing Handicap Indices (NHHI) which may be used to evaluate communicative handicap in a geriatric

institutionalized population. The Self NHHI and the Staff NHHI were administered on 105 residents of four different nursing homes in connection with pure tone threshold tests given. Best PTA and NHHI scores were compared. The results revealed that when using PTA as a standard, some nursing home staffs are better than others in making such handicap assessments. Overall Staff NHHI scores generally correlated better ( $r = .62$ ) with PTA than did Self NHHI scores ( $r = .49$ ) indicating that staff personnel are more objective in such evaluations. Comparison of NHHI percentage scores for different degrees of loss revealed that according to the "objective" staff observer, the residents with normal hearing (0-25 dB) have little hearing handicap (9.8%), while mean scores from those with mild to moderate losses (40-69 dB) reach the range of handicap (44% - 47%) evident in most hearing impaired clinical populations measured by HHS (42% - 45%). PTA's of 40 dB or greater are suggested as being indicative of substantial hearing handicap in a nursing home setting. NHHI scores of 40% or greater may also be viewed as a symptom of serious handicap when reported by the resident or the staff. It is advised that all three measures (PTA, Self and Staff NHHI) be used in evaluating hearing status and in planning aural rehabilitation for the nursing home resident.

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## APPENDIX A

NURSING HOME HEARING HANDICAP INDEX (NHHI)  
(Self version for resident)

|  | VERY<br>OFTEN | 4 | 3 | 2 | ALMOST<br>NEVER<br>1 |
|--|---------------|---|---|---|----------------------|
| 1. When you are with other people do you wish you could hear better?   | 5             | 4 | 3 | 2 | 1                    |
| 2. Do other people feel you have a hearing problem (*when they try to talk to you)?                                    | 5             | 4 | 3 | 2 | 1                    |
| 3. Do you have trouble hearing another person if there is a radio or TV playing (in the same room)?                    | 5             | 4 | 3 | 2 | 1                    |
| 4. Do you have trouble hearing the radio or TV? 5  | 5             | 4 | 3 | 2 | 1                    |
| 5. (How often) do you feel life would be better if you could hear better?  | 5             | 4 | 3 | 2 | 1                    |
| 6. How often are you embarrassed because you don't hear well?  | 5             | 4 | 3 | 2 | 1                    |
| 7. When you are alone do you wish you could hear better?   | 5             | 4 | 3 | 2 | 1                    |
| 8. Do people (tend to) leave you out of conversations because you don't hear well?                                     | 5             | 4 | 3 | 2 | 1                    |
| 9. (How often) do you withdraw from social activities (in which you ought to participate) because you don't hear well? | 5             | 4 | 3 | 2 | 1                    |
| 10. Do you say "what" or "pardon me" when people first speak to you?   | 5             | 4 | 3 | 2 | 1                    |

\*words in parenthesis are optional when items are read to resident.

NURSING HOME HEARING HANDICAP INDEX (NHHI)  
(Staff Version)

|   | VERY<br>OFTEN |   |   | ALMOST<br>NEVER |   |
|---|---------------|---|---|-----------------|---|
| 1. When this person is with other people does he/she need to hear better?   | 5             | 4 | 3 | 2               | 1 |
| 2. Do members of the staff, family and friends make negative comments about this person's hearing problem?            | 5             | 4 | 3 | 2               | 1 |
| 3. Do they have trouble hearing another person if there is a radio or TV playing in the same room.                    | 5             | 4 | 3 | 2               | 1 |
| 4. When this person is listening to radio or TV do they have trouble hearing?   | 5             | 4 | 3 | 2               | 1 |
| 5. How often do you feel life would be better for this person if they could hear better?                              | 5             | 4 | 3 | 2               | 1 |
| 6. How often are they embarrassed because they don't hear well?   | 5             | 4 | 3 | 2               | 1 |
| 7. When they are alone do they need to hear the everyday sounds of life better?                                       | 5             | 4 | 3 | 2               | 1 |
| 8. Do people tend to leave them out of conversations because they don't hear well?                                    | 5             | 4 | 3 | 2               | 1 |
| 9. How often do they withdraw from social activities in which they ought to participate because they don't hear well? | 5             | 4 | 3 | 2               | 1 |
| 10. Do they say "what" or "pardon me" when people first speak to them?  | 5             | 4 | 3 | 2               | 1 |

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