A Hearing Screen Test For The Elderly

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The percentage of elderly in the population of the United States is becoming larger. For example, in 1900, four percent of the population were age 65 and older. In 1978, the figure was 10.9%, (DHEW, 1978). Estimates (of varying accuracy) of hearing loss among the elderly range from as low as seven percent for the non-institutionalized (National Center for Health Statistics, 1975) to as high as 25% for the well-elderly between ages 65 and 74 (DHEW, 1975), 48% for those age 75 and older (Public Health Service, 1968), and 90% for the institutionalized elderly (Chafee, 1967).

Disagreement about accuracy of the numbers cannot obscure the trend and should not obscure the fact that hearing loss among the elderly is now a significant health problem. The hearing impaired elderly need to be served by audiologists and other hearing health care and rehabilitative professionals. To accomplish appropriate referrals to health care professionals, those elderly must be identified.

The need for reliable methods of identification has been recognized for some time and hearing assessment scales and communication inventories abound in the literature (High, Fairbanks and Glorig, 1964; Noble and Atherly, 1970; Shotola and Maurer, 1974; Alpiner, 1975; Schow and Nerbonne, 1977; Giolas, et

al., 1979). Those scales often are useful in providing baseline data on behavioral symptoms associated with hearing loss and in profiling areas of communication deficiency. They may be criticized as methods of identifying hearing loss in the elderly, however, because they are time-consuming and, in some cases, require professional administration. We have developed what we believe to be a simple and efficient hearing screen for quick identification for those elderly needing audiologic assessment.

Of particular interest to use was the Shotola and Maurer (1974) six-question hearing screen which was developed from the High, Fairbanks and Glorig Hearing Assessment Scale (1964). It is simple, does not require professional assistance and, according to its authors, predicts hearing loss among the elderly. The authors report that the six-item questionnaire yields a multiple correlation coefficient of .749 with pure tone averages. Item analysis reveals that 85% of those with significant hearing loss (defined as 45 dB or worse) would have been correctly identified.

We have tried the Shotola and Maurer questionnaire in our clinic, but have been disappointed with its low predictive value. Our experience has been that the patient denies his hearing deficit and, therefore, would not be referred for audiologic evaluation. To overcome that problem while, at the same time, retaining the short form, we developed a list of projective-type questions, e.g., "Do you find that people tend to speak too softly?" Initial field testing determined the efficacy of such questions.

The purpose of our study was two-fold:

(1) To assess the combined and separate predictive values of the Shotola-Maurer questionnaire and the newly constructed Manzella-Taigman questionnaire;

(2) To apply the more predictive scale to a sample population of elderly.

METHOD

Subjects

The sample population was drawn at random from the following:

(1) A local Los Angeles hospital during a community health clinic day (represents lower and middle class status);

(2) Two residential homes of well-elderly in Santa Monica, California (one home has a predominance of low SES, the other, high SES).

The 73 subjects (54 female; 19 males) ranged in age from 62 to 99 with a mean of 79.

Data Collection

On the basis of extant literature and research relative to at-

titudes, motivations and behaviors of hearing impaired elderly, and as a result of extensive field study, interviews, we constructed a 16-item questionnaire. The Manzella-Taigman portion comprises questions one through ten. Note the projective nature of questions one through four, six, nine and ten. Shotola and Maurer's questions are 11 through 16 and reflect the six most

FIGURE I

Name _____ Age _____

SELF ASSESSMENT OF HEARING

Please answer YES or NO to the following questions:

1. Do you find that people fail to speak clearly? _____
2. Do you find that people speak too softly? _____
3. Do you find that people tend to speak too quickly? _____
4. Do you think you have a problem with your hearing? _____
5. Have you ever owned a hearing aid? _____
6. Do you hear better when you can see the speaker's face? _____
7. Has your hearing been getting worse over the last five to ten years? _____
8. Do you have a ringing or buzzing in your ears which bothers you when you are in a quiet place? _____
9. Do people tell you that you speak too softly? _____
10. Do people tell you that you speak too loudly? _____
11. Do you feel that any difficulty with your hearing limits or hampers your personal or social life? _____
12. Can you carry on a telephone conversation without difficulty? _____
13. Can you hear when somebody speaks in a whisper? _____
14. Can you carry on a conversation with one other person when you are in a noisy place such as a restaurant or at a party? _____
15. Does any problem or difficulty with your hearing upset you at all? _____
16. Can you hear when someone rings the doorbell or knocks on the door? _____

DO NOT WRITE BELOW DOTTED LINE

	500	1000	2000	4000	6000	8000
RIGHT						
LEFT						

predictive questions selected out of the High, Fairbanks and Glorig Hearing Assessment Scale. The 16-item questionnaire is set out in Figure 1.

Equipment

On-site testing was performed with portable audiometers with Amplivox Audiocups. The Tractor RA-216 Rudmose-Audiometer and Audiotone AU1 were calibrated to ANSI 1969 standards one week before the tests were conducted.

Procedure

Each subject was asked to respond to the 16-item questionnaire by writing "yes" or "no" to each question. We selected a two-item discrete response as opposed to a continuous response on the basis of geriatric behavioral research. That research indicates that, as ambiguity of response choice increases, the elderly perform less optimally, i.e., they omit responses or choose the least risky response as the number of choices increase (Botwinick, 1973; Reese and Botwinick, 1971; Kaplan, 1978). Each subject was asked to state his or her age.

TABLE 1

SUMMARY TABLE M/R

Dependent Variable: Average N=73

	Variables	Multiple R	Variance	RSQ Change	Simple R	F
1.	X8 Aid	0.52016	0.27056	0.27056	-0.52016	9.05
2.	X5 Soft	0.62743	0.39367	0.12311	-0.46817	4.39
3.	X17 Noisy	0.66355	0.44003	0.04636	0.34395	5.51
4.	X3 Age	0.69476	0.48269	0.04267	0.40331	9.11
5.	X14 Limits	0.72417	0.52443	0.04173	-0.36499	6.80
6.	X12 Speaksof	0.73486	0.54002	0.01559	-0.19386	2.23
7.	X19 Door	0.74132	0.54956	0.00954	0.33965	
8.	X4 Clear	0.74496	0.55496	0.00540	-0.36987	
9.	X11 Buzz	0.74740	0.55861	0.00365	-0.17336	
10.	X2 Sex	0.74883	0.56074	0.00213	-0.19661	
11.	X13 Speaklo	0.74932	0.56148	0.00074	0.15497	
12.	X10 Worse	0.74991	0.56236	0.00088	-0.19482	
13.	X18 Upset	0.75029	0.56293	0.00057	-0.17996	
14.	X15 Phone	0.75064	0.56346	0.00053	0.16593	
15.	X7 Problem	0.75089	0.56384	0.00038	-0.40655	
16.	X16 Whisper	0.75096	0.56395	0.00011	0.39426	

After the questionnaires were completed, the subjects were given pure tone air conduction tests at 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 6000 Hz, 8000 Hz by licensed and certified audiologists. Subjects were given the results of the pure tone tests and referred to their family physicians if they failed the screening criterion.

RESULTS

Responses to the 16 questions and the ages of the subjects (independent variables) were entered freely into a step-wise multi-

ple regression equation with the mean of the speech frequencies for the better ear (AVERAGE) defined as the dependent variable. Significant results were shown to have been obtained from five of the 16 questions and the age of the subjects, representing the combined predictive value of the Shotola-Maurer questions and the Manzella-Taigman questions. Those results establish that the responses to those six items do predict hearing loss, accounting for 54% of the variance with a multiple correlation of .73 (Table 1).

The following are the significant questions or items with the appropriate predictive responses:

(1)	Have you ever owned a hearing aid?	YES
(2)	Do you find that people tend to speak too softly?	YES
(3)	Can you carry on a conversation with one other person when you are in a noisy place such as a restaurant or at a party?	NO
(4)	Age?	75 or older
(5)	Do you feel that any difficulty with your hearing limits or hampers your personal or social life?	YES
(6)	Do people tell you that you speak too softly?	YES

A response analysis was conducted to determine the differentiating effect of the six items relative to degree of the hearing loss (Table 2). Results established that:

(1) Those subjects with 40 dB or worse hearing in the better ear gave three or more positive indicators of hearing loss;

(2) Those subjects with "good" hearing (less than 30 dB average) gave less than three positive indicators of hearing loss;

(3) Those subjects with mild hearing losses (30 dB to 39 dB demonstrated no discernible pattern of response.

If one point is given for every response predictive of hearing loss and one point for ages 75 years and older, then three points is a resonable criterion for audiologic referral. Of those with 40 dB average hearing losses, 21 out of 25 or 84% would have been correctly identified; of those with "good" hearing, only three or 11.5% would have been incorrectly identified.

Separate analyses done for the Shotola-Maurer (1974) questions and the Manzells-Taigman questions accounted for 29% and 42% of the variance respectively, indicating less predictive value than the combined effect of the questionnaires. Therefore,

STUDY I
TABLE 2

PREDICTIVE QUESTIONS: VARIABLES X8,X5,X17,X3,X14,X12

Dependent Variable: Average N=73

Average = 30 dB		Average = 30 to 39 dB		Average = 40 dB	
# responses	N	# responses	N	# responses	N
0	4	0	2	0	0
1	5	1	6	1	0
2	14	2	4	2	4
3	3	3	8	3	7
4	0	4	0	4	10
5	0	5	2	5	4
6	0	6	0	6	0
Total	26		22		25
Percent	11.5%		45%		84%

response analysis was not carried out for the studies as separate entities.

NEW TEST DATA

Recently, we administered the six significant items to a sample population of 76 subjects ranging in age from 60 to 97 years with a mean age of 73. Pure tone audiometric tests were administered in a sound booth using a Beltone 200C audiometer calibrated to ANSI 1969 standards. As in the first study, the mean of the speech frequencies for the better ear was taken as the dependent variable and the six items were analyzed for predictive value (Table 3).

STUDY II
TABLE 3

PREDICTIVE QUESTIONS: VARIABLES X8,X5,X17,X3,X14,X12

Dependent Variable: Average N=76

Average = 30 dB		Average = 30 to 39 dB		Average = 40 dB +	
# responses	N	# responses	N	# responses	N
0	9	0	2	0	1
1	12	1	6	1	0
2	10	2	3	2	2
3	8	3	3	3	10
4	0	4	2	4	4
5	0	5	0	5	2
6	0	6	0	6	2
Total	39		16		21
Percent	20%		31%		85%

Response analysis showed results in good agreement with the original study. Indeed, 85% of those subjects with significant hearing loss (40 dB or greater) were correctly identified using the criterion of three positive indicators out of six items. Those with "good" hearing (30 dB) would have been over-referred at the rate of 20%.

DISCUSSION AND IMPLICATIONS

Shenoy et al. (1978) found that the High, Fairbanks and Glorig Hearing Assessment Scale correctly identified 18 of 21 (85.7%) of those needing audiologic referral. The Shotola-Maurer scale alone correctly identified 85% of those with hearing losses greater than 45 dB. The results of our studies compare favorably with the predictive value of those methods.

Step-wise multiple regression was chosen as the method of statistical analysis of the 16-item questionnaire in order to select those items which were independent and which significantly contributed to the percentage of variance explained. As a result, to the subject, the six items comprising the final Manzella-Taigman Questionnaire do not appear obviously related to one another. There is no apparent flow from one item to the next and the items even may appear disjointed and unconnected. It is those very characteristics which have resulted in the six items satisfying the assumption of independence.

The real advantage of the six-item Manzella-Taigman Questionnaire, we believe, is that it is both simple and quick, as well as predictive. Those characteristics make it more useful than others in identifying the hearing impaired elderly. Because professionals are not needed for its administration, our questionnaire can be given easily in a variety of settings, including senior citizens centers, board and care facilities, acute hospitals and medical offices. It serves as a desirable alternative to other, more lengthy methods and constitutes an important first step in an effective geriatric aural rehabilitation program.

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