An Aural Rehabilitation Screening Scale: Self Assessment, Auditory Aptitude, and Visual Aptitude

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The Alpiner-Meline Aural Rehabilitation Screening Scale (AMAR) is designed to identify individuals who may need aural rehabilitation. The AMAR Screening Scale allowed us to identify problems related to hearing loss in three categories: (a) self assessment, (b) visual aptitude, and (c) auditory aptitude. Further, the AMAR Screening Scale identifies the effects of hearing loss which cannot be identified solely on the basis of diagnostic audiometric or hearing aid evaluation data.

Frankel (1981) reports that a decrease in pure-tone hearing sensitivity interferes with communication function in different ways for different people. A number of authors have attempted to quantify these relationships through the use of hearing handicap scales (Alpiner, 1987; Demorest & Erdman, 1987; Ewertsen & Birk-Nielsen, 1973; Giolas, Owens, Lamb, & Schubert, 1979; High, Fairbanks, & Glorig, 1964; Hutton, 1980; Kaplan, Feeley, & Brown, 1978; Noble & Atherley, 1970; Sanders, 1988; Schow & Nerbonne, 1977; Ventry & Weinstein, 1983). Other authors have examined and modeled the ability of adults with hearing loss to perceive measures of auditory recognition and discrimination (Boothroyd, 1984; Owens & Schubert, 1977; Sanders, 1982).

Still others have examined the normal and hearing-impaired persons' visual reception of speech in syllables, words, and running speech (Binnie, Jackson, & Montgomery, 1976; Owens & Blazek, 1985; Spitzer, Leder, Milner, Flevaris-

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Phillips, & Giolas, 1987; Tye-Murray & Tyler, 1988). In addition, authors have studied the simultaneous reception of auditory and visual information (Binnie, Montgomery, & Jackson, 1974; Sumby & Pollack, 1956) as well as the effect of degraded auditory and visual signals on the ability to perceive speech (Erber, 1972, 1974). However, information is limited regarding the use of these measurement tools as a means for efficient screening of candidates for aural rehabilitation.

A number of short screening instruments have been developed, for example, a communication screening profile which has a total of 20 test items for use with geriatric clients (Schow & Nerbonne, 1977). Later, Manzella and Taigman (1980) introduced a hearing handicap scale for the elderly. Ventry and Weinstein (1983) developed a 10 yes/no item hearing handicap screening scale for senior citizens based on the Hearing Handicap Inventory for the Elderly (HHIE-S). These screening scales are designed to identify geriatric patients who need aural rehabilitation services by assessment of both an individual's difficulties in specific situations and his/her feelings about hearing loss. However, these measures do not consider visual and auditory communication modalities. Further, they may not be appropriate measures for use in clinical settings with different age ranges of adult clients.

Alpiner and Garstecki (1989) indicated that self report measures of skills related to the communication competence of hearing-impaired individuals have been given low priority in many clinical settings. Lesner (1990) postulated that a number of factors are responsible for this lack of attention to the development of self-assessment tools. Possible reasons for this situation include a lack of awareness of present assessment tools, time constraints in ENT clinical practices, and limited funding sources for aural rehabilitation procedures. Factors reported by Alpiner, Meline, and Cotton (1990) include poor cost effectiveness and poor accessibility of assessment tools through commercial sources. These factors cannot be viewed lightly when determining procedures to be included in a basic test battery designed for adult hearing-impaired individuals. The need for non-audiometric, cost effective procedures, for measuring additional related modalities of communication performance exists. The purpose of this study, therefore, was to develop an aural rehabilitation screening scale that includes items sensitive to three independent modalities of communication behavior. These modalities include self assessment of hearing handicap, visual aptitude, and auditory aptitude.

METHOD

Subjects

Subjects were selected according to the following criteria: (a) 35 to 85 years of age, (b) hearing loss based on a modified pure tone average (500, 1000, 2000, and 3000 Hz) for the better ear between 15 dB and 60 dB HTL, and (c) normal or corrected vision within normal limits as determined by the hospital Optometry

Service. The 48 male, veteran subjects selected for this study ranged in age from 44 to 80 years, with a mean age of 62 years, 4 months, and a standard deviation of 7.6. Twenty-four subjects displayed a mild hearing loss (15 to 40 dB HTL); and 24 subjects displayed a moderate hearing loss (41 to 60 dB HTL). Group A consisted of 24 individuals who were non-hearing aid users and Group B was composed of individuals who had worn hearing aids for one or more years. Descriptive statistics for Group A and Group B are presented in Table 1.

Table 1

Descriptive Statistics for Hearing Aid Users and Non Users

	Group A: Hearing Aid Users			Group B: Non Users		
	AGE	**PTA**	**WDS**	**AGE**	**PTA**	**WDS**
Mean	63.9	45.92	85.75	60.11	34.91	87.50
SD	7.6	11.50	9.24	7.60	9.21	11.09
Range	51.4-79.8	21-79	64-100	44.1-73.8	22-54	64-100

PTA = modified PTA (.5k, 1k, 2k, and 3k Hz) and WDS = word discrimination score. $n = 24$ for groups A & B; Total $n = 48$.

Materials

To measure hearing handicap behavior, nine items from the McCarthy-Alpiner Scale of Hearing Handicap were chosen (McCarthy & Alpiner, 1983). This test was chosen because it: (a) provides an index of whether the organic hearing loss has manifested itself as a handicap; (b) provides diagnostic data with rehabilitative implications; and (c) provides for a detailed analysis of psychological, social, and vocational problem areas (McCarthy & Alpiner, 1983).

To measure visual aptitude for lipreading, five items were arbitrarily chosen from the Denver Quick Test of Lipreading Ability (Alpiner, 1978). This test originally contained 20 common expressions, and has been correlated ($r = .90$) (McNeil & Alpiner, 1975) with the Utley Sentence test (Jeffers & Barley, 1971) of speechreading ability.

The Larsen Sound Discrimination Test (1950) was chosen to represent auditory aptitude. This test was designed to provide information about particular consonant sounds that present discrimination difficulties to the listener. It is composed of 35 sets of five or more paired words. In each set, one phoneme is varied, resulting in a high degree of acoustic information for each consonant set. A collection of 6 word-pair items was chosen for use on the basis of pilot data (Alpiner et al., 1990). The word-pair items emphasize high frequency consonants which tend to be problems in presbycusis or hearing loss due to noise exposure.

Procedures

Following a basic audiometric test battery (including immittance audiometry,

air and bone conduction threshold testing, speech reception thresholds and word recognition scores), subjects completed the AMAR Screening Scale. The scale was administered in a quiet room by one of three clinicians who was trained for the task. Items were presented to subjects in an interview format. Data were scored by the examiners immediately following the subject's responses.

Each subtest of the AMAR Screening Scale was scored independently. Part I, Self Assessment of Hearing Handicap, had nine items rated in terms of five possible responses: ALWAYS, USUALLY, SOMETIMES, RARELY, and NEVER. For all of the items, (except item number five), ALWAYS refers to the maximum negative response possible, that is, a problem exists. For item number five, NEVER refers to the maximum negative response.

For purposes of this study, a functionally significant problem was indicated when the response was either ALWAYS, USUALLY, or SOMETIMES. (For number five, a problem was counted when the response was either NEVER, RARELY, or SOMETIMES.) The possible number of problems for PART I can range from 0 to 9.

The five visual aptitude sentences were presented face to face by an experienced aural rehabilitation clinician at a distance of five feet (Romano & Berlow, 1974) in a therapy room, with a normal to slow articulatory rate and no voice. Client's oral responses were scored on the basis of the examiner's judgement as to whether or not the client identified the thought or idea of the stimulus (see Appendix). The minus sign was circled for sentences which were not identified.

For auditory aptitude, six CVC or CV items were tested. For each of the six items, the examiner asked the subject to circle one of two words. For example, the subject was asked to circle the word "chew," for the item pair of "few-chew." The word was presented live voice in an IAC Sound Suite at a distance of five feet. A $5'' \times 8''$ perforated card was held at three inches from the mouth so that no visual cues are received by the subject. The minus sign was circled for each incorrect response. The items were presented in both quiet and noise conditions in an IAC Sound Suite by trained aural rehabilitation examiners. The speech noise was adjusted for an approximate S/N ratio of +6 dB (Binnie et al., 1974).

The AMAR scores were calculated as the total number of "minuses" or problems indicated on the AMAR form (see Appendix). The total time required for administration, scoring, and interpretation of the test was approximately 15 minutes.

RESULTS

Item Analysis

A mild but significant correlation was noted for auditory aptitude in quiet and auditory aptitude in noise, $r = .3475$, $p < .01$. These results indicated a shared variance for these two tests. The error rate for the individual 16 items for the two auditory cue conditions was compared. Ten of the 16 item pairs that were the least discriminative (i.e., had the lowest error rates) were deleted from addi-

tional experiments and analysis leaving the six item pairs which were used for the auditory aptitude section. All six of these items were from the "in quiet" testing condition.

Preliminary Analysis

A four by four correlation matrix for the performance of the 48 subjects for the four subtests of the screening scale is presented in Table 2.

The correlation matrix was constructed to identify which subtests may be providing redundant information. Subtests of the screening scale were condensed to (a) Part I: Self Assessment of Hearing Handicap; (b) Part II: Visual Aptitude; and (c) Part III: Auditory Aptitude. The total of the twenty remaining items on these three subtests now comprise the Alpiner-Meline Aural Rehabilitation (AMAR) Screening Scale (see Appendix).

Further Analysis

A multiple regression analysis revealed that scores on each subtest of the AMAR scale correlated significantly with the total score (Subtest 1: $r = .763$, $p < .01$; Subtest 2: $r = .476$, $p < .01$; Subtest 3: $r = .422$, $p < .01$).

Subjects were then divided into two equal groups of 24 on the basis of hearing aid use as previously described. Negative score frequencies for the 20-item AMAR Screening Scale were compared between hearing aid users and non-hearing aid users via chi-square cross tabulations. There were no significant differences in error rate between two groups with the exception of Part I, item 3, $\chi^2 = 4.54$, $p < .03$. These results indicate that individuals with a hearing loss,

Table 2

AMAR Subtests Means, Standard Deviations, and Correlation Matrix among Subtests
$N = 48$

	Subtests			
	1	**2**	**3**	**4**
Number Items	9	5	6	6
Mean	4.60	1.06	2.00	1.96
SD	2.54	1.10	1.30	1.32
	Correlation Matrix			
Subtests				
1	–	.09	.01	.01
2		–	.09	−.17
3			–	.35*
4				–

Note: Subtest 1: Self Assessment of Hearing Handicap, Subtest 2: Visual Aptitude, Subtest 3: Auditory Cue Aptitude in Quiet, and Subtest 4: Auditory Cue Aptitude in Noise.

*Significant correlation $p > .05$.

who do not wear amplification, feel more frustrated about communication failure than those individuals who wear hearing aids.

For the purpose of examining total performance on the AMAR Screening Scale, subjects were collapsed into one group. A frequency distribution of errors is displayed in Figure 1. From this figure it can be easily recognized that error performance was fairly normally distributed. Therefore, percentile ranks for scoring purposes were established on the basis of error rate for 48 individuals.

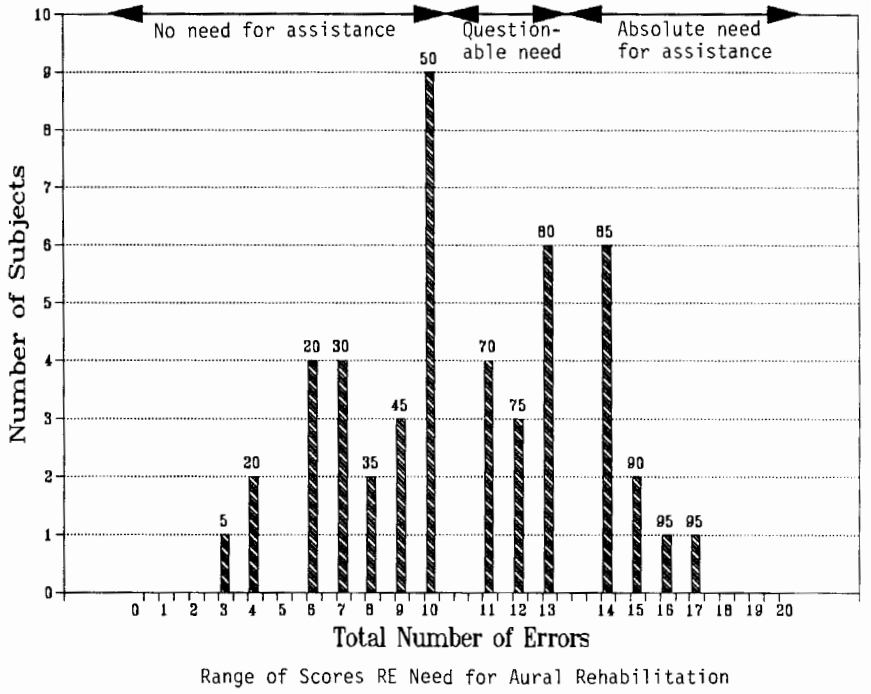

Figure 1. Frequency of Errors, AMAR Screening Scale.

Two standard deviations from the mean is a standard psychometric margin for evaluating data (Freund, 1988). It was determined that individuals who scored within the 85th percentile or above for the number of errors on the AMAR Screening Scale could be identified as those with absolute needs for aural rehabilitation services. "Absolute needs" are defined as individuals who demonstrate significant difficulties in utilizing resources, coping skills, and auditory/visual information to optimum benefit. The range of "Questionable needs" for aural rehabilitation services was established as the 70th to the 84th percentile range. Questionable need is defined as those individuals who demonstrate moderate difficulty in psychological, social, or vocational adjustment to hearing loss, and/or limited aptitude in using auditory or visual cues to enhance communication

ability. Results indicate that individuals who fall into the range of 1st to 69th percentile were considered to be unlikely to need aural rehabilitation.

SUMMARY AND CONCLUSIONS

A screening scale has been developed that attempts to differentiate between individuals for whom application of a hearing aid has been sufficient to alleviate communication difficulties, and those persons who may require additional aural rehabilitation. We believe that the AMAR Screening Scale meets the criteria for application with both hearing aid and non-hearing aid users since it queries social, psychological, and vocational difficulties as well as visual and auditory communication capabilities. It was quick and efficient to administer. Further study should be directed toward measuring reliability and validity of these measures with larger populations. It is hoped that this study will serve as a catalyst in the development of a new generation of screening scales in aural rehabilitation which may enable clinicians to screen clients who need only hearing aids as compared to those who may need further aural rehabilitation measures such as speechreading, auditory training, and counseling.

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APPENDIX

ALPINER-MELINE AURAL REHABILITATION (AMAR) SCREENING SCALE

Name: _____

Birthday: _____ Age: _____ SSN: _____

Hearing Aid Status:

(Circle one) NONE ITE BODY BONE EYEGLASS MONAURAL BINAURAL

Number of Years of hearing aid use: _____

Occupation: _____

Audiologist: _____ Date of Screening: _____

PART I: SELF ASSESSMENT OF HEARING HANDICAP

(Choose One) A = Always U = Usually S = Sometimes R = Rarely N = Never

1. I feel like I am isolated from things because of my hearing loss.	A	U	S	R	N	+	−
2. I feel very frustrated when I can not understand a conversation.	A	U	S	R	N	+	−
3. My hearing loss has affected my life.	A	U	S	R	N	+	−
4. I tend to avoid people because of my hearing loss.	A	U	S	R	N	+	−
5. People in general are tolerant of my hearing loss.	A	U	S	R	N	+	−
6. My hearing loss has affected my relationship with my spouse.	A	U	S	R	N	+	−
7. I try to hide my hearing loss from my co-workers.	A	U	S	R	N	+	−
8. My hearing loss has interfered with job performance.	A	U	S	R	N	+	−
9. I feel more pressure at work because of my hearing loss.	A	U	S	R	N	+	−

PART I PROBLEMS _____

PART II: VISUAL APTITUDE

1. Good morning.	+	−
2. How old are you?	+	−
3. I live in (state of residence).	+	−
4. I only have a dollar.	+	−
5. There is somebody at the door.	+	−

PART II PROBLEMS _____

PART III: AUDITORY APTITUDE

1. FEW	CHEW	+	−
2. FIT	KIT	+	−
3. THIN	FIN	+	−
4. THUMB	SUM	+	−
5. TIE	THIGH	+	−
6. KICK	TICK	+	−

PART III PROBLEMS _____

00-10 Problems = NO NEED
11-13 Problems = QUESTIONABLE NEED
14-20 Problems = ABSOLUTE NEED

TOTAL AMAR PROBLEMS _____

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