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A COMPARISON OF TWO DISABILITY CODING SYSTEMS FOR HEARING-IMPAIRED REHABILITATION CLIENTS

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The Rehabilitation Services Administration (RSA) collects data from State rehabilitation agencies on each rehabilitation client's handicapping condition. This information is then pooled by RSA in a centralized data retrieval system. By recalling this information in various pre-determined arrays, it is possible to obtain a disability profile of the national rehabilitation client population. For such a coding procedure to be effective it must meet three criteria: First, it must classify rehabilitation clients using parameters which are relevant to the rehabilitation process. Second, its coding definitions must be universally understood. Finally, it must be readily and easily applied by rehabilitation counselors.

Concerns have been expressed regarding the extent to which the above three conditions are presently being met in actual practice. This paper will examine these expressed concerns, specifically as they apply to hearing impaired clients, propose a revised coding procedure based upon the above concerns, and report the results of a study which compared the present coding procedure with the proposed revised procedure.

The present codes and their definitions, as found in the Rehabilitation Service Manual Statistical Reporting System, are given in Table 1.

TABLE 1 — Present Disability Codes

(2--)	HEARING IMPAIRMENTS
(20-)	Deafness, unable to talk due to:
200	degenerative and other non-infectious and specified diseases of ear
202	upper respiratory infectious and other infectious diseases
206	congenital malformations
208	accident, poisoning, exposure or injury
209	ill-defined and unspecified causes
(21-)	Deafness, able to talk, due to:
210	degenerative and other non-infectious and specified diseases of ear
212	upper respiratory infections and other infectious diseases
216	congenital malformations
218	accident, poisoning, exposure or injury
219	ill-defined and unspecified causes
(22-1)	Other hearing impairments, due to:
220	degenerative and other non-infectious and specified diseases of ear
220	upper respiratory infectious and other infectious diseases
226	congenital malformations
228	accident, poisoning, exposure or injury
229	ill-defined and unspecified causes

(RSA, 1974, p. 24)

Additionally, the RSA reporting system defines as severely disabled any hearing

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impaired client whose disability is coded 200 through 219 or whose disability is coded 220 through 229 "if loss exceeds 70 decibels in better ear in conversational range with correction" (RSA, 1974, p. 59).

In an attempt to identify and remediate possible coding and reporting problems relating to hearing impairment, a task force met in Washington, D. C. in April 1976 to develop and propose an improved coding system (RSA, 1979).

Since the changes they proposed in the coding system were quite complex, RSA concluded that a broader overview from state vocational rehabilitation agencies would be desirable before changes were undertaken. Accordingly, state agencies were asked to react to the current codes for the hearing impaired as listed above.

When all but 12 states had replied, the Regional Resource Center for the Deaf at the Oregon College of Education in Monmouth, Oregon assembled a second task force to meld the state agency comments and the report of the 1976 task force.

This task force, meeting in early 1979, addressed itself to the concerns expressed by the state vocational rehabilitation agencies. The following is the task force condensation of these concerns:

**TABLE 2 — State Agency Concerns Regarding
Regarding Current RSA-300 Codes
for Hearing Impaired Clients
(N = 38)**

<i>Nature of Expressed Concern</i>	<i>Frequency of Expressed Concern</i>
Use of the 70 dB cut-off level denote "severely handicapped".	18
Use of "able to talk" criterion.	15
Requests for the inclusion of additional information (a partial list includes: Speech Intelligibility, Mode of communication Preferred by Client, Age at Onset, Language Level, Type of Loss, Severity of Loss, Psycho-Social Implications, Speech Discrimination Ability,	15

Existence of Multiple Handicaps, and Medical Otological, Audiological Audiological Descriptions of Loss).

Concerns that the definition of basic terms is lacking or nebulous.	13
Objections to the use of puretone, rather than speech discrimination measures.	13
Objections to the use of "corrected" threshold rather than "uncorrected threshold".	11
Confusion about the delineation between "deaf and "hard of hearing".	11
Concerns that the list of etiologies is obsolete.	5
Feelings of insufficient medical expertise for making clinical judgements about clients.	5

The task force subsequently developed the following definitions and revised the three-digit coding scheme:

1. *Definitions of "Deaf" and "Hard-of-Hearing"*
 - a. "Deaf" — A person whose hearing is so severely impaired that he/she must depend on visual communication such as writing, speechreading, manual communication, and gestures, or tactile input.
 - b. "Hard-of-Hearing" — A person whose hearing is impaired but not to the extent that he/she must depend primarily upon visual or tactile communication.
2. *Definitions of "Age at Onset"*
 - a. "Prelingual" — Assumed to occur any-time prior to the 3rd birthday.
 - b. "Prevocational" — Assumed to occur on or after the 3rd birthday, but prior to the 19th birthday.
 - c. "Post-vocational" — Assumed to occur on or after the 19th birthday.
3. *Definitions of "Etiology"*
 - a. "Congenital" — Assumed to have

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- been present at birth as a result of prenatal or perinatal factors. In this context the term "congenital" does not relate to age at onset.
- b. "Disease" – Degenerative, infectious, or neoplastic process.
 - c. "Accident/Injury" – Trauma, including noise-induced loss.
 - d. "Unknown" – Includes all ill-defined, unspecified, and unknown causes.
4. *Definition of "Severely Disabled Hard of Hearing"*

In addition, a person meeting any one of the following three criteria would be considered severely disabled:

- a. At least a 55 dB loss, reference 1969, 1972 American National Standards Institute (ANSI), speech reception threshold (SRT) in the more useful ear (Reference Note 1) OR (if a

speech audiometric assessment is unavailable),

- b. At least a 55 dB loss, reference 1969, 1972 (ANSI), pure tone average (PTA) in the more useful ear (Reference Note 2), OR
- c. Between 30-55 dB loss, reference 1969, 1972 (ANSI), SRT or PTA in the more useful ear with one of the following:
 - 1. Speech discrimination score less than 55% (Reference Note 3), OR
 - 2. A statement from a physician skilled in diagnosis of diseases of the ear indicating progressive loss.

These first three definitions enable the hearing impaired client to be placed into one of 24 possible disability code categories as illustrated in the matrix pictured below.

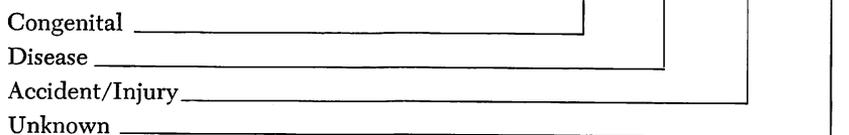
TABLE 3 – A Taxonomy for Describing Hearing Impaired Rehabilitation Clients

FIRST DIGIT = Hearing Impaired (2)

SECOND DIGIT = Onset/Level

Pre-Lingual/Deaf	(3)	231	233	234	239
Pre-vocational/Deaf	(4)	241	243	244	249
Post-vocational/Deaf	(5)	251	253	254	259
Pre-lingual/HoH	(6)	261	263	264	269
Pre-vocational/HoH	(7)	271	273	274	279
Post-vocational/HoH	(8)	281	283	284	289

THIRD DIGIT = Etiology



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The first digit of the proposed code, "2", indicates a disability of "hearing-impaired". The definitions of level of hearing loss and age at onset determine which of six codes are assigned to the second digit. For example, a "pre-vocational", "hard of hearing" client is assigned the number "7". The definition of etiology constitutes the third digit of the three-digit code. Using the above example, if the pre-vocational, hard of hearing client became hard of hearing through a degenerative process (disease), his disability would be coded "273".

The proposed revision of the coding scheme has several advantages over the existing coding system. First, the primary concerns of state rehabilitation coordinators and counselors have been addressed. Second, the primary features of the handicapping condition of hearing impairment (i.e., age at onset; general etiology classification; and severity or extent of handicap) are generalizable to other disability groups, thus providing the ability to make empirical comparisons between the hearing impaired and other disability groups receiving rehabilitation services. Third, the proposed coding system uses definitions which reflect contemporary and universally interpreted terminology pertinent to the rehabilitation process, such as the code classifications found in the 1974 census of the deaf (Schein & Delk, 1974) and the *Model for A State Plan for Vocational Rehabilitation of Deaf Clients* (Schein, 1973).

Finally, the revised codes are compatible with the current three-digit RSA format because the proposed code numbers are currently not in use.

Before implementation of such a code revision, its reliability and validity need to be assessed. These characteristics, for both the current and proposed systems, were analyzed in a pilot study.

Methodology

Six state vocational rehabilitation agencies: Arkansas, California, New Jersey, Ohio, Oregon, and Washington provided both trained coders and representative case rec-

ords of hearing impaired clients. Coders for this reliability study were the six state rehabilitation coordinators for the deaf from each of the volunteer states and thirty volunteer rehabilitation counselors, five from each state. Half of the counselors were specialized rehabilitation counselors for the deaf (RCD's) and half were general rehabilitation counselors (GC's).

Photocopies of the casefiles of 300 clients who had been coded hearing impaired under the present system were obtained, 50 from each of the six participating state agencies. Each case was assigned a number and the existing disability code was deleted from the case file along with other client identifying information irrelevant to the coding task. Two copies of each case file were made and the copies were randomly assigned to counselors under the restriction that no case would be coded by two counselors from the same state. Each counselor was thus assigned a unique set of twenty cases. Each coordinator was assigned the one-hundred non-duplicated cases given to the state's five counselors. Coordinators and counselors were provided comprehensive directions for coding which included instructions not to discuss their specific cases with other coders. Raters were instructed to first code each of their assigned cases using the present system (PS), wait several days, and then code each case using the proposed revised system (PRS). Each case was assigned the following disability codes:

1. The original disability code which was in the case record. (This was available for some cases);
2. Two PS and two PRS state coordinator assigned codes;
3. Two PS and two PRS counselor assigned codes, and;
4. The counselor codings were also identified as having been made by either an RCD or general counselor.

Reliability

If a case received an identical code by

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two raters, a "match" was said to occur. The greater the percentage of "matched" codes, the more consistent and reliable the coding. Baseline reliability data was obtained from the average percentage or "matches" between each of the four independent PS codings and the original case file code. The original code was available for 267 of the cases. The experimental "panel of experts" was able to replicate only 29 percent of the original case record disability codes.

Given the four independent disability

codes assigned to each case under each coding system, an assessment of consistency can be made by examining all of the possible combinations of rater agreement. Each system's codes may evidence zero, one, two, three, or six matches out of a possible total of six. Five of the 300 cases were deleted from this study because they did not have two complete sets of codings. An analysis of the total number of matches obtained for each of the remaining 295 cases under both systems is presented in Table 4.

TABLE 4 — Comparison of Match Combinations: Present vs Proposed Coding System

	No. of Matches	Proposed Revised Coding System (PRS)					PS Total
		0	1	2	3	6	
Present Coding System (PS)	0	6	14	3	6	2	31 (11%)
	1	8	34	12	36	17	107 (36%)
	2	1	5	4	5	8	23 (8%)
	3	2	18	12	26	36	94 (32%)
	6	0	4	2	10	24	40 (14%)
PRS Total		17 (6%)	75 (25%)	33 (11%)	83 (28%)	87 (30%)	295 (100%)

($\chi^2 = 59.32$, $P < .001$, Gamma = .45)

For each coding system there were 1,770 possible matched pairs. The actual obtained percentage of matched pairs was 38.1 percent for the present system and 51.5 percent for the revised system. However, agreement among coders was not independent of the cases being coded. Cases for which a high level of inter-rater reliability was obtained using one system also tended to be high in the other system. This was a reflection of both the adequacy of the disability documentation found in a case file and because a given case was assigned both systems' codes by the same set of four judges.

Since the number of matches represented correlated ordinal data, the Wilcoxon matched-pairs signed-ranks test was used to pro-

vide an appropriate statistical test of the significance of the obtained differences (Siegel, 1956). The results of this test, $Z = 5.29$, $p < .001$, demonstrated that the above percentage difference in matches was statistically significant.

It is important to note that the percentage of matches was partially dependent upon the number of available code categories. If codes were randomly assigned, a certain proportion of matches would be expected by chance alone. This proportion is equal to the reciprocal of the number of categories. For this coding task, that corresponds to 1/15 for the present system and 1/24 for the proposed system. This chance effect serves to upwardly bias the percentage of matches for both

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systems, although it has a greater biasing impact on the present system. Correcting for this factor reduces the PS match percentage to 33.7% and the PRS match percentage to 49.4%. Comparing the revised figures, it may be observed that the proposed revised system's codings were $(49.4/33.7) = 1.47$ times more reliable than the present system's codings.

While the proposed hearing impaired disability coding system provides greater reliability both statistically and practically, is it more valid?

Validity

A potential criterion for validation was the code assigned by "more expert" coders; the state coordinators and the RCD's. For the 295 cases, the current system codings assigned by counselors matched for 36% of the ratings. The state coordinators match rate was 40%. For the proposed system the match rates for counselors and coordinators were 51% and 50% respectively. Neither of these differences between coders were significant.

To analyze the coding consistency of RCD's, as opposed to GC's, counselor pairs of codings were categorized in one of three ways according to the type of counselors involved: Both RCD's (N=70), both GC's (N=71), or one RCD and one GC (N=154). The PS system match rates were 31%, 31%, and 40% respectively. The corresponding PRS match rates were 40%, 45%, and 55%. There was, thus, no evidence to support superior coding consistency by RCD's. Indeed, the highest percentage of matches were obtained by mixed pairs of coders.

These analyses supported the contention that there was no basis for assigning greater validity to codes assigned by either RCD's or state coordinators. Given the basic familiarity with disability coding and rehabilitation case records evidenced by all 36 of the coders, greater experience with the hearing impaired population did not appear to improve inter-rater consistency of coding. Since reliability is a prerequisite for validity, it would be questionable to assume that their

codings evidenced greater validity.

Limitations of the Study

There were three factors which may have served to bias these findings. First, all of the coders were aware that they were participating in a study. This may have resulted in higher reliabilities than those expected in actual rehabilitation counseling practice. Evidence of this is the higher PS match rate among the experimental coders when compared with the match rate between the experimentally assigned codes and the original case file codes.

Second, since all coders had previously reviewed the case records before assigning the proposed code, they would be expected to be more familiar with the case during the second round of coding. This could have served to increase the relative reliability of the proposed codes.

Finally, the raters were clearly aware of which coding system was experimental. If they were dissatisfied with the present system, they could have expended more effort in the task of assigning the proposed codes.

The above limitations of this experiment could have been reduced by only using completely documented and pre-validated model case records and by using experimentally naive raters. However, by sampling actual case files, the results of this experiment are probably more reflective of current professional practice.

Conclusions and Recommendations

This study, using actual case records, was unable to obtain highly consistent disability codings. This lack of reliability appeared to arise from two sources: Inadequate case documentation and lack of clear decision rules for coding. Inadequate documentation of disability criteria in the case record should be addressed through administrative review and counselor/medical consultant training. Likewise, clear decision rules for the coding of disability components need to be established by RSA and incorporated into the hearing impaired disability coding system.

Based on the above analysis, it may be

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concluded that the revised codes have the potential to become a more sensitive and powerful tool of monitoring the services provided to hearing impaired rehabilitation

clients in America. They provide data which is more reliably coded, universally understood, and pertinent to the rehabilitation process.

REFERENCE NOTES

1. SRT is the lowest level of sound intensity at which a client can correctly respond to at least 50% of a list of spondee (bi-syllabic) words.
500 Hz; 60 dB
1000 Hz; 80 dB
2000 Hz; 90 dB
the pure tone average = $\frac{60 + 80 + 90}{3} = 77$ dB
2. PTA is determined for each ear by computing the average of the pure tone thresholds at 500, 1000, 2000 Hz. For example, if the left ear thresholds are:
3. As determined by a phonetically balanced (PB) word list. PB list should be administered at maximum comfort level (MCL).

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