CHAPTER

# 10

# Reliability and Classification of Writing and Drawing Performance in Mildly Aphasic Patients and Normal Individuals

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Writing is usually impaired following left-hemisphere damage that results in aphasia (Benson, 1979; Kertesz, 1979; Rosenbek, LaPointe, and Wertz, 1989). Aphasic writing is characterized by spelling errors (Leischner, 1969; Marcie and Hecaen, 1979; Goodglass, 1981), agrammatic or paraphasic style (Leischner, 1969; Goodglass, 1981), and crossed-out letters or overwriting (Marcie and Hecaen, 1979).

Keenan (1971) reported that writing sentences to dictation is a good means to detect mild aphasia, but he also observed that writing by some normal subjects was judged as being aphasic. Hansen and McNeil (1986) and Hansen, McNeil, and Vetter (1987) demonstrated that normal writing is not "error free." Other than these reports, there is limited information on the differences and overlap between normal and mildly aphasic writing.

Some suggest that drawing may be compromised following left-hemisphere brain damage (Bay, 1962; Benton, 1979). Benson and Barton (1970) state, ". . . drawing, by itself, is a reasonably good test for detecting brain damage" (p. 40). Drawings by left-hemisphere-damaged patients have been described as simplistic (Arrigoni and De Renzi, 1964; Swindell et al. 1988), having reduced fluency (Jones-Gotman and Milner, 1977), deficient perspective (Hatfield and Zangwill, 1974), and not being fully communicative (Lyon and Sims, 1986). There is also evidence that left-hemisphere damage interferes with the patient's ability to plan his or her drawings (Warrington, James, and Kinsbourne, 1966; Hecaen and Assal, 1970).

Normal individuals also may have difficulty when asked to draw pictures, especially those requiring perspective (Arrigoni and De Renzi, 1964). In addition, non-brain-damaged subjects have shown perseveration on drawing fluency tasks (Jones-Gotman and Milner, 1977).

Writing and drawing are used to assess aphasic performance. However, errors in normal writing and drawing suggest that it may be difficult to differentiate normal individuals from mildly aphasic patients. Therefore, we sought answers to the following questions:

1. Can speech-language pathologists determine the presence of mild aphasia in a writing sample?
2. Can speech-language pathologists determine the presence of mild aphasia in a drawing sample?
3. How reliable are speech-language pathologists' numerical scores for the written paragraph task in the Western Aphasia Battery (WAB) (Kertesz, 1982)?
4. How reliable are speech-language pathologists' numerical scores for the drawing task in the WAB?

**TABLE 10-1. DEMOGRAPHIC FIGURES FOR THE TWO EXPERIMENTAL GROUPS**

| | *Aphasic subjects* | | *Controls* | |
|---|---|---|---|---|
| | $\bar{x}$ | *SD* | $\bar{x}$ | *SD* |
| Age (years) | 62.33 (50–83) | 8.55 | 62.60 (52–79) | 7.98 |
| Education (years) | 12.69 (8–20) | 3.21 | 14.13 (8–18) | 2.60 |
| Aphasia quotient (WAB) | 89.47 (81.6–93.7) | 3.90 | 99.16 (97.4–100) | 0.75 |

## METHODS

Fifteen aphasic patients participated in the study. All were right-handed, native English speakers who had sustained left cerebral vascular damage. And all were mildly aphasic with WAB aphasia quotient (AQ) between 80 and 93.8.

Fifteen normal control subjects were matched for age with the aphasic patients. All control subjects were right-handed, literate, native English speakers, reported no history of a neurologic and/or speech-language disorder, and scored above the normal cutoff (93.8) on the WAB. Descriptive data for both groups are shown in Table 10-1.

Twelve speech-language pathologists with at least 2 years of postgraduate experience working with neurogenic communicative disorders served as judges. They were asked to score and classify the aphasic patients' and normal individuals' written language samples and drawings. Thirty randomized writing samples (15 aphasic and 15 normal) and 30 randomized drawing samples (15 aphasic and 15 normal) were judged. Each judge was instructed about the nature of the experiment and provided specific information as described in the WAB for scoring the writing and drawing samples.

### *WRITTEN PICTURE DESCRIPTION*

To focus on language and avoid differences in motor control, a typed transcript of the WAB written picture description (section VI.B) was prepared for each aphasic and control subject. Reliability of the transcrip-

tion was not calculated. Transcripts reflected spelling, punctuation, and the number of words per line. Directions for calculating the numerical score (maximum of 34) were taken verbatim from the WAB test booklet. In addition to the numerical score, judges were asked to determine, from the writing sample, whether each subject was aphasic or normal.

### *DRAWING PERFORMANCE*

Seven drawings from the WAB (circle, cube, square, clock, tree, house, and person) were obtained from each aphasic and control subject. Judges used the WAB test booklet instructions to score each picture (combined score of 27). In addition, judges were asked to determine from the drawing performance whether each subject was aphasic or normal.

## RESULTS

### *INTRAJUDGE RELIABILITY*

Intrajudge reliability was obtained by having two of the judges rescore the writing and drawing samples. Point-by-point agreement was 83 percent or better for numerical scores in the writing and drawing samples and 88 percent or better for aphasic subject versus normal subject classifications.

### *CLASSIFICATION RESULTS*

There were 360 judgments based on writing samples (12 judges, 30 subjects). One hundred eighty of these could have been correct by chance. Figure 10-1 shows that 150 of 180 judgments for aphasic subjects and 155 of 180 judgments for normal subjects were correct. This is significantly better than chance (chi-square = 173.74, df = 1, $p < .001$) (Siegel and Castellan, 1988).

There were 356 judgments based on drawing performance (4 judgments were unavailable owing to rater error). Figure 10-2 shows that 137 of 177 judgments for aphasic subjects and 118 of 179 judgments for normal subjects were correct. This is significantly better than chance (chi-square = 67.67, df = 1, $p < .001$) (Siegel and Castellan, 1988).

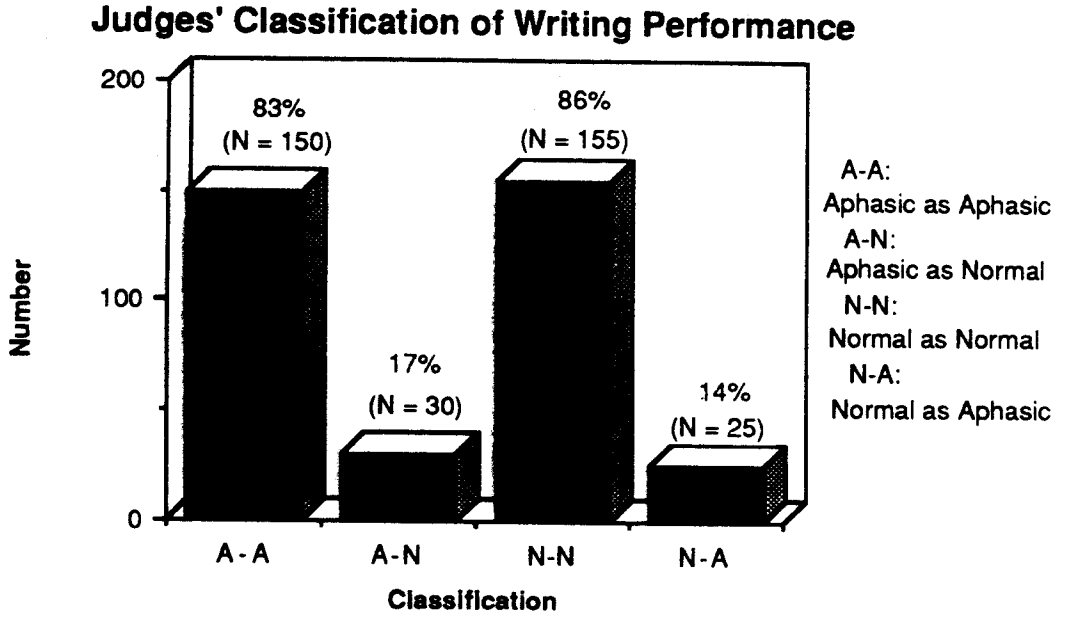



**Fig. 10-1.** Judges' classifications of aphasic and normal subjects on writing performance.

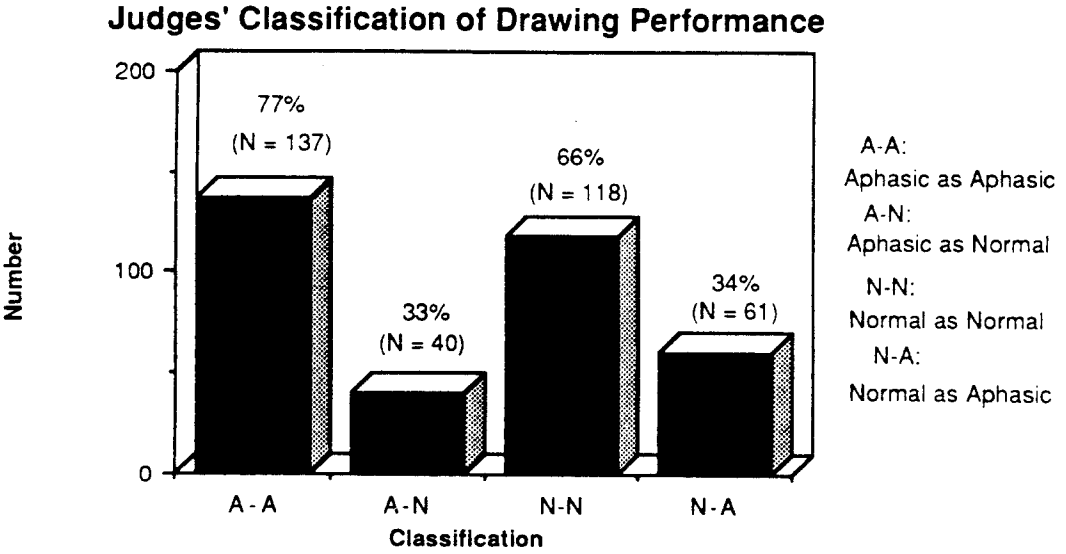



**Fig. 10-2.** Judges' classifications of aphasic and normal subjects on drawing performance.

A kappa analysis of rater classifications (Siegel and Castellan, 1988) for the 30 subjects was performed. Results of this analysis indicated moderately strong agreement among raters for writing performance ($K = 0.62$, $Z = 25.54$, $p < .001$) and for drawing performance ($K = 0.56$, $Z = 23.91$, $p < .001$).

**TABLE 10-2. EXAMPLES OF WRITTEN PICTURE DESCRIPTIONS AND HOW THEY WERE CLASSIFIED**

| *Classification* | *Example* |
|---|---|
| Aphasia as aphasia | They are large tree in front of the house and they are people ///// / ///ying in front of house and they are / boat in the lake |
| Aphasia as normal | There is a large tree in the picture.<br>A boy is sitting and reading.<br>The girl is pouring a drink in the cup.<br>The car is parked in the space for it.<br>The house is basically under the trees.<br>The girl has a radio turned on.<br>There is a tall flag. |
| Normal as normal | The scene here shows a family on a vacation. The family includes at least a mother and father and son. The family appears to be enjoying a beautiful day beside a lake. The mother and father are enjoying the end of a picnic lunch while their son flys a kite. Their dog also seems to be having a good time watching the boy flying a kite. |
| Normal as aphasia | The Sail Boat is in watter.<br>Boy Sailing Kite<br>Man & woman is having a picknick<br>Boy is diping up water by Eade of Lak |

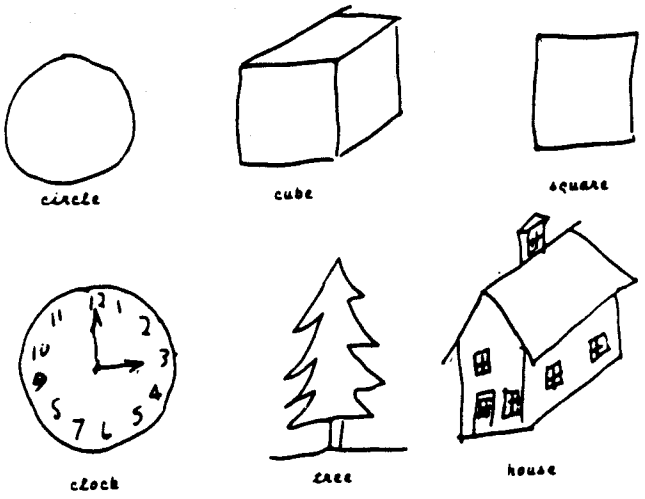
*Note:* A slash represents a crossed out letter.

Judges were more accurate when classifying writing performance than drawing performance. Figures 10-1 and 10-2 show that classification of aphasic patients was 83 percent correct for writing and 77 percent for drawing. Classification of normal subjects was 86 percent correct for writing and 66 percent correct for drawing.

Some subjects were consistently classified correctly and some were consistently misclassified on the written picture description task (Table 10-2). Similarly, some were consistently classified correctly and some were consistently misclassified on the drawing task (Figs. 10-3 and 10-4).

## *INTERJUDGE NUMERICAL SCORING RELIABILITY*

Kendall's coefficient of concordance (Siegel and Castellan, 1988) indicates a moderately high degree of concordance among judges' scoring



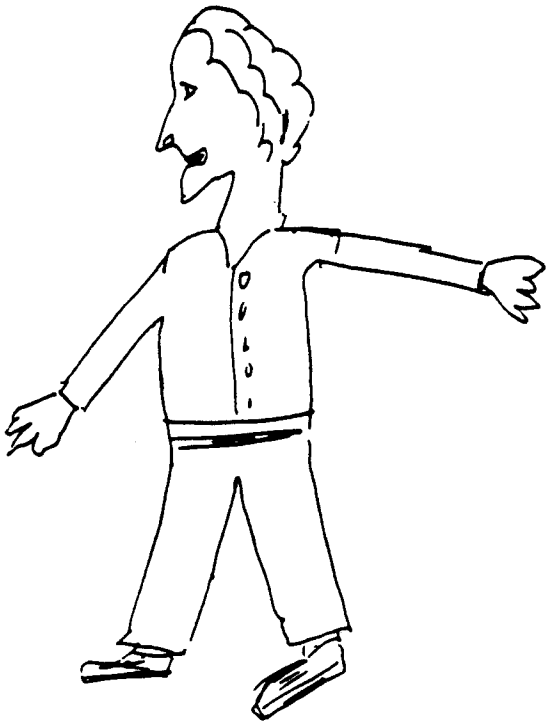



**Fig. 10-3.** Example of judges' classifications of a subject's drawings: Aphasia classified as normal.

of the writing samples ($W = 0.68$, chi-square = 236.64, df = 29, $p < .001$). Interjudge reliability for drawing was calculated using a single score (summation of the seven drawing scores for each subject). Concordance was $W = 0.81$, chi-square = 281.88, df = 29, and $p < .001$. Although the concordance of rankings was relatively high among

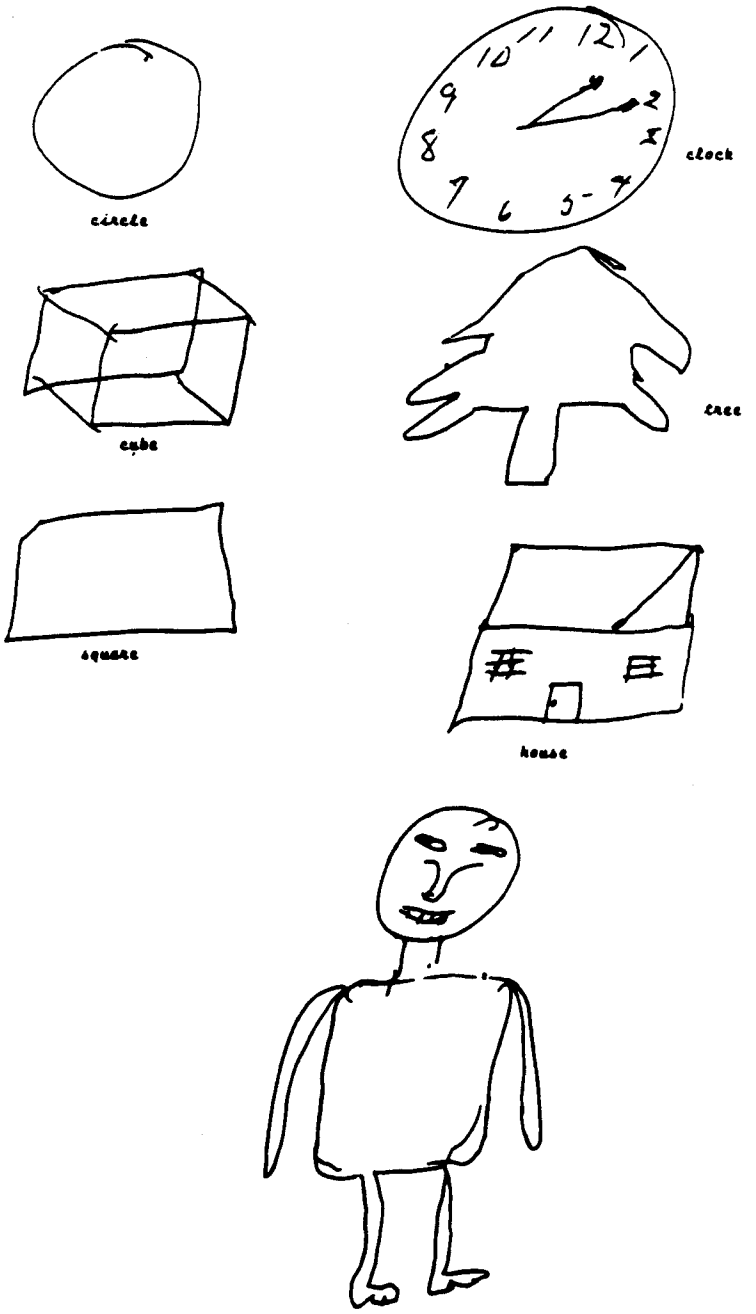



**Fig. 10-4.** Example of judges' classifications of a subject's drawings: Normal classified as aphasia.

judges, variability for individual subjects was evident (Figs. 10-5 to 10-8). This was found to a lesser degree for writing scores in normal subjects as compared to writing scores in aphasic patients. Variability was evident in drawing scores for both normal and aphasic subjects.

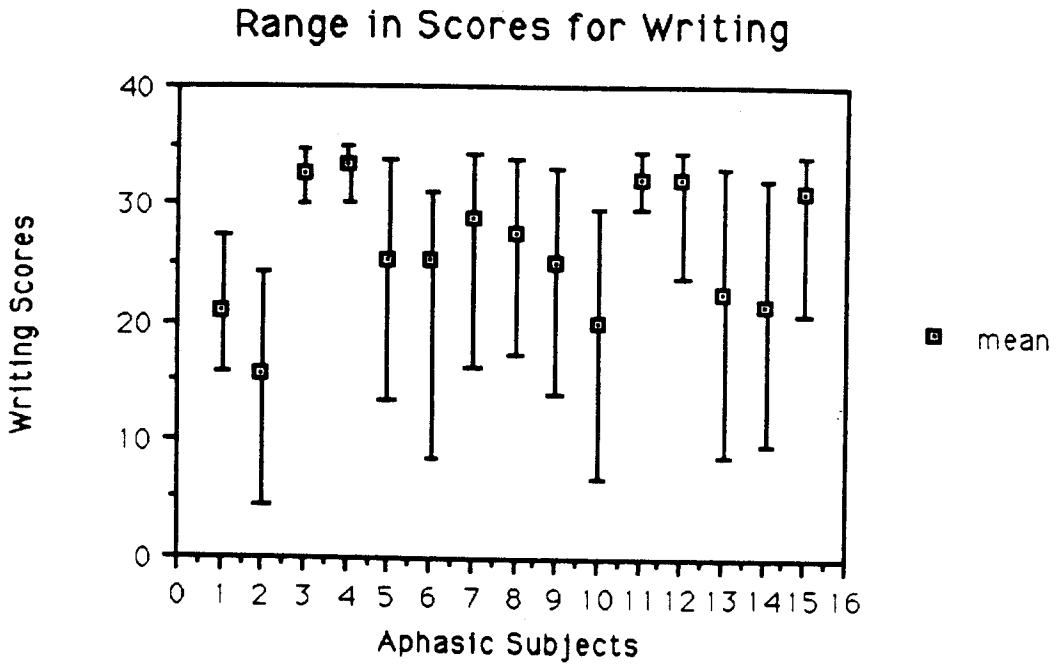
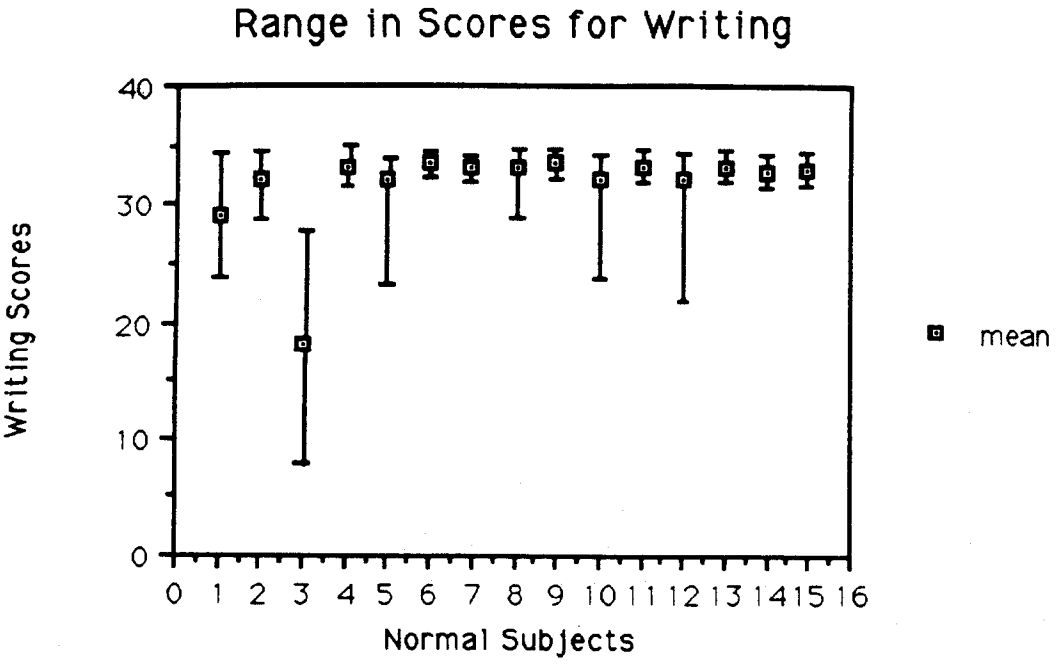



**Fig. 10-5.** Writing score range and means for 15 aphasic subjects.

**Fig. 10-6.** Writing score range and means for 15 normal subjects.



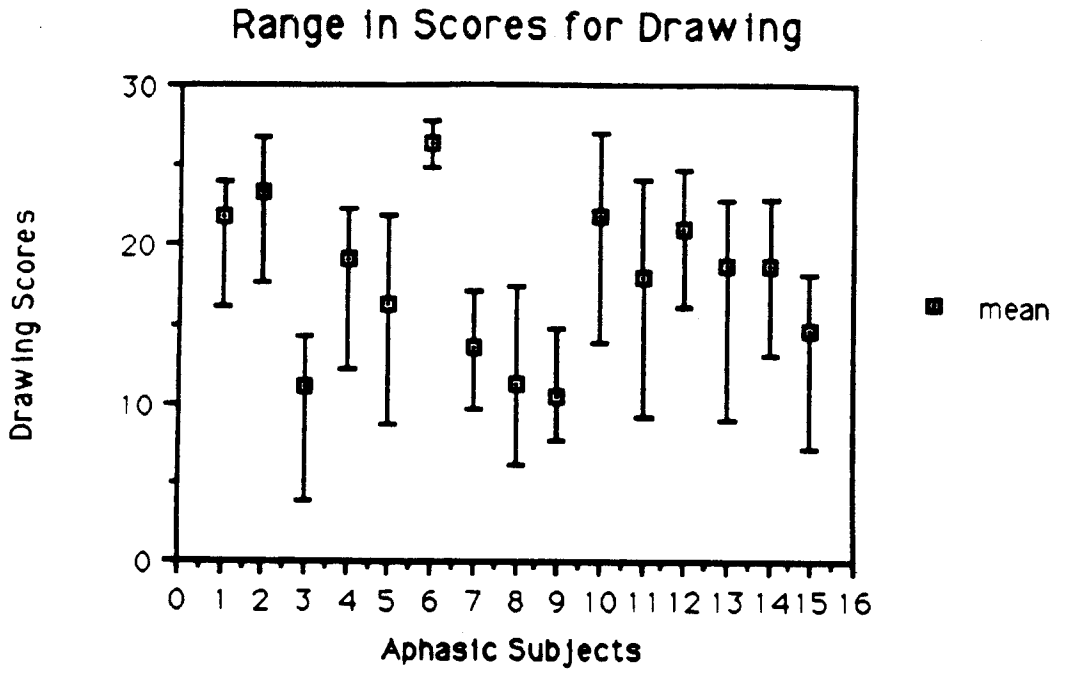
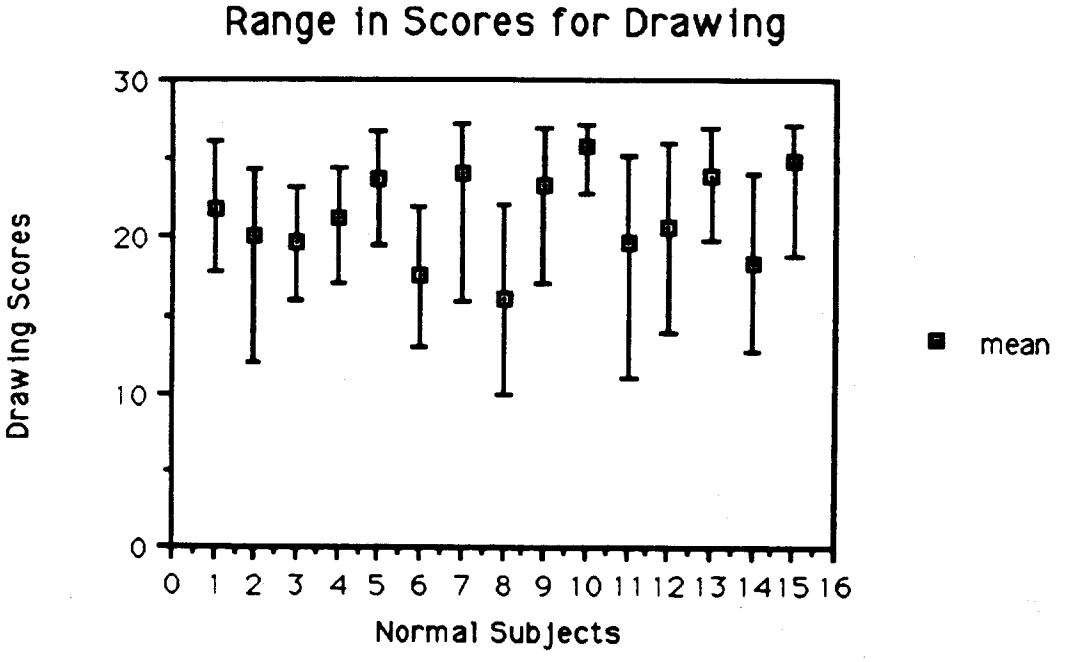



Fig. 10-7. Drawing score range and means for 15 aphasic subjects.

Fig. 10-8. Drawing score range and means for 15 normal subjects.



## DISCUSSION

Our results indicate that speech-language pathologists are relatively good at determining the presence of mild aphasia from a writing or drawing sample. There were misclassifications, but we have not sought specific reasons for them. The literature suggests misclassifications may be explained by age (Ulatowska et al., 1985), education (Benson and Cummings, 1985; Duffy et al., 1976), literacy (Lecours et al., 1987), profession (Leischner, 1969; Benson and Cummings, 1985), or artistic ability (Gardner and Winner, 1981). Further, Hansen and McNeil (1986) indicate that normal performance is not error-free, and Rosenbek (Hansen, McNeil, and Vetter, 1987) observed that not all errors are caused by aphasia. Until the influence of premorbid factors on aphasia and the range of normal performance are established, we caution not to consider all errors as pathologic.

Further, our results indicate that speech-language pathologists are relatively reliable in scoring writing and drawing tasks on the WAB. However, the range in scores for some subjects, normal and aphasic, was large. We speculate that differences among judges' scores result from different applications of the scoring system and inadequate instructions. For example, some judges report starting with the total possible points and subtracting for errors. Other judges begin with no points and add points for what is produced. Yet other judges may use one approach or the other, depending on the quality and quantity of the subject's production. The WAB directions for scoring do not specify which approach to use with whom or when.

Finally, statistically acceptable classification and scoring reliability may not be adequate for clinical purposes. Our significant agreement and that of Shewan and Kertesz (1980) do not prevent our mistaking differences among clinicians as differences within or among patients.

## REFERENCES

Arrigoni, G., and De Renzi, E. (1964). Constructional apraxia and hemispheric locus of lesion. *Cortex, 1,* 170–197.

Bay, E. (1962). Aphasia and nonverbal disorders of language. *Brain, 85,* 411–426.

Benson, D. (1979). *Aphasia, alexia, and agraphia.* New York: Churchill Livingstone.

Benson, D., and Barton, M. (1970). Disturbances in constructional ability. *Cortex, 6,* 19–45.

Benson, D., and Cummings, J. (1985). Agraphia. In J. A. M. Frederiks (Ed.), *Handbook of clinical neurology,* Vol. 1, 45: *Clinical neuropsychology* (pp. 457–472). New York: Elsevier Science Publishers.

Benton, A. (1979). Visuoperceptive, visuospatial, and visuoconstructive disorders. In K. Heilman and E. Valenstein (Eds.), *Clinical neuropsychology* (pp. 186–232). New York: Oxford University Press.

Duffy, J., Keith, R., Shane, H., and Podraza, B. (1976). Performance of normal (non-brain-injured) adults on the Porch Index of Communicative Ability. In R. H. Brookshire (Ed.), *Clinical aphasiology,* Vol. 6 (pp. 32–42). Minneapolis, MN: BRK Publishers.

Gardner, H., and Winner, E. (1981). Artistry and aphasia. In M. Sarno (Ed.), *Acquired aphasia* (pp. 361–384). New York: Academic Press.

Goodglass, H. (1981). The syndromes of aphasia: Similarities and differences in neurolinguistic features. In K. Butler (Ed.), *Topics in language disorders,* Vol. 1 (pp. 1–14). Gaithersberg, MD: Aspen Systems Corp.

Hansen, A., and McNeil, M. (1986). Differences between writing with the dominant and nondominant hand by normal geriatric subjects on a spontaneous writing task: Twenty perceptual and computerized measures. In R. H. Brookshire (Ed.), *Clinical aphasiology,* Vol. 16 (pp. 116–122). Minneapolis, MN: BRK Publishers.

Hansen, A., McNeil, M., and Vetter, D. (1987). More differences between writing with the dominant and nondominant hand by normal geriatric subjects: Eight perceptual and eight computerized measures on a sentence dictation task. In R. H. Brookshire (Ed.), *Clinical aphasiology,* Vol. 17 (pp. 152–157). Minneapolis, MN: BRK Publishers.

Hatfield, F., and Zangwill, O. (1974). Ideation in aphasia: The picture-story method. *Neuropsychologia, 12,* 389–393.

Hecaen, H., and Assal, G. (1970). A comparison of constructive deficits following right and left hemispheric lesions. *Neuropsychologia, 8,* 289–303.

Jones-Gotman, M., and Milner, B. (1977). Design fluency: The invention of nonsense drawings after focal cortical lesions. *Neuropsychologia, 15,* 653–674.

Keenan, J. (1971). The detection of minimal dysphasia. *Archives of Physical Medicine and Rehabilitation, 52,* 227–232.

Kertesz, A. (1979). *Aphasia and associated disorders.* New York: Grune & Stratton.

Kertesz, A. (1982). *Western aphasia battery.* New York: Grune & Stratton.

Lecours, A., Mehler, J., Parente, M., et al. (1987). Illiteracy and brain damage: I. Aphasia testing in culturally contrasted populations (control subjects). *Neuropsychologia, 25,* 231–245.

Leischner, A. (1969). The agraphias. In P. J. Vinken and G. W. Bruyn (Eds.), *Handbook of clinical neurology: Disorders of speech, perception, and symbolic behaviour,* Vol. 4 (pp. 141–180). Amsterdam: North-Holland.

Lyon, J., and Sims, E. (1986). Drawing: Its communicative significance for expressively restricted aphasic adults. Clinical workshop presented at the ASHA Convention, Detroit, Michigan.

Marcie, P., and Hecaen, H. (1979). Agraphia: Writing disorders associated with unilateral cortical lesions. In K. Heilman and E. Valenstein (Eds.), *Clinical neuropsychology* (pp. 92–127). New York: Oxford University Press.

Rosenbek, J., LaPointe, L., and Wertz, R. (1989). *Aphasia: A clinical approach.* Austin, TX: PRO-ED.

Shewan, C., and Kertesz, A. (1980). Reliability and validity characteristics of the Western Aphasia Battery. *Journal of Speech and Hearing Disorders, 45,* 308–324.

Siegel, S., and Castellan, N. (1988). *Nonparametric statistics for the behavioral sciences.* New York: McGraw-Hill.

Swindell, C., Holland, A., Fromm, D., and Greenhouse, J. (1988). Characteristics of recovery of drawing ability in left and right brain-damaged patients. *Brain and Cognition, 7,* 16–30.

Ulatowska, H., Cannito, M., Hayaski, M., and Fleming, S. (1985). Language abilities in the elderly. In H. K. Ulatowska (Ed.), *The aging brain: Communication in the elderly* (pp. 125–139). Austin, TX: PRO-ED.

Warrington, E., James, M., and Kinsbourne, M. (1966). Drawing disability in relation to laterality of cerebral lesion. *Brain, 89,* 53–92.