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ABSTRACT

The relation between reading and writing is important because tacit and possibly unwarranted assumptions underlie the theories and pedagogies which govern these processes. These assumptions are challenged by the claims that: (1) reading and writing are related in neurolinguistically specifiable ways; (2) they do not seem to be simple inverses of each other; and (3) they do not seem clearly hierarchically dependent on one another. Some evidence for the claims is seen in the fact that reading and writing are not always equally impaired after damage to the left or dominant hemisphere. Also, people are considered good readers if they can read and understand sentences they have not seen before, even if it is impossible for them to write such sentences. The syndrome called alexia without agraphia is taken to indicate that reading and writing as neuropsychological processes are partially separated. Pedagogy, while admittedly different from pathology, can learn from the neurolinguistic evidence. This evidence seems to challenge the assumption that reading instruction must precede writing. Approaches in first and foreign language instruction are cited as evidence that writing can be taught first as a road to reading. Although closely-related processes, the decoding and encoding involved are not symmetrical. Neurolinguistic evidence does not support the assumption that reading depends on the prior acquisition of writing. (AMH)

Process and Pedagogy in Writing: Neurolinguistic Considerations

Presented at the American Association of Applied Linguistics, New York, 1981

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Recently, there has been a flurry of attention paid to the brain sciences, especially those concerning the processes and mechanisms of the cerebral hemispheres. Several articles have appeared which attempt to link composition and hemisphere function. Most of the articles, such as those by Janet Emig (1978), Howard Gardner and Ellen Winner (1981), Benjamin Glassner (1981), and W. Ross Winterowd (1979) have been concerned with describing and understanding the contribution of the right hemisphere to the writing process. Their work is fascinating, but because it is necessarily highly speculative, it has received a mixed response, including enthusiasm, bewilderment, and suspicion. Those who have ventured into this area of inquiry have generally found it so exhilarating that they may indeed occasionally make somewhat exaggerated or reductive claims.[1] For that, allowances must be made considering that they are pioneering a new interdisciplinary field, mapping out new intellectual terrain.

In this paper we will not deal with the selective contributions of the left and right hemispheres to the writing process; we will focus on what may be a more basic question for the neurolinguistic foundations of the writing process, namely, on the relation between reading and writing. This information is important because tacit and possibly unwarranted assumptions about that relation underlie ~~the theories and pedagogies which~~ govern these processes.

While there has been a great deal of conjecture and discussion on the similarities and differences between oral language and written language,[2] the complex and dynamic relation between reading and writing as variant processes involved with written language has

not, until recently, received much scrutiny. Many researchers in the neurosciences use the term "written language" to refer indiscriminately to reading or writing or both. Alternately, educators have sometimes treated writing and reading as almost unrelated phenomena. Some researchers who have attempted to define the relation between reading and writing such as William H. Gaddes, have suggested that: "In a simplistic sense, reading and writing are reverse neuropsychological processes" (Gaddes, 1980, 260). Finally, there is a common tendency among theorists and educators alike, to treat reading as primary, and writing as a skill, or better a set of skills, which is hierarchically dependent on the established presence of reading skills.[3] Thus it is a common educational practice to teach writing only after a child has mastered the rudiments of reading. The neurolinguistic evidence we offer in this paper tries to clarify and challenge these assumptions. Therefore, we claim 1) that reading and writing are related in neurolinguistically specifiable ways, but 2) that they do not seem to be simple inverses of each other, and 3) they do not seem clearly hierarchically dependent on one another.

There is no doubt that reading and writing are highly interactive processes, and that both utilize some of the same neuropsychological mechanisms. This is borne out, for example, by the neurolinguistic evidence on the combined disturbance of reading and writing, a syndrome called "alexia with agraphia". (alexia means "reading disorder," agraphia means "writing disorder"). The syndrome is caused by a lesion in the angular gyrus, in the parietal

lobe of the left or dominant side of the brain. (See Figure 1, page 4) People with this syndrome can speak and understand speech quite well, but their ability to read and write is selectively and severely disturbed. Although these patients can often comprehend spoken language normally, they generally cannot comprehend words that are spelled to them, nor can they spell words aloud (Benson and Geschwind; 1969, 411).

In alexia with agraphia then, reading and writing are equally impaired. Geschwind points out, for example, that "the individual who is able to read a few letters or a few words will also write a few letters or a few words" (Benson and Geschwind, 410), but he sees the general effect of the lesion as "reducing the patient to a state of illiteracy" (Benson and Geschwind, 413). These specific deficits in reading, writing, and spelling[4] have in common the inability to make visual-verbal associations, which are sometimes called grapheme-morpheme or grapheme-phoneme transcodings. This operation which seems to be mediated by the angular gyrus, is fundamental to all three of these processes at some point.

Interestingly enough, however, reading and writing are not always equally impaired after damage to the language areas of the left or dominant hemisphere. The classic syndrome of Broca's Aphasia, for example, gives us evidence to suggest that reading and writing are neurolinguistically distinct in certain respects.

Broca's Aphasia is a language disturbance which is the result of damage to Broca's area (which is in the frontal lobe of the language side of the brain). (See Figure 2, page 5) Broca's

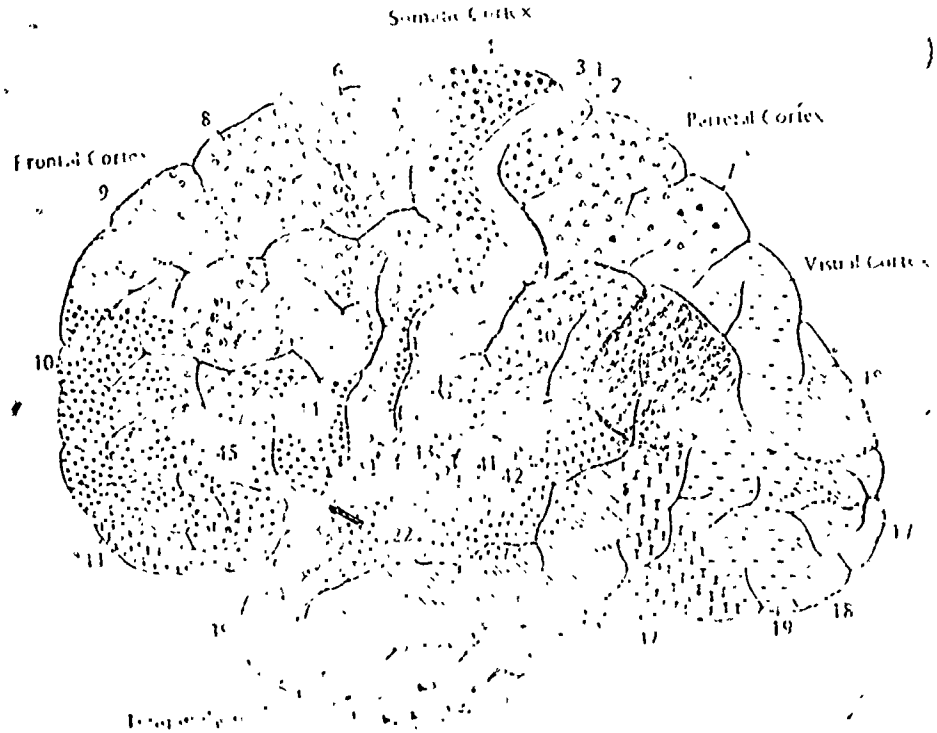


Figure 1

ALEXIA WITH AGRAPHIA

(loss of both reading and writing)

Lesion site: Angular gyrus

BROCA'S APHASIA

SPEECH: effortful, slow.

content words better than function words ("agrammatism"; "telegraphic speech").
reading aloud: bee/oar better than be/or

COMPREHENSION:

Good, for such questions as "Is the source of illumination in this room incandescent?" and for ordinary conversation.

Problems where grammar is crucial, as in
reversible passives ("The lion was killed by the tiger");
suffixes ("That's my mother's brother. Is it a man or a woman?");
prepositions, with certain word order
("Touch the comb with the pencil" --wrong response;
"With the pencil, touch the comb" --right response).

REPETITION:

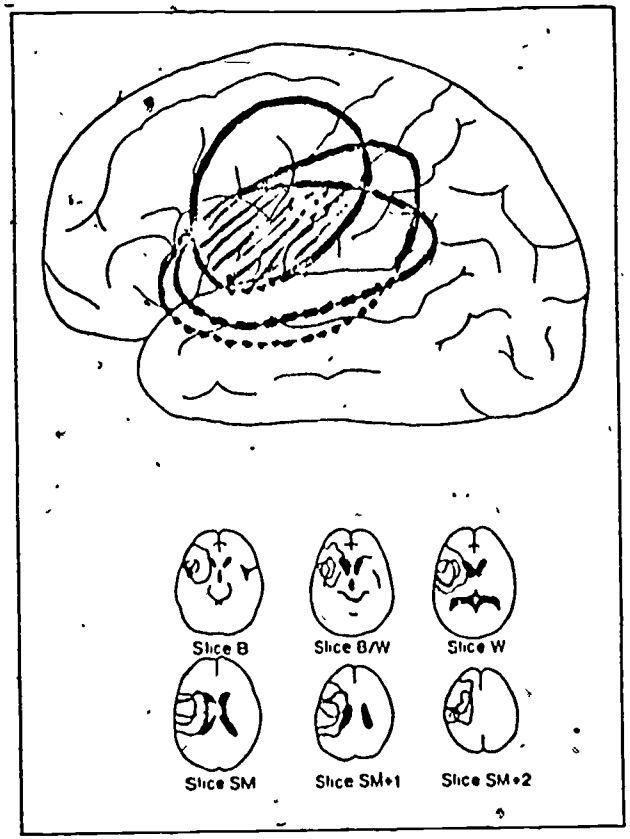
easy: "Constitution"
hard: "It is here."
harder: "Is it here?"
hardest: "No if's and's or but's."

WRITING: same deficit as speech.

FACIAL APRAXIA ("pretend to blow out a match")

SINGING (without words) PRESERVED

SITE OF LESION: Frontal lobe;
Large lesion around Broca's area.



Broca aphasia composites. Lateral composite shows large prerolandic involvement. Dotted lines indicate lesions deep to, but not in, temporal lobe. Cross-sectional composite demonstrates cortical and deep involvement in Broca area on slices B and B/W and large lesion size in frontoparietal areas on higher slices. The Wernicke area is spared (n = 3).

Figure 2
(from Naeser & Hayward, 1978).

aphasics have considerable difficulty producing speech although the actual physical mechanisms which underlie speech production are intact. They also have tremendous difficulty with grammar, and thus their speech is labeled "telegraphic" or "agrammatic" because it is largely limited to content words such as nouns, verbs, or adjectives.

But in spite of the severe problem with grammar, the Broca's aphasic has very good comprehension where content words and contextual words carry the meaning. They respond quickly and accurately to questions like "Is the source of illumination in this room incandescent?" They do, however, have trouble understanding sentences in which the grammar is complicated or the meaning is not evident from context, such as reversible passives, as "The lion was killed by the tiger." In fact, it is easier for them to repeat a phrase like "Royal Irish Constabulary" than a simple sentence like "Is he here?"

The deficits in reading and writing apparent in Broca's Aphasia parallel the deficits we have described in the comprehension and production of speech. With reading there is the same problem of content words versus grammatical words. It is not uncommon to see patients who can read the word bee and the word oar, but who are unable to read the grammatical words be and or. Yet reading comprehension, like speech comprehension is quite possible in spite of the severe grammatical problem, whereas writing with no grammar is much more unsatisfactory. This is strong evidence to dispute the assumption that writing and reading are

nearly identical, albeit inverse processes. We can read and understand sentences which contain words we have never seen before, but we cannot write such sentences (except for gibberish or lexical inventions). We are good readers if we can understand sentences in which every fifth word has been deleted; we are poor writers if our writing always seems to be lacking every fifth word. Broca's aphasics can understand sentences where the grammar is unrecognizable to them. But for writing, both in the pathological and the normal case, we not only need greater control over vocabulary and clarity of thought.

In Broca's Aphasia then, reading comprehension can be retained to a reasonable degree, while spontaneous writing and writing to dictation are almost completely limited to the production of content words, and thus are severely affected. The evidence from Broca's Aphasia helps to refute claims that the processes of reading and writing are inseparable, or simple inverses of each other, but is not incompatible with the idea of hierarchical ordering between the two, with writing the most easily disrupted linguistic function, and reading a more fundamental, and thus less vulnerable set of skills.

However, there is another neurolinguistic syndrome which does in certain respects contradict the notion of a hierarchical dependence between the two processes. The syndrome is called "alexia without agraphia" which means that the ability to write spontaneously and to dictation is well preserved, even though the ability to read, even one's own writing, is completely or nearly completely

lost (Albert, et al, 1981). Though the anatomy of this lesion is fairly complex (See Figure 3, page 9), the deficit can be explained relatively simply. What happens is that visual information (that is, words to be read) which has been received in the visual cortex of the occipital lobe, is cut off from the fully intact language areas of the left hemisphere. Because the angular gyrus is preserved, oral spelling and the recognition of orally spelled words is normal, as is the writing, although there may be minor errors in orthography (Albert, et al, 114). The occurrence of this syndrome strikingly supports the partial dissociation of reading and writing as neuropsychological processes, and most directly contradicts the notion that one must be able to read in order to learn to write.

Pedagogy, of course, is quite different from pathology. What implications for pedagogy can we draw from this neurolinguistic evidence? Let us focus on two cases in which our neurolinguistic considerations give us the tools to initiate a critical evaluation of some of the assumptions that underlie reading and writing pedagogy. A basic consideration of reading and writing pedagogy is whether reading and writing are related hierarchically so that reading is seen as fundamental and should be taught first. This is an assumption of many curricula, and for example, the position of Myklebust (1964) and Margaret Clark (1976), who are influential theorists.

The neurolinguistic evidence has suggested that this position is not necessarily correct: competence in reading does not have to precede acquisition of writing as the two processes can be made

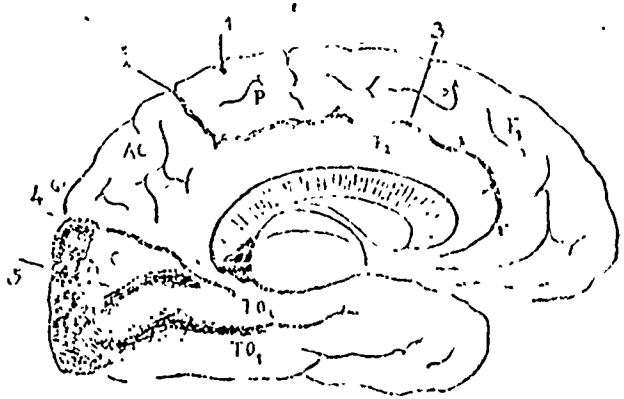


Fig 2. Left hemisphere, medial view. The structure marked by radiating lines is the corpus callosum, the posterior end of which (the splenium) is seen to contain an area of old destruction. 5 calcarine fissure, along the lips of which lies the visual cortex, which is shown as involved in the area of old destruction. Reproduced from Dejerine (1892). (Geschwind 1974, 9)

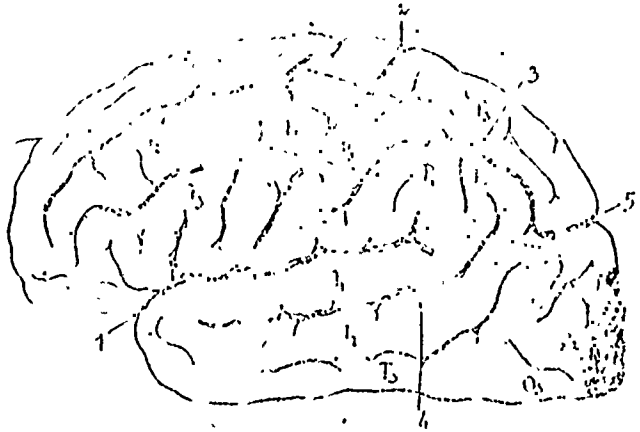


Fig. 1. Left hemisphere of Dejerine's patient, lateral view. The dark area in the occipital lobe represents the old region of destruction, the stippled area the recent lesion. 1 = Sylvian fissure; 2 = Rolandic fissure; F_3 = third frontal gyrus; T_1 = first temporal gyrus; Pc = angular gyrus. Reproduced from Dejerine (1895).

(Geschwind 1974, 8)

ALEXIA WITHOUT AGRAPHIA

(loss of ability to read, retaining the ability to write)

Lesion site: visual cortex of left hemisphere, with involvement of corpus callosum fibers leading from the right hemisphere visual area to the left hemisphere language areas.

to be somewhat independent. In fact, there is also pedagogical evidence that it can be fruitful to concentrate on teaching writing first as a road to reading, as it is done by such different approaches as that of Romalda Spaulding (1969) who uses an atomistic approach, and Donald Graves (1979) who advocates a holistic approach, and as it is done in the context of foreign language teaching by Emile de Sauze. As Sean Walmsley points out:

> Some authors (e.g., Aston Warner, 1953; Chomsky, 1971, Graves, 1979) have successfully demonstrated that children can begin to write before they read, having acquired sufficient knowledge of the orthography (albeit not necessarily the standard version) to produce comprehensible written stories well in advance of their ability to read conventional text. (Walmsley, 1982, 26)

Indeed, Glenda Bissex's recent extensive case study of her son's acquisition of reading and writing offers major support for the contention that reading and writing are interactive yet in certain respects separable processes. As she writes in her preface: "Since Paul became a fluent writer (using his own spelling system) before he became a fluent reader, I have described his development in writing first and then his growth in reading. The processes seem separable though only in some ways separate." (Bissex, 1980, viii)

Also, the question arises as to how one can justify teaching writing first, if, as we have argued, it seems in some respects

more complex than reading, and as Chedru and Geschwind (1972) have termed it, the more "fragile" of the two processes. The answer lies in examining the assumption that writing (or reading for that matter) is a unitary process. Actually the literature on writing frequently lumps together as one process such disparate aspects of writing as copying alien scripts of languages one does not know, copying letters or words in one's own language, taking dictation, writing lists and letters, writing poetry, or even dictating novels to a machine. The neurolinguistic evidence indicates that some of these aspects of writing can be selectively impaired or preserved in pathology. The implication is that one could teach some of these aspects of writing to beginners without worrying about the fact that writing courses may be required all the way through school into college. Just because mathematics is complex, we don't hesitate to teach children to count in the pre-school years.

Our conclusion then, is that reading and writing are closely related processes, involving as they do, the decoding and encoding of the same graphic system. Our major point is that this decoding and encoding are not symmetrical: they are not simply "reverse" neuropsychological processes." Certain neural structures are more crucial to the encoding than to the decoding, and others more crucial to the decoding. The neurolinguistic evidence does not support the assumption that writing depends on the prior acquisition of reading. In certain educational settings it may be fruitful to

teach reading before one begins to teach writing, but strong educational arguments can be made for concentrating on writing first. Sound educational practice in most settings would be to teach writing and reading at the same time, but if mastery of the code is a primary goal, writing (encoding) is the process in which mastery of the code is the more essential.

Endnotes

[1] An example of this possible overspeculation can be seen in Cathy Fultz Telzrow's article "The Impact of Brain Development on Curriculum" (1981). For instance, she cites the finding that "the majority of human beings have one hemisphere larger than the other ... and in such cases the larger hemisphere may take over and minimize the contribution of the other hemisphere," which is a tremendous oversimplification of the research by Galaburda, et al (1978) and Witelson (1977) she is drawing on. Also, her thesis characterizes the right hemisphere with its high level cognitive skills as a-conceptual, and non-synthetic, and associates right hemisphere activity with plateaus in learning as opposed to the periodic increases in learning activity which is presumably related to increased left hemisphere function. If there is any evidence which clearly supports these views, it is not cited, and the argument itself, in its current form, seems to have obvious gaps.

[2] See, for example, Exploring Speaking-Writing Relationships: Connections and Contrasts, Barry M Kroll and Roberta J. Vann (eds.) Urbana, NCTE, 1981.

[3] Sean Walmsley, (1982) looks into this issue thoroughly, and documents the primacy of reading even in basic definitions of literacy: "Until quite recently, the reading field has defined the notion of literacy almost exclusively in terms of reading, while regarding writing either as penmanship and spelling or as a language art with the same status as drama and speaking. When James Allen, former U.S. Commissioner of Education, launched the national Right-to-Read effort in 1969 he spoke of achieving national literacy by 1980 but he meant achievement on reading (c.f. Carroll and Chall, 1975). Until 1978 the National Institute of Education defined its basic skills research program solely in terms of reading and arithmetic." (p.2)

[4] There are a few reports, however, of spared spelling and letter recognition abilities in patients with alexia and agraphia which will need to be reconciled in the literature. See for example Rothi and Heilman (1981).

References Cited

Albert, M., Geschwind, N., Helm, N., Reubens, A., and Alexander, M. Clinical Aspects of Dysphasia. Wien:Springer-Verlag, 1981.

Ashton-Warner, S. Teacher. New York: Simon and Schuster, 1963.

Benson, D. F. and Geschwind, N., The alexias. in Handbook of Clinical Neurology (ed. by P. J. Vinken and G. W. Bruyn), North-Holland, Amsterdam, Vol. 4, 1969, pp. 112-140. Reprinted in Geschwind, 1974.

Bissex, G. GNYS AT WRK: A Child Learns to Read and Write. Cambridge: Harvard University Press, 1980.

Carroll, J. B. and Chall, J. S. Toward a Literate Society. New York: McGraw-Hill, 1975.

Chedru, F. and Geschwind, N. Writing disturbances in acute confusional states. Neuropsychologia 10, 1972, pp. 343-353. Reprinted in Geschwind (1974).

Chomsky, C. Write first, read later. Childhood Education 1971, 47, 296-299.

Clark, M. Young Fluent Readers. London: Heineman Educational Books, 1976.

Emig, J. Hand, eye, brain: some "basics" in the writing process. In Charles Cooper and Lee Odell (eds.) Research on Composing: Points of Departure. Urbana: NCTE, 1978, pp. 59-72.

Gaddes, W. H. Learning Disabilities and Brain Function: A Neuropsychological Approach. New York: Springer-Verlag, 1980.

Galaburda, A. M. , LeMay, M., Kemper, T., Geschwind, N. Left-right asymmetries in the brain. Science, 199, 1978, pp. 852-856.

Gardner, H. and Winner, E. Artistry and aphasia. In M. T. Sarno (ed.) Acquired Aphasia. New York: Academic Press, 1981, pp. 361-384.

Geschwind, N. Selected Papers on Language and the Brain. Boston Studies in the Philosophy of Science, Vol. 16, R. S. Cohen and M. W. Wartofsky (eds.) Dordrect: D. Reidel, 1974.

Glassner, B. Writing as an integrator of hemispheric function. In Barry M. Kroll and Roberta J. Vann (eds.) Exploring Speaking

Writing Relationships: Connections and Contrasts. Urbana, NCTE, 1981, pp. 142-153.

Graves, D. Balance the basics: let them write. New York: Ford Foundation, 1978.

Graves, D. A new look at research on writing. In S. Haley-Hames (ed.) Perspectives on Writing in Grades 1-8. Urbana, NCTE, 1981.

Kroll, B. M. and Roberta J. Vann (eds.) Exploring Speaking/ Writing Relationships: Connections and Contrasts. Urbana, NCTE, 1981.

Myklebust, H. R. The Psychology of Deafness. New York: Grune and Stratton, 1964. Cited in Gaddes, W. H. (ed.) Learning Disabilities and Brain Function: A Neuropsychological Approach. New York: Springer-Verlag, 1980, pp. 207-208.

Naeser, Margaret A. and Hayward, Robert W. Lesion localization in aphasia with cranial computed tomography and the Boston Diagnostic Aphasia Exam. Neurology, 1978, 28, 6, pp. 545-551.

Rothi, R. J., and Heilman, K. M. Alexia and agraphia with spared spelling and letter recognition abilities. Brain and Language, 1981, 12, pp. 1-13.

Spaulding, R. B. The Writing Road to Reading. New York: William Morrow and Company, 1969.

Telzrow, C. F. The impact of brain development on curriculum. The Educational Forum, May, 1981, pp. 477-483.

Walmsley, S. A. Writing disability. To appear in P. Mosenthal, L. Tamor, and S. A. Walmsley Research in Writing: Principles and Methods. New York: Longman, 1982.

Winterowd, R. R. Brain, rhetoric, and style. In D. McQuade (ed.) Linguistics, Stylistics and the Teaching of Composition. Akron: Akron University Press, 1979, pp. 151-181.

Witelson, S. F. Developmental dyslexia: two right hemispheres and none left. Science, 1977, 195, pp. 309-311.