1987

Communication impairments following right hemisphere brain damage.

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COMMUNICATION IMPAIRMENTS FOLLOWING RIGHT HEMISPHERE BRAIN DAMAGE

By

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B.A., University of Montana, 1984

Submitted to the

Department of Communication Disorders and the Graduate School

in partial fulfillment of the requirements

for the degree of

Master of Communication Sciences and Disorders

University of Montana

1987

Approved by

Chairman, Board of Examiners

Dean, Graduate School

June 8, 1987

Date

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P.O. Box 1346
Ann Arbor, MI 48106 - 1346

6-19-87

ACKNOWLEDGEMENTS

I would like to thank my committee for providing a comprehensive review of my externship experience and for creating a stimulating discussion of this topic.

I would also like to thank the Speech Pathology Staff at the Veterans Administration Medical Center in Seattle for the opportunity to learn from them and for their support for this project.

Lastly, I would like to thank Mike Wynne for creating this externship and for his guidance.

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CHAPTER 1

INTRODUCTION

In the past, researchers have studied the human brain in an attempt to localize its behavioral functions. Initially, the focus was on the function of language in the brain. This is a logical beginning since the human being's unique mode of communication is through verbal language. In their initial studies in the mid-1800s, Dax, Broca and Wernicke promoted the view that the left hemisphere of the brain mediated language functions. These results were documented following identification of left brain lesions in post-mortum adults who had exhibited absent or deficient language abilities (Corballis, 1983, cited in Searleman, 1977). Studies concerning the left hemisphere functions in communication continued to be of primary focus until 1876, when Jackson identified individuals exhibiting decreased visual-spatial abilities attributed to right hemisphere brain damage. Other researchers including Badel (1888), Dunn (1895), Freud (1891), Lissauer (1890), Monk (1881) and Willbrand (1887) confirmed and expanded upon this hypothesis (Corballis, 1983, cited in Searleman, 1977). These initial left and right hemisphere studies set a precedence for a long-standing division between the left and right hemisphere capabilities. The mid-1900s reflected a change in thinking presented by Head and Goldstein (Corballis, 1983, cited in Searleman, 1977) who viewed the brain as a unitary whole. However, the view that speech/language functions were predominantly mediated by the left hemisphere and visual-spatial abilities were mediated by the right

hemisphere was not refuted.

As indicated by this brief review of the early research describing communication deficits following brain damage, little or no attention was given to the effects of right hemisphere brain damage on communication. Recently, there has been a growth of interest in the right hemisphere's contribution to communication and the development of hypotheses to account for the impaired communication skills exhibited by individuals with damage to their right hemispheres. The purpose of this paper is to provide a review of the research which describes the role of the right hemisphere in communication and the behavioral characteristics exhibited by adults with right hemisphere brain damage following cerebral vascular accidents (i.e., CVA). The role of information processing in communication will also be considered as it pertains to right hemisphere brain damage. Following this discussion, a specific information processing style will be promoted as playing a predominant role in hemispheric organization for communication skills. This information processing style will be the basis for a philosophical discussion of the effects of right hemisphere damage on communication effectiveness. These communication behaviors will be described in depth followed by diagnostic and remediation consideration for the individual with right hemisphere brain damage.

In brief, this paper will address various aspects of the effect of right hemisphere damage on communication and the importance of diagnosis and remediation of these disorders by speech pathologists to

individuals with right hemisphere damage. Initially, two information processing theories, "verbal-visual" processing and "analytic-gestalt" processing, will be addressed as they relate to the general sequence involved in information processing , to hemispheric specialization for information processing, and to impairments in information processing following right hemisphere brain damage which affect communication. Following this discussion, the analytic-gestalt theory will be advocated as better representing the function of information processing in the human brain. In justification of this position, previous research will be reviewed which addresses the affect of right hemisphere damage on communication, and their possible relationship to analytic-gestalt information processing.

Another major portion of this paper will address the importance of diagnosis of communication impairments following right hemisphere damage. Several previously developed diagnostic protocols will be reviewed and critiqued. A protocol will be developed to: 1) provide receptive and expressive measures of communication behaviors commonly exhibited by right hemisphere damaged individuals, 2) provide subjective rating scales for behavior interpretation, and 3) provide a rationale for assessing these behaviors as they relate to the analytic-gestalt information processing theory.

Finally, remediation considerations will be addressed as they pertain to communication impairments exhibited by individuals with right hemisphere damage. These will include discussions of several therapy approaches as well as family and patient counseling.

CHAPTER 2

INFORMATION PROCESSING THEORIES

A prerequisite to a discussion of the role of information processing in communication is a definition of information processing itself. Information processing in this context shall be defined as the brain's ability to sense, analyze, code and represent stimuli as meaningful mental representations. A variety of theories have been proposed to account for the brain's ability to process information. Two such theories will be addressed here and one of these theories will be advocated as being better able to account for the brain's ability to process information as related to right hemisphere impairments and their effect upon communication.

Verbal-Visual Information Processing

The first theory is that of "verbal-visual" information processing. Early in the literature of information processing, the Verbal Loop Hypothesis, as advocated by Glanzer and Rock (1964, cited in Searleman, 1977) and Whitehouse (1981), argued that all information, linguistic as well as visual, was ultimately stored as a verbal code. Therefore, even abstract forms (i.e., geometric shapes) were represented as a verbal representation. Despite the importance of language as a coding and representational system, researchers soon advanced this theory to include visual as well as verbal coding/ representational abilities of the brain (Caramazzo, Gordon, Zuriff and DeLuca, 1981; Whitehouse, 1981). In this view, interhemispheric

specialization for coding and representation of these modalities (i.e., verbal and visual) was said to occur. That is, the left hemisphere was hypothesized to process verbal information whereas the right hemisphere processed visual information (Caramazzo et al., 1981). This view of interhemispheric specialization for information processing of stimuli presented via different modalities (i.e., auditory and/or visual) was interpreted in three types of studies--studies of unilaterally brain damaged individuals, studies using dichoptic and dichotic tasks with neurologically intact subjects and studies of split-brain individuals (Whitehouse, 1981).

Studies of unilaterally brain damaged individuals provided evidence supporting the verbal-visual information processing theory. As early as 1863, Broca showed that damage to the left hemisphere resulted in language impairments. In 1876, Jackson proposed that the right hemisphere processed images as his evidence indicated that visual perception (i.e., ability to process and integrate visual information apart from visual acuity) problems occur following right hemisphere damage (Whitehouse, 1981).

Later studies provided support for this view interlaced with some interesting discrepancies. Various interhemispheric specialization studies (review cited by Whitehouse, 1981) revealed that left hemisphere damaged patients exhibited similar impairments in their processing of information presented in visual as well as verbal modalities, indicating that the left hemisphere may play a role in visual processing.

Dichotic and dichoptic techniques revealed that the rudimentary distinction between the left hemisphere's preponderance for language processing and the right hemisphere's preponderance for visual processing was apparently maintained but, again, with interesting discrepancies. For instance, Hines (1976) presented concrete and abstract nouns dichopticly and found larger right visual field advantages for the recognition of abstract nouns that for concrete nouns. He interpreted this asymmetry as representing a recognition of concrete nouns in the right hemisphere. Similarly, split-brain studies (Gazzaniga and Hillyard, 1971) suggested that the right hemisphere was capable of comprehending single concrete nouns. Wapner, Hamby and Gardner (1981) reported dichotic listening tacks which indicated that the right hemisphere processes intonational contours and affectively intoned speech stimuli.

Analytic-Gestalt Information Processing

In its pure form, the verbal-visual information processing hypothesis was unable to account for these discrepancies since the right hemisphere apparently played a role in processing of linguistic information and the left hemisphere apparently processed some visual perception information. This resulted in another processing view which attempted to study information processing beyond the medium or modality whereby information was initially presented. This theory focused on the processing of information in terms of analytic versus gestalt modes. Analytic processing, also commonly referred to as

"linear, sequential, propositional, or feature detection processing" is hypothesized to be a function of the left hemisphere whereas gestalt processing, also referred to as "integrative, appropositional, simultaneous, denotative, intuitive, or holistic processing" is hypothesized to be a function of the right hemisphere (Burns, Halper and Mogil, 1985; Gazzaniga, Smylie, Baynes, Hirst and McCleary, 1984; Myers, 1978, 1986; Searleman, 1977; Wapner et al., 1981). This hypothesis suggested that information is processed in two different ways. Analytically, information is processed in a step-by-step, sequential manner whereby each unit is analyzed and coded upon a rule-governed basis. Once the coding of the stimulus is completed (i.e., analytic coding) the information is processed in the form of the gestalt or whole unit.

Information Processing Sequence

At this time, a description of the entire information processing sequence is necessary as it relates to the analytic-gestalt information processing hypothesis. Initially, stimuli are sensed and stimulate an awareness of their presence. Stimuli may be presented via three modalities--auditory, visual or haptic (i.e., sensation of taste, smell and touch) or any combination of these three modalities. Once the stimulus is received via a certain modality, this information is processed via analytic coding. That is, the brain interprets this information based upon a rule-governed system, much like a computer. In the coding of this modality-specific information, a variety of

codes may represent the same content. For example, "dog" may be presented via different modalities (e.g., auditory = spoken word "dog", visual = picture of a dog, or haptic = Braille reading) which is ultimately conceptualized as the same form (i.e., an animal). While this sequence appears relatively straight forward, recent research (Glass, Holyoak and Santa, 1979) has suggested that end-product mental representations may be coded in a different manner than the modality through which they were initially presented. For instance, in a task requiring subjects to remember lists of six written letters (e.g., PHKVCR), an analysis of the errors revealed that these errors were related to letters which sounded like the presented letter rather than those which looked similar to it visually. This suggested that the actual mental representation of this code was linguistic rather than visual as it had originally been presented (Conrad, 1964, cited in Glass et al., 1979). As a result, information may be processed through several codes which stand for the same content. This research suggested that this ultimate representation is not always a result of direct mapping from the medium by which it was presented, as is advocated by the verbal-visual information processing theory. Rather, a complicated interaction of analytic coding of modality-specific information accompanied by wholistic processing across stimuli result in the ultimate conceptualization of the stimuli as a thought or idea.

This information is analyzed in three ways at the level of perception wherein information is initially coded. Auditory

information is analyzed according to its verbal and nonverbal qualities. Verbal information is comprised of the components of language including form (i.e., phonology, morphology and syntax) and content (i.e., concrete semantic units). Non-verbal information is comprised of information which carries no linguistic meaning (i.e., speech suprasegmentals, environmental noise). Many parts of language use depend on an individual's ability to interpret nonverbal cues in order to fully understand the speaker's intent as well as using nonverbal cues in ones own messages. Secondly, information may be analyzed according to its visual properties (i.e., visual acuity and visual perception). Thirdly, information may be analyzed according to its haptic (i.e., smell, taste and touch) properties. Of course, there is information which is comprised of several modalities (i.e., written material which requires visual as well as linguistic coding).

Once this information has been analyzed and coded on a rule-governed basis, this information is mentally represented in three ways. First, information may be represented in terms of auditory, visual and haptic stimuli. Next, information may be represented in terms of its linguistic representation. This representation is the unique quality of human beings and comprises a large part of mental representation. Linguistic representation is comprised of the consolidation of the following language units: form (i.e., morphology, phonology, syntax), content (i.e., semantics) and use (i.e., pragmatics). Communication use (i.e., rules governing appropriate interactions) is particularly affected by other mental

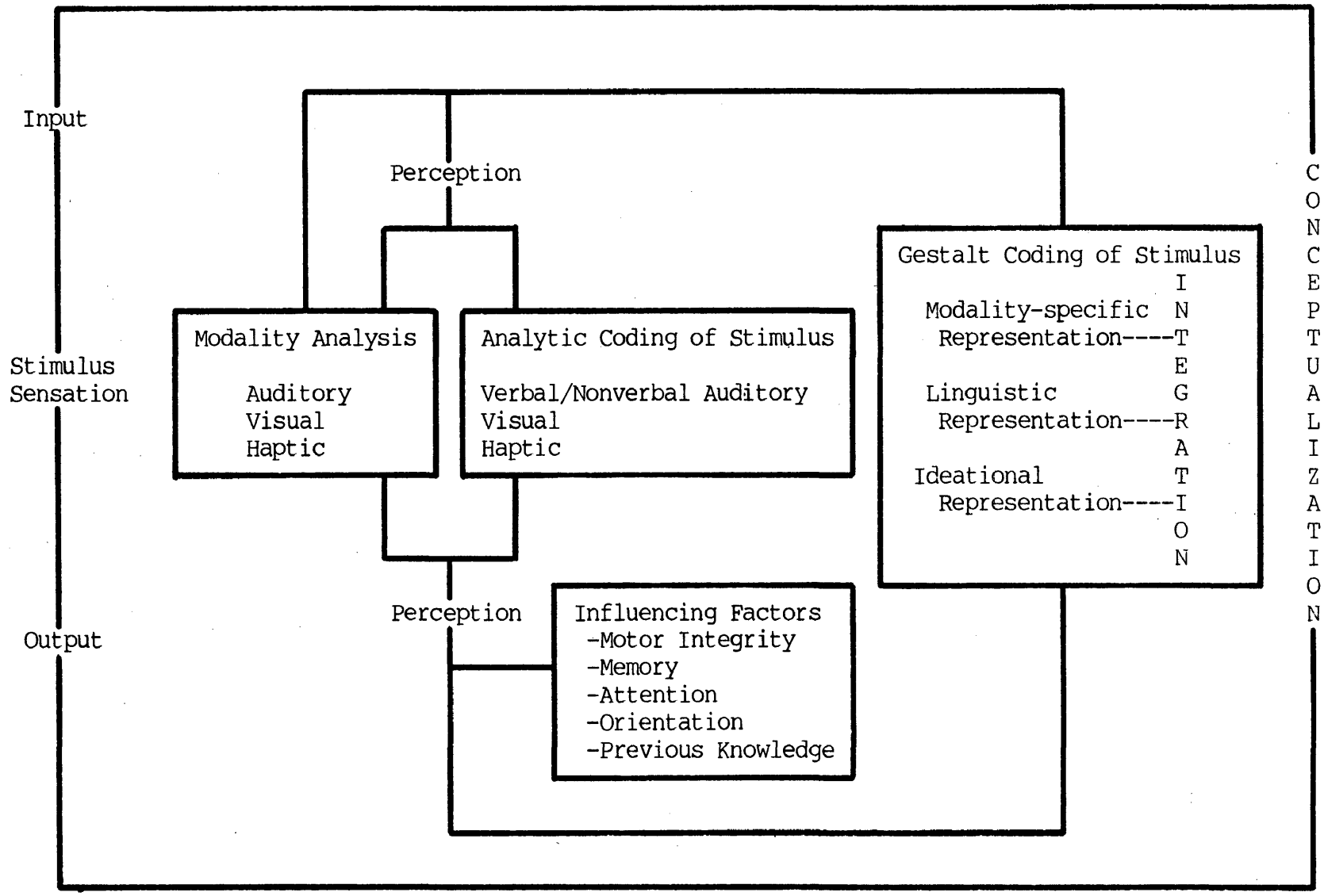
representations. That is, in order for an individual to exhibit appropriate communication interactions, he must understand linguistic as well as non-linguistic (e.g., tone of voice, facial expression, abstract thought) codes and interpret the message's intent as a whole. Information may also be represented in terms of its ideational form. Ideational representation stands for that information which is abstract in nature and cannot be represented in terms of a linguistic code alone. These three forms are integrated to form the gestalt mental representation of the stimulus. This mental representation combined with other influencing factors, including the neuromuscular integrity of the processing mechanism, memory, attention and previous knowledge, interact to form the ultimate conceptualization of the stimulus as an idea or thought. (Refer to Figure 1 for analytic-gestalt information processing model.)

Hemispheric Specialization for Information Processing

It has been hypothesized that the hemispheres are specialized for different information processing modes. This theory proposes that the left hemisphere is primarily responsible for the processing of information in an analytic, rule-governed way whereas the right hemisphere is responsible for the gestalt processing and integration of information.

Goldberg and Costa (1981) provided neuroanatomical evidence for this position in their study of the gray-to-white matter ratios of the cerebral cortex. These neuroanatomical measures suggested that

Figure 1. Analytic-Gestalt Processing Model



hemispherical asymmetries in the cortex are not modality specific (i.e., visual versus verbal) as had been previously hypothesized but is such that distinct modality-specific representations (i.e., auditory, visual and haptic) are more prominent in the left hemisphere whereas the right hemisphere is characterized by greater areas of "associative cortex" important in complex levels of processing and integration. The right hemisphere is hypothesized to consist of heavily interconnected areas of cortex which form one functional unit whereas the left hemisphere displays a region-by-region pattern of connectivity. The plausible cognitive implications for this type of neuroanatomical organization suggest that the right hemisphere has greater ability to process many modes of representation at one time, whereas the left hemisphere is superior in tasks which require step-by-step analysis of information. Therefore, it is hypothesized that the right hemisphere is better at integrating information across and within modalities (Burns et al., 1985).

In terms of communication behaviors, the left hemisphere is believed to process those aspects of the linguistic signal and/or code which are based upon fixed systems of rules. Therefore, the components of language, including phonetic, morphologic, syntactic and, less so, semantic processing (Gazzaniga et al., 1984), as well as several processing abilities (e.g., spatial sequencing) which are rule-based may, in fact, be processed in the left hemisphere which is predisposed for such an analytic processing style. Other communication behaviors (e.g., abstract language, pragmatic behaviors,

speech suprasegmentals) as well as many visual perception behaviors may, alternatively, require a gestalt form of processing which enables the brain to process information across several mental representations. That is, the right hemisphere damaged individual may be impaired on tasks requiring an ability to process information as a whole unit using all the mental representations available to them. Their inability to process and integrate this information completely and their overreliance upon analytic coding of the message impairs their ability to understand and use communication appropriately. In this sense, these individuals exhibit "communication" disorders rather than "language" disorders since their deficits are a result of an inability to integrate their intact linguistic representations (i.e., based upon an analytic processing system) with ideational- and modality-specific representations (i.e., based upon a gestalt coding system) into an accurate conceptualization of the idea or thought. Therefore, the right hemisphere damaged individual will process the basic linguistic message relayed to him and will exhibit linguistically intact language output, but will exhibit a decreased aptitude for integrating this rule-based code with abstract thought and nonverbal cues to understand and relay messages as a communicative whole.

CHAPTER 3

RIGHT HEMISPHERE STUDIES

To justify this position, previous research will be reviewed regarding the analysis of communication behaviors exhibited by individuals with right hemisphere brain damage. A review of information regarding the capabilities of the intact right hemisphere will also be presented. This information will be presented in two sections: 1) studies of the intact right hemisphere consisting of split-brain studies of commissurotomized epileptic individuals and dichotic/dichoptic studies of normal individuals and individuals with left hemisphere brain damage, and 2) studies of individuals with right hemisphere brain damage exhibiting communication disorders.

These studies will be presented according to their effect upon individuals' language as it is comprised of form, content and use, as well as the effect on an individual's comprehension and use of speech suprasegmentals (e.g., prosody). The neuromuscular behaviors (i.e., dysarthrias) exhibited following right hemisphere brain damage will not be addressed as they are beyond the scope of this paper.

Intact Right Hemisphere Studies

In addressing the presence of language in the right hemisphere, an initial discussion of the presence of language organization in dextral (i.e., right-handed individuals) versus sinistral (i.e., left-handed individuals) is in order. Searleman (1977) provided an in-depth review of the relationship between handedness and apparent

language lateralization. This review indicated that 90 to 99 percent of right-handed individuals have their linguistic functions (i.e., rule-based coding) predominantly served by the left hemisphere. Similarly, approximately 50 to 75 percent of non-right-handed individuals (i.e., ambidextrous/left-handed) also have their rule-governed linguistic organization localized in the left hemisphere. Therefore, between 75 and 80 percent of all normal individuals are likely to have their linguistic organization within the left hemisphere. Keeping this in mind, this paper will address the left hemisphere as being organized for analytic processing whereas the right hemisphere will be addressed according to its gestalt coding abilities and resulting participation in communication.

Receptive Abilities

In studies of commissurotomized epileptic, left-hemisphere damaged, and normal individuals, the following linguistic functions have been identified as existing in the intact right hemisphere. In terms of these individuals' comprehension of language form and content, the research suggested that the right hemisphere may possess an ability to recognize verbs and sentence transformations (Zaidel, 1973) but it is virtually unable to make phonological transformations (Gianotti, Caltagirone, Miceli and Masullo, 1981; Searleman, 1977). For example, these individuals may recognize that the words "ache" and "lake" possess different meanings but will be unable to recognize that the two words also rhyme. Various studies have also suggested that

the right hemisphere is able to recognize some nouns, adjectives (Gazzaniga, 1970; Gazzaniga and Hillyard, 1971; and Gazzaniga and Sperry, 1967--all cited in Searleman, 1977) and verbs, carry out spoken commands (Gianotti et al., 1981; Searleman, 1977) and correctly choose objects from a verbal description (Gazzaniga and Sperry, 1967). Gazzaniga et al. (1984), in their split-brain studies, disputed these findings and stated that while their subjects possessed rich semantic systems tested with the Peabody Picture Vocabulary Test, they were unable to carry out simple printed commands. Moscovitch (1976) reported that the normal individuals, unlike the commissurotomized individuals in his studies, were unable to process verbal stimuli in the right hemisphere in dichotic tasks. In addition, normal subjects could also identify concrete nouns, but they could not identify verbs or even elementary grammatical relations (Caramazza et al., 1981). Dichotic listening (i.e., auditorially-presented verbal information) and tachitoscopic (i.e., visually-presented verbal stimuli) techniques have revealed left ear and left field advantages, respectively, for this information in left hemisphere damaged subjects. These results were interpreted as indicating a greater role of the right hemisphere in processing of linguistic information.

Expressive Abilities

Commissurotomized epileptic individuals and normal subjects, although able to understand single words presented to their right hemispheres, were unable to expressively name these words, but they

could spell simple words by tactually manipulating letters with their left hands (Searleman, 1977). By contrast, Gazzaniga et al. (1984) described their group of subjects as possessing an ability to name words. In their summary of split brain, normal and left hemisphere damaged individuals, Gianotti et al. (1981) concluded that the intact right hemisphere possessed far greater capacity to comprehend language than to produce it either in spoken or written forms.

Summary of Language Skills

In summary, this review of split-brain, normal and left hemisphere lesion subjects suggested that the intact right hemisphere may, in fact, be capable of comprehending some simple language content (i.e., word meaning) and some simple commands requiring lexical as well as syntactic knowledge, but appeared to be unable to process phonemic information. Expressively, these subjects appeared able to occasionally name or write single words but this was not consistent throughout the literature.

Cautions in Interpretation

A few cautions must be stated regarding the interpretation of the results of these studies. First, regarding split-brain studies, these individuals exhibited comprehension and expressive language abilities generated from the right hemisphere but one must remember that commissurotomized epileptic subjects are not a homogenous group and may not represent the language abilities of the general population.

Although these subjects have all undergone commissurotomies of the hemispheres, this may be the most common variable amongst them. One must also consider such factors as onset and severity of their epilepsy, their pre-morbid intelligence levels, etc. This wide variety of variables may partially account for the disparate results in the literature regarding the presence of language in the right hemisphere. Unfortunately, these variables have not been studied systematically to analyze the correlation between these factors and the presence of language in the right hemisphere. Similarly, normal individuals are not a homogenous group, suggesting that each individual may possess slightly different language processing abilities and lateralization of those functions in the brain.

Commissurotomized epileptic individuals, also, may not represent the general population's ability to process language in the right hemisphere. There is a hypothesis that epileptic individuals may be more predisposed to bilateral cerebral language development in childhood than normal individuals not prone to seizures (Searleman, 1977). If this hypothesis is proven valid, it would serve to invalidate the above language characteristics of the right hemisphere as applied to the normal population.

Analytic-Gestalt Theory: Explanation of Right Hemisphere Language Skills

Assuming the previous literature is valid, it suggests that the intact right hemisphere possesses an ability to comprehend and produce simple language content (i.e., word meaning) as well as comprehend

syntactic information (i.e., follow simple commands requiring knowledge of word meaning and order), but it is not capable of processing isolated phonemic information. This suggests that the human brain possesses an ability to process information beyond modality-specific organization of each hemisphere (i.e., verbal-visual information processing theory). Had this been the case, these studies would have revealed a clear-cut separation of language organization and would have indicated absent language skills in the right hemisphere. However, this absence of language organization in the intact right hemisphere was not exhibited, thus, requiring a more detailed explanation of the presence of these abilities in the right hemisphere.

Based on the analytic-gestalt information processing theory, these behaviors can be partially described. First, the inability of the intact right hemisphere to process phonetic information may indicate that the right hemisphere was unable to process this information using its specific processing style--that of a gestalt mode. That is, a phonetic analysis was not performed since it required a step-by-step comparative process not provided by the right hemisphere. Instead, the right hemisphere may have attempted to analyze this information as a whole unit, found it unmeaningful, and this resulted in a breakdown in its processing. On the other hand, the right hemisphere was able to process single words, perhaps because it was able to linguistically process this information as a whole unit or identified it as an ideational representation. In regard to the

right hemisphere's ability to comprehend and follow simple commands, its ability to do so is more complex. Simple commands would appear to require a more analytic style of processing, one which would allow step-by-step analysis of the command. Perhaps the information was presented in such a manner that contextual cues (i.e., facial expression, tone of voice, gestures) were provided which enabled the right hemisphere to process the command as a whole unit. Although these studies provide some basis for the analytic-gestalt information processing theory, they are in no way conclusive and, as the above example demonstrates, this theory cannot account for all the behaviors exhibited by the intact right hemisphere.

Damaged Right Hemisphere Studies

Early Research

Another way to relate the abilities of the right hemisphere to its proposed information processing styles is to present the literature which describes communication behaviors following right hemisphere brain damage. As early as 1962, Eisenson reported subtle language deficits related to right hemisphere damage. The right hemisphere damaged subjects in his study exhibited decreased abilities compared with normal subjects on tasks using abstract concepts from the Stanford-Binet Intelligence Scale (Form L) and the Institute of Educational Research Inventory. Critchley (1962, cited in Searleman, 1977) suggested right hemisphere damage resulted in the following behaviors: difficulties with articulation (perhaps related to a

dysarthria?), an inability to do creative work, word-finding difficulties, and difficulties learning novel linguistic material. Other studies have documented preservation, reading errors and naming difficulties (Searleman, 1977) as behaviors exhibited following right hemisphere brain damage. Archibald and Wepman (1968) attributed syntactic errors exhibited by right hemisphere damaged individuals to general mental deterioration involving decreased attention. Although these studies attempted to describe the behaviors exhibited by these individuals with damage to their right hemispheres, they did so in an unsystematic manner without regard to the underlying mechanisms which may have caused the disruptions. Also, many of these studies were poorly controlled with regard to site of lesion and plausibility for bilateral brain damage. It was not until the late 1960s and the 1970s that communication disorders exhibited following right hemisphere brain damage were studied in any systematic manner.

Research Using Standard Aphasia Batteries

Since the late 1960s, researchers have attempted to characterize the communication behaviors exhibited by right hemisphere damaged individuals by assessing the individual's language skills using standardized aphasia batteries. Although these tests revealed some decreased receptive and expressive language skills, they generally were not sensitive enough to provide detailed descriptions of the communicative behaviors exhibited by these individuals. For instance, several researchers including Adamovich and Brooks (1981) and Myers

(1978) used the Boston Diagnostic Aphasia Examination to identify the language abilities of these subjects. In general, their results revealed that right hemisphere damaged individuals exhibited difficulties comprehending complex ideational materials and sentence and paragraph length information. Expressively, these individuals exhibited errors on tasks of word fluency, oral sentence reading, word-picture matching, sequencing tasks, and responsive naming. The authors attributed these reading, matching and sequencing errors to disruptions in the individuals' ability to integrate across and within modalities. Abstract language impairments were then attributed to a decreased ideational representation of the concept with resulting communication breakdown in its use.

The Revised Token Test, as utilized by McNeil and Prescott (1978) and Swisher and Sarno (1969), also revealed receptive disorders as the linguistic complexity of the task increased. The Boston Naming Test, used by Kaplan, Goodglass and Weintraub (1976), indicated overall lower scores by the right hemisphere damaged individuals than by control subjects. Although these test results were presented, little explanation was provided for the underlying basis for these impairments. It would be interesting to study these results retrospectively to analyze these behaviors relative to the information processing model presented here. That is, this type of analysis may be better suited to describe these behaviors as they relate to the brain's ability to analyze information in an analytic versus gestalt mode. Unfortunately, this information was not provided but did serve

to spawn continued interest in the communication skills of right hemisphere damaged individuals. These results also provided future researchers with an incentive to further study the difficulties these subjects had with processing abstract or ideational material.

Abstract Language Impairments

Several researchers (Brownell, Potter and Michelow, 1984; Gardner and Denes, 1973) have addressed individuals' abilities to understand denotative (i.e., literal, dictionary-type meaning) versus connotative (i.e., meaning inferred from context) meaning. The results from these studies revealed that the right hemisphere damaged patients relied on denotative meaning whereas left hemisphere damaged patients relied more on meaning relations based on connotation. Gardner and Denes (1973) interpreted this finding as indicating two separate lexical stores as a function of hemispheric specificity, whereas Brownell et al. (1984) attributed these deficits to organization of different cognitive structures. These results may also be interpreted in another manner regarding information processing style. The right hemisphere damaged individuals' inability to understand connotative meaning may have been a function of the disruption of the gestalt processing style which allows us to comprehend linguistic meaning with a broader scope (i.e., utilization of other cues such as contextual information) and beyond its literal linguistic form.

Similar disruptions have been reported in the right hemisphere damaged individuals' ability to understand humor, idioms and metaphor.

For instance, studies of right hemisphere damaged individuals' comprehension of humorous material revealed decreased comprehension of humorous material presented visually (e.g., picture form) with and without captions (Gardner, Ling, Flamm and Silverman, 1975). Interesting as this finding was, the behaviors exhibited by these individuals were even more interesting. The individuals' affective responses to the information were inappropriate to the situation (e.g., the individuals either laughed throughout or not at all). Also, the individuals tended to produce confabulatory remarks or inaccurate inferences from the information presented. The authors concluded that these individuals' cognitive reactions appeared dissociated from their affective/emotional response. That is, these right hemisphere brain damaged individuals appeared unable to comprehend accurately the underlying meaning in the humor and, therefore, responded to it in an affectively inappropriate manner (Gardner et al., 1975). Thus, brain damaged individuals may have decreased sensitivity to certain aspects of the perceptual world (e.g., visual and spatial information) combined with an overreliance on purely linguistic information. This perceptual insensitivity combined with the dependency on purely linguistic information caused these individuals to express themselves inappropriately, demonstrating irrelevant, confabulatory statements. These results further supported the analytic-gestalt processing theory of the right hemisphere, since these subjects exhibited a decreased aptitude for representing information as a whole. In this case, individuals demonstrated

reduced abilities to process linguistic, visual and contextual cues integrated with previous knowledge to comprehend the humor of the situation.

Similar disruptions in comprehension of metaphor and idioms have been documented in the literature with individuals demonstrating right hemisphere damage (Winner and Gardner, 1977). On a visually presented task, right hemisphere damaged individuals exhibited tendencies to choose literal pictures over metaphorical interpretations on tasks requiring interpretation of a metaphor (e.g., "The cat has her tongue.") These subjects not only interpreted metaphor inappropriately but also saw nothing strange about the literal depiction. The authors indicated that the right hemisphere has a major role in processing denotative language and detecting absurd or humorous content. Extending this idea, one might hypothesize that the comprehension deficit is related to the primary impairments in ideational representation combined with intact linguistic representation to produce a literal interpretation of abstract messages. Myers and Linebaugh (1981) assessed right hemisphere damaged individuals' comprehension of idioms and concluded that these individuals are less adept at comprehending figurative language than normals even when contextual cues are available. Myers and Linebaugh applied these results to the gestalt processing model, stating these subjects may have attempted to interpret idioms in an analytic fashion (i.e., breaking it down into its component elements) by choosing the meaning of the sum of the individual words rather than the meaning of

the idiom as a whole. This, accompanied by their decreased abilities to utilize context and conceptualize abstraction, resulted in an overall difficulty to comprehend implication and intention since the subjects relied on what was said rather than what was meant.

Burns et al. (1985) reconfirmed these findings by documenting disruptions in comprehension of pictorial interpretation of metaphors and concrete interpretation of proverbs in right hemisphere brain damaged individuals. Burns et al. asserted that in order for people to correctly comprehend figurative language of this sort, they must go beyond an analysis of the word-by-word sequence, and recognize the sequence as a single meaningful unit. The sequential analysis of idioms and proverbs was hypothesized by Burns et al. to result in a concrete or literal interpretation of the meaning.

As these studies indicated, right hemisphere damaged individuals exhibit impairments in processing information across all mental representations to conceptualize the idea as a whole unit. Although these individuals can comprehend the basic linguistic code and express themselves in the same manner, they tend to demonstrate inappropriate communicative interactions as a result of their inability to integrate this linguistic information with its underlying intent.

Pragmatic Language Impairments

Burns et al. (1985) described such impairments as residing within the realm of the individuals' pragmatic behavior. They defined pragmatics as "communication in context". They characterized

pragmatics as being comprised of the following components:

1. Pragmatics encompasses the ways in which an individual uses knowledge about the situation, participants, topic at hand, previous parts of the conversation and social conventions to make a point.

2. Pragmatics is concerned not only with how context is used to convey information (i.e., the proposition) but also with how the speaker manipulates nonverbal and verbal aspects of the message to express a desired intention (i.e., the performative) (Burns et al., 1985).

These means of conveying the intent of a message are mediated through verbal and nonverbal behaviors (i.e., behaviors accompanying a language relayed message) such as gestures, facial expressions, eye contact and emotional intonation in speech. Nonverbal behaviors can also carry meaning alone (i.e, gestures or facial expression) or interface with the linguistic elements of a message to clarify meaning or intent.

Other cues that aid communication are provided through context. Extra-linguistic elements of a message include the situation, physical setting and type of speaking activity, as well as speaker/listener exchanges of these cues. The shared knowledge about each other and the topic at hand permit deletion of commonly known information. In addition, conversational partners are able to omit shared knowledge (i.e., presupposition) which may enhance communication by the inclusion or deletion of specific items or references. The speaker's intention can also provide contextual information to the listener. Therefore, effective communication can and does utilize nonverbal behaviors to perform the underlying goals of conversation.

Linguistic context also provides information. Some contextual

information is provided in terms of the references made in conversation as well as the ability to adjust references from speaker to listener as the gist of the conversation changes. Other types of conversational contextual cues provide organization and aid in the comprehension of the narrative and discourse. The ability to utilize these cues aids the speaker and the listener in conveying appropriate messages, drawing conclusions, appreciating humor and deriving morals (Burns et al., 1985).

Several researchers have assessed right hemisphere damaged individuals' pragmatic behaviors. Myers (1979) described the communication characteristics of right hemisphere brain damaged individuals as being comprised of "copious, inappropriate, confabulatory, irrelevant, literal, and occasionally bizarre" expressive abilities. Myers further reported that these individuals exhibited difficulties expressing themselves in a narrative form (i.e., storytelling). These individuals lacked an ability to integrate discrete items of information as a whole to provide an interpretation of events, and also missed the implication of questions, often responding in a literal/concrete manner. Based on these findings, Myers concluded that these individuals lack the abilities to identify critical information, to see relationships among events and, ultimately, to draw conclusions or inferences from this information. That is, these individuals were able to attend to the information relating to the general topic but they attend to irrelevant details because they were unable to integrate pertinent

information while rejecting irrelevant details.

Rivers and Love (1980) assessed right hemisphere damaged subjects' ability to perform oral storytelling. These subjects exhibited a decreased ability to use information contained in the sequence of three pictures to tell complete stories. Compared to normal subjects, these individuals used more words and confabulatory remarks to literally describe the pictured events with decreased aptitude for drawing inferences based upon the information given. The authors concluded that since these tasks required apprehension of visual actions, relationships and emotional nuances of characters, the subjects were unable to accurately integrate and use this information as a whole unit in order to provide accurate narratives.

Other researchers have elaborated on the right hemisphere damaged individual's inability to process information as a whole and use it appropriately in communication interactions. Right hemisphere damaged individuals, compared with left hemisphere damaged subjects, exhibited problems with antonyms, used excessive and rambling spontaneous speech with a tendency to focus on insignificant details, and frequently used tangential remarks. These persons also exhibited difficulties with appreciation of humor and had problems arranging sentences into coherent narratives (Gardner, Brownell, Wapner et al., 1983). Foldi (1983, cited in Burns et al., 1985) summarized these behaviors and stated that despite the right hemisphere damaged patients' competence with literal language, they are "severly disadvantaged because of difficulty with abstract meaning, problems organizing and

comprehending narratives, and difficulty interpreting jokes and metaphors."

Myers (1986) has also characterized the pragmatic disorders exhibited by right hemisphere damaged individuals. In her study, Myers initially described pragmatics as comprising: 1) rules governing conversation, 2) purpose of an exchange, 3) listener's needs, and 4) speaker's needs. Pragmatics, in her view, are dependent upon an ability to apprehend and use contextual cues, distinguish and identify critical information, and organize information into a hierarchy. Right hemisphere damaged patients were reported to manifest the following pragmatic disturbances:

1) difficulties in organizing information in an efficient, meaningful manner,

2) impulsive answers rife with tangential and related, but unnecessary detail,

3) over-personalization of events, and

4) literal interpretations of figurative language.

In sum, the right hemisphere seems to mediate the processing of information and its components (i.e., verbal and nonverbal communication behaviors) into a whole. When damage to the right hemisphere occurs, an individual may exhibit impairments in his ability to process and organize information as a whole, meaningful unit. As a result, this individual develops an overdependency on the linguistic system which codes information in an analytical fashion. This leads to impaired comprehension and use of abstract language as well as an impaired ability to respond and act appropriately in

communicative interactions. That is, the individual focuses on the strict linguistic code relayed to him with decreased ability to utilize other parts of the message to interpret, understand and appropriately respond to its true intent. These misinterpretations result in responses to communication interactions which relate to the general topic but contain irrelevant, egocentric and unorganized information.

Impairments in Prosody and Facial Expression

These behaviors have also alluded to an inability of the right hemisphere damaged individuals to process and integrate prosodic and facial expressive aspects of communication with the linguistic components of communication into a composite whole. These behaviors also provide essential information for the successfulness of communication interactions. These behaviors comprise impairments in the comprehension and use of appropriate affect and prosody of speech as well as recognition as use of facial expression.

Prosody

Prosody refers to the "affective coloring, melody and cadence of speech. It is the faculty of speech which conveys meaning by variations in stress and pitch irrespective of the words used or the grammatical construction of the message (Heilman, Bowers, Speedie and Coslett, 1984). These aspects of communication relay emotional content to language and allow communication of the speaker's emotional

state. Normal prosody is believed to depend upon both left and right hemisphere integrity, but right-sided lesions may impair prosody without altering the propositional components of verbal output and comprehension (Burns et al., 1985). Experimental evidence for decreased comprehension and use of prosody and affect by right hemisphere damaged subjects is well documented. Research indicates that, following right hemisphere damage, individuals frequently exhibit decreased abilities to discriminate and associate affective speech to the emotion it represents (Heilman et al., 1984; Tucker, Watson and Heilman, 1977; Weintraub et al., 1984). These subjects also exhibited decreased abilities to comprehend non-affective aspects of information such as deletion of intonational contours for questions versus statements (Heilman et al., 1984; Ross and Mesulam, 1979; Weintraub et al., 1984). Similarly, right hemisphere damaged individuals have demonstrated impairments in their ability to use prosodic variation in their speech. Ross and Mesulam (1979) defined this failure or absence of normal prosody variations in speech as "aprosodia". Aprosodia, secondary to right hemisphere brain damage, is characterized by monotone speech, poor ability to repeat sentences with prosodic-affective variation (Ross, Harney, deLacoste-Utamsing and Purdy, 1981) as well as decreased ability to spontaneously produce nonemotional prosody (Weintraub et al., 1984).

Ross (1981) has proposed a model of prosodic production and comprehension in which the anterior right hemisphere is responsible for the production of prosody and the posterior right hemisphere is

responsible for the comprehension of prosody. Damage to the anterior right hemisphere is said to create decreased expression but an intact comprehension of prosody. Damage to the posterior region was hypothesized to result in deficits in prosodic comprehension. Tucker et al. (1977), however, found deficits in comprehension and production of prosody in subjects with posterior right hemisphere brain damage. Clearly, further research is needed to identify the association between right hemisphere damage and prosodic disturbances.

Facial Expression

Individuals with right hemisphere damage have also been identified as exhibiting a decreased comprehension and use of facial expression (Myers, 1986). Receptively, these individuals have been shown to exhibit the following impairments:

1) naming emotional scenes,
2) discriminating between neutral faces,
3) discriminating between emotions depicted in facial expression, and
4) choosing accurate facial emotions (Myers, 1986).

Expressively, these right hemisphere damaged subjects have exhibited decreased emotional reactions to a variety of stimuli (i.e., pleasant, unpleasant, familiar, unfamiliar).

In summary, the clinical evidence to date suggests that the right hemisphere plays a role in processing of prosody and facial expression, which are important behaviors used in effective communication interactions. One must consider the basis for these

impairments. Two alternatives present themselves. These impairments may be symptomatic of a deeper, underlying emotional deficit or may be impairments superimposed over an intact emotional structure. Further research needs to clarify the nature of these behaviors. However, the existence of these behaviors in relation to the analytic-gestalt processing theory may be explained. The deficits exhibited by right hemisphere damaged individuals are but a small part of the overall impairment in their ability to analyze information. That is, even though these individuals exhibit impairments in their ability to understand and use facial expression and prosody accurately to infer meaning, they also exhibit an inability to process abstract linguistic information in the way it was intended. These behaviors are all a part of the impairment in processing information as a whole unit. These individuals become overreliant on their intact processing mechanism, that of analytic coding. Communicatively, the individual relies upon the analytically-based linguistic coding of information and omits coding of communication as a whole unit using abstract reasoning and nonverbal cues.

Table 1 summarizes the communication impairments exhibited by individuals with right hemisphere damage.

Table 1. Communication Impairments following Right Hemisphere Damage.

Category	Behavior
Abstract Language	Impaired ability to interpret and use: Connotative meaning Humor Idioms Metaphor Proverbs Absurdities
Pragmatic Behaviors	Impaired ability to organize narratives using the following skills: Sequencing story logically and concisely Identifying critical information Drawing inferences and implication Impaired ability to follow and use communication interaction rules, exhibiting the following behaviors: Irrelevant statements Confabulation Tangential comments Egocentricity Impaired ability to understand and use nonverbal contextual cues, including: Prosody of speech Facial expression

Visual Perception Impairments

Although recent research has seen an upsurge in interest in communication impairments following right hemisphere brain damage, traditionally the right hemisphere has been primarily considered as contributing to visual perception. Visual perception refers to the "ability to attend to a visually presented stimulus, evaluate its significance, integrate discrete stimuli into a pattern and associate

external stimuli with internal knowledge and experience" (Myers, 1986). As this definition implies, visual perception requires a complex interaction and representation of information in order to view the stimulus as a perceptual whole. Although visual perception deficits have been well documented in previous literature on right hemisphere damage, the deficits have rarely been analyzed relative to their role in information processing. The following discussion will address the most frequently exhibited visual perception deficits following right hemisphere damage and their possible relationship to the analytic-gestalt information processing theory.

Various visual perception deficits have been documented as resulting from right hemisphere damage. One such deficit is termed "environmental agnosia". Environmental agnosia is the inability to recognize a familiar environment. Although the individual can see and describe his surroundings accurately, he has no sense of familiarity about it, and therefore is unable to identify the location (Cummings, 1985; Myers, 1986). Cummings (1985) described this deficit as "perception stripped of its meaning". That is, the individual recognized the class of the object but was unable to distinguish among members of the class (i.e., to differentiate his house from another's house). In terms of the analytic-gestalt processing theory, this deficit may be representative of a decreased ability to compare current perceptions with stored perceptual memories and to integrate this idea into a meaningful whole.

A second perceptual disorder which follows right hemisphere brain

damage involves the individuals' ability to discriminate between faces and to recognize familiar faces (Cummings, 1985; Meadows, 1974; Myers, 1986). Meadows (1974) defined the inability to recognize familiar faces as "prosopagnosia". He stated that facial recognition is a complex and sophisticated visual achievement which is "gestalt-like" in nature, since it is resistant to verbal interpretation. This is a particularly interesting point as it relates to the analytic-gestalt processing view. In the individual's decreased ability to process information as a whole (i.e., in this case, modality-specific representation), he may rely on an analytic coding strategy which is inappropriate for the information with a resulting breakdown in the perceptual process. In facial recognition, many factors must be integrated to produce a perceptual whole (e.g., analysis of new information with comparison to old knowledge). Since the individual is unable to efficiently assess the information through a step-by-step rule-governed coding system, the message is inaccurately coded and represented. Research suggests, however, that the individual may learn to compensate for this deficit by relying on an analytic coding strategy to associate a salient feature to an individual (e.g., sound of voices, mole on face, eyeglasses, etc.) in order to recognize him later (Cummings, 1985).

Another perceptual disorder associated with right hemisphere damage is visual hallucination. Several visual hallucination disorders have been documented following right hemisphere damage, including "ictal" hallucinations and "release" hallucinations.

"Ictal" hallucinations are hypothesized to be a manifestation of epileptic discharges. They are brief in origin and are stereotypically flashes of light that the individual typically remembers. "Release" hallucinations are typically several hours in length, variable in content (e.g., story-like), accompanied by visual field deficits and not generally remembered by the individual. "Palinopsia", or the abnormal persistence or late occurrence of visual images after the stimulus has been removed, are hypothesized to be a type of "release" hallucination. These hallucinations, especially the "release" hallucinations, may be a result of the individual's inability to integrate the perception of his surroundings accurately (Cummings, 1985).

Several other perceptual disturbances have been documented as resulting from either left or right hemisphere damage. These deficits serve to reinforce the hypothesis that the right hemisphere cannot operate independently without deficits being produced. One impairment is termed "constructional disability" and includes the ability to draw spontaneously, copy modeled figures, assemble blocks and reproduce geometric shapes. These impairments are not attributable to sensory (i.e., visual acuity) or motor deficits (i.e., ataxia of apraxia) (Collins, 1976; Cummings, 1985; Myers, 1986). These abilities appear to require both an analytic and gestalt processing. For example, the individual must initially perceive the task as a whole (i.e., block design) and, then, must sequentially build it according to the model form provided. It may be that the right hemisphere's inability to

initially perceive the model as a whole prevents an accurate reduplication of the model and the ultimate representation of the whole form.

A second deficit which results from left or right hemisphere damage is "hemispatial neglect". Right hemisphere damaged patients typically exhibit a neglect of the left space. Hemispatial neglect is defined as "the failure of the individual to detect, report, or orient the stimuli in one hemiuniverse, regardless, of modality of presentation" (Cummings, 1985). Neglect is hypothesized to be comprised of many elements including arousal, attention, emotional affect/motivation and motor responsiveness. This deficit, therefore, may be the result of the inability to associate the impaired body (i.e., sensation and movement) and the spatial stimuli to the previous representation of those parameters in memory.

"Achromatopsia" or acquired color blindness is also associated with lesions of the left or right hemisphere. This disorder is frequently associated with environmental agnosia and prosopagnosia. This disorder is not readily interpretable according to the analytic-gestalt information processing theory.

Several other behaviors have also been exhibited by right hemisphere damaged individuals which accompany visual perceptual disorders. One behavior is dressing disturbances related to the individual's unilateral body/spatial neglect and disorientation. Another behavior is "anasognosia" which is defined as the denial of illness (Cummings, 1985). These individuals frequently also exhibit

reading and writing impairments. Reading deficits have been attributed to visual perception problems in tracking and scanning secondary to left neglect (Burns et al., 1985). Writing deficits in these individuals are characterized by omission of strokes, graphemes, syllables and words, as well as a failure to dot i's and cross t's, and the usage of extra capitals (Metzler and Jelinek, 1976). These behaviors have been attributed to neglect as well.

In studying visual perception disorders in right hemisphere damaged individuals, one must consider the speech pathologist's role in assessing and intervening these impairments. Depending upon the speech pathologist's role in the rehabilitation setting (i.e., interdisciplinary team member versus private practice), the speech pathologist may be called upon to treat the deficits and/or provide suggestions to other rehabilitation team members for strategies to overcome the various impairments. This is thought to be a logical and ethical role of the speech pathologist when remediation is based on analytic-gestalt processing theory which suggests that the right hemisphere damaged individual may become dependent upon his intact analytic coding strategies (i.e., linguistic skills) in order to interact in his environment.

Table 2 summarizes visual perception impairments associated with right hemisphere brain damage.

Table 2. Visual Perception Impairments following Right Hemisphere Damage.

Lesion Site	Impairment
Right Hemisphere	Environmental agnosia Facial recognition Visual hallucination
Right or Left Hemisphere	Constructional disability Hemispatial neglect Achromatopsia
Secondary to Other Visual Perception Impairments	Dressing disturbances Anasognosia Reading and writing impairment

Attention, Orientation and Memory Impairments

Three other impairments have been documented following right hemisphere damage. These comprise deficits in attention, orientation and memory (Moscovitch, 1976). Briefly, attentional disturbances in this population seem to comprise deficits in the attentional focus to tasks as well as the attention to left hemisphere (e.g., neglect and denial of illness). Individuals with right hemisphere damage also exhibit a disorientation to time, place and person. These deficits commonly result from the individuals' visual perception and integration impairment. Right hemisphere damaged individuals have also been documented as exhibiting decreased short- and long-term memory for visually-based information. These impairments, as described by Moscovitch (1976), are believed to be a result of the brain damage in general and, more specifically, may be secondary to

the visual perception and integration deficits of right hemisphere brain damage (Burns et al., 1985; Moscovitch, 1976). That is, the individual's inability to accurately perceive and interpret information across various modalities, especially visually, may lead these individuals to not fully understand the message. In his attempt to analyze the message, the right hemisphere damaged individual resorts to his analytically-based coding system (e.g., linguistic code) but is still unable to conceptualize the entire message with a resulting breakdown in perception. In communication, the individual attempts to talk about the incompletely coded perception with various resulting communication breakdowns since his idea was based on a defective coding system.

CHAPTER 4

DIAGNOSIS

Review of Diagnostic Protocols

Now that the impairments exhibited during right hemisphere brain damage have been reviewed and a philosophical rationale concerning their relationship to impairments in gestalt processing presented, this section will be dedicated to a review of several diagnostic protocols developed for the assessment of deficits following right hemisphere damage.

Three test protocols will be compared. These protocols include the RIC Evaluation for Communication Problems in Right Hemisphere Dysfunction (Burns et al. 1985), Diagnostic Approaches to the Right Hemisphere (West, Leader and Basson, 1982), and the Evanston Hospital Checklist (Evanston Hospital, Illinois). Tables 3, 4 and 5 describe each protocol's organization, behaviors assessed with these measures, and the relative advantages and disadvantages of each.

Goals of Diagnosis

In assessing/diagnosing communication impairments of any kind, the following objectives are provided by this information. The assessment procedures should provide pre-therapy baseline measures of the individual's abilities. Equally important, the assessment of these behaviors should aid the clinician in identifying the patient's strengths and weakness. This will provide the clinician with valuable

Table 3. Review of RICE Protocol. Protocol Name: RIC Evaluation of Communication Problems in Right Hemisphere Dysfunction (RICE) (Burns et al., 1985)

Behavioral Category/Materials	Behavior Assessed	Advantages	Diasadvantages
I. General Behavior Patterns Behavior Observation Profile *Interview questions *Interactions with others *5-point rating scale	Attention; eye contact; awareness of illness; orientation to place, time & person; facial expression; intonation; impulsivity; perseveration; unawareness of errors; decreased task orientation; left neglect	*Thorough checklist of behaviors which may influence prognosis	*Subjective judgement across clinicians may reduce reliability
II. Visual Scanning & Tracking *Scanning for letters & words with progressively more difficult tasks	Left neglect	*Provides information regarding severity of neglect in reading	*Assesses neglect in reading only
III. Writing *Copying, dictating & providing written description *5-point rating scale	Visuospatial disorganization, left neglect, omission of letters & strokes, ambiguous sentences, incomplete sentences, grammatical errors, phonetically- or visually-based spelling errors	*Provides good checklist for assessing writing skills	*Does not provide guidelines for differentiating between behaviors (e.g., phonetically- versus visually-based spelling errors)
IV. Pragmatic Communication Skills A. Nonverbal skills *5-point rating scale B. Conversational skills *5-point rating scale *Dialogue between patient & clinician C. Use of linguistic context D. Organization of narrative	A. Intonation, facial expression, eye contact, gesture, proxemics B. Initiation, verbosity, turn-taking C. Topic maintenance, presupposition, referencing D. Organization & completeness	*Provides explanation of terms	*Measures expressive behavior only *Does not provide information regarding patient's ability to benefit from cuing/models *Subjective judgement
V. Metaphorical Language *7-point rating scale *Auditorally-presented stimuli	Proverb & idiom interpretation	*Assesses ability to interpret metaphor without cues	*Measures expressive behavior only *Measures behavior in isolation only, needs step-using cues

Table 4. Review of West, Leader and Basson Protocol. Protocol Name: Diagnostic Approaches to the Right Hemisphere (West, Leader and Basson, 1982).

Behavioral Category/Materials	Behavior Assessed	Advantages	Diasadvantages
I. Language *Screening items from Boston Naming Test & Token Test	Expressive naming & auditory comprehension	*Provides baseline measure of these abilities	*Does not thoroughly assess expressive & receptive language skills, only specific behaviors
II. Single Word Responses	Part-whole relationships, oral opposites, written opposites, oral & written analogies	*Provides cues to patient; infer prognostic information from their ability to improve with cuing *Measures abstract thinking	*Provides no norms or guidelines for interpretation
III. Interpretive Skills	Oral & written idioms, proverbs, "threes" (e.g., "three things you can do with a hammer")	*Provides comprehension tasks for idioms & proverbs *Provides expressive tasks for idioms & proverbs	*Provides no norms or guidelines for interpretation
IV. Imagery Effects	Sentence repetition, paired associative learning with & without abstract pairing	*Assesses memory & integration of concrete & abstract words *Prognostic indicator	*Provides no norms or guidelines for interpretation
V. Humor *Auditory & visual presentation *Multiple-choice response	Oral absurdities; punch lines of jokes; cartoons, captions	*Measures comprehension across modalities *Measures ability to separate pertinent from absurd detail, to integrate into a whole	*Provides no norms or guidelines for interpretation

Table 5. Review of Evanston Hospital Checklist. Protocol Name: Evanston Hospital Right CVA Checklist

Behavioral Category/Materials	Behavior Assessed	Advantages	Diasadvantages
I. Subtests 1 to 4 *Scanning words & letters Subtests 5 & 6 *Reading comprehension	Left neglect, ability to scan & track	*Hierarchy of tasks, identify level of breakdown	*Provides no rating scale *Does not account for attention or memory factors
II. Subtests 7 to 9	Verbal absurdities, analogies, ordering of events	*Assesses ability to abstract & sequence items on a verbal task	*Provides no rating scale *May not represent skills in visual-motor sequencing (e.g., patient may be able to tell the sequence of a task but be unable to carry it out motorally)
III. Subtest 10: Visual-Motor Coordination Subtest 11: Written Pictorial Description Subtest 12: Sentence Copying Subtest 13: Spelling to Dictation	Visual-motor coordination, left neglect, legibility of writing, sentence construction, spelling, phonemic & semantic errors	*Hierarchy of skills, demonstrate level of breakdwon, useful for therapy baseline	*Provides no rating scale *Does not assess abstract language behavior for written descriptions
IV. Subtests 14 & 15: Proverb & Idioms *Expressive tasks *Checklist of behaviors exhibited	Proverb & idiom interpretation out of context	*Provides checklist of behaviors to observe	*Assesses expressive skills only *Interpretation is out of context, may not represent performance in spontaneous speech

information in determining the patient's candidacy for therapy as well as targeting specific therapy strategies and goals. Another prime consideration in assessment is any prognostic information. This information will be particularly helpful for family counseling and interdisciplinary team decision for rehabilitation, as well as for determining treatment goals (Burns et al., 1985).

The protocols presented in Tables 3, 4 and 5 have attempted to provide the clinician with this information. However, in general, these protocols have several inherent problems. One problem involves the unsystematic manner in which expressive and receptive abilities for communication tasks are assessed. The RICE protocol does not directly assess receptive behaviors and the other checklists do so in an unorganized manner. In addition, these protocols frequently provide no guidelines or rating scales for interpretation of the behaviors assessed. The RICE protocol provides a well organized rating scales which will be elaborated upon in the protocol developed and outlined in this paper.

The goals of the following protocol will be three-fold:

1) to provide expressive and receptive evaluation measures,

2) to provide subjective rating scales for behavior interpretation, and

3) to provide a rationale for these behaviors as they relate to the analytic-gestalt information processing theory.

As mentioned, the following protocol will utilize many of the behavior evaluation measures used by the RICE protocol in that it will assess the following behaviors: attention, orientation, visual

perception and communication disorders. The rating scales used by the RICE protocol will also be applied to this protocol. This protocol will draw from the other protocols in that it will assess receptive abilities as they apply to communication behaviors. An assessment of visual perception abilities will be included to assess left neglect as well as constructional abilities, visual integration, visual memory and visual-linguistic abilities (e.g., reading and writing). The communication section will also include an assessment of pragmatic skills as well as comprehension and expression of abstract language.

Rationale for Proposed Protocol

Before this protocol is reviewed, the following rationale will provide the reader with the underlying basis for the development of each protocol section as it applies to the gestalt processing abilities of the right hemisphere and, more specifically, its application in identifying impairments following right hemisphere damage.

Part I of this protocol was adapted from the RICE protocol to provide the examiner with general information regarding the patient's attention, eye contact, awareness of illness, orientation, expression, intonation and conversational skills in several environments. In addition to these skills, this writer will expand on the basic RICE protocol to include behavioral observations of the patient's visual perception abilities as he/she interacts in environmental situations. These observations include the patient's ability to dress, propel a

wheelchair, eat meals and carry out other activities of daily living. These behaviors are all important prognostic indicators of the patient's ability to benefit from therapy as well as indicate the way in which the patient will interact in his environment as a whole. The rating scale adapted from the RICE protocol will provide the examiner with information regarding the patient's relative strengths and weaknesses, identifying those behaviors which require more detailed assessment. However, the revised protocol provides a slightly altered rating scale in that rating level 2 represents the patient's ability to benefit from verbal/visual/tactile cuing. This allows the clinician to document the patient's response to stimuli with and without cues, which is considered to be an important prognostic factor during diagnosis.

These two alterations have been added to the RICE protocol to provide increased subjective data to the clinician regarding the patient's ability to perceive and integrate visual information as well as a more definitive measure of the patient's stimulability as provided by the revised RICE rating scale.

Part II of this protocol will provide the examiner with information regarding the patient's visual perception abilities as a function of his overall conceptualization of his environment and their relationship to his communication skills. The behaviors assessed by this protocol include left neglect, constructional disability, visual integration, visual memory and visual-linguistic skills (e.g., writing). These behaviors are assessed since they interfere with the

individual's ability to perceive his environment as a whole and, indirectly, result in reduced communication interactions.

First, left neglect is assessed to provide the clinician with information regarding the presence of left neglect across various modalities. Although the RICE protocol assesses left neglect in reading, it does not assess the presence of left neglect for tactile stimulation. Subtest #1 in Part A of the Visual Perception Testing section was added to provide the clinician with a method for identifying and rating severity of left neglect for tactile stimulation. Therefore, this information will provide additional data regarding the patient's ability to interact and, indirectly, communicate in the environment.

Secondly, several categories were developed and derived separately from the RICE protocol. These categories include the assessment of constructional disability, visual integration, visual memory and visual-linguistic behaviors (i.e., writing skills). The assessment of the presence of constructional disability was developed at two levels. Subtest #1 assesses the patient's ability to copy rudimentary shapes, whereas Subtest #2 assesses higher level abilities to perform a continuum (concrete to increasingly abstract) of designs. Again, these subtests were provided to supply the clinician with data regarding the patient's perception of visual stimuli and his ability to perform visual-motor acts. These abilities/impairments may be reflected in the patient's interactions in his environment and, subsequently, the way in which he communicates about his perceptions.

Visual integration skills, as adapted from the Hooper Visual Organization Test, are also briefly screened in this protocol to provide the clinician with rudimentary data regarding the patient's ability to develop a whole from parts. Visual memory assessment is also provided which measures the patient's ability to follow sequenced visual-motor acts and memory for pictures. Therefore, visual integration and memory assessment, as provided by this protocol, provide the clinician with general data which identify visual-motor impairments which may affect the individual's perception of his environment as a whole.

Finally, the Visual Perception Testing section of this protocol assesses the patient's ability to integrate visual and linguistic skills in various writing tasks. Subtest #1, adapted from the Evanston Hospital Right Hemisphere Checklist, assesses the patient's ability to copy letters at the sentence. This subtest, therefore, will provide the clinician with additional information about the patient's skill with visual copying. If the patient exhibits deficits at this low level, one may infer that a visual-motor basis may be attributing to the problem. Subtest #2, on the other hand, assesses the individual's ability to formulate and provide a written description. This subtest, adapted from the Boston Diagnostic Aphasia Examination, also provides guidelines for interpretation of the picture concepts as provided by Yorkston and Beukelman (1977). By evaluating the description provided by the individual, the clinician may assess rudimentary writing skills, sentence formulation and use of

literal versus interpretive concepts informally in order to identify any possible deficits for further, indepth evaluation.

In summary, these additions are supplemental to the RICE protocol's visual perception testing for left neglect to provide the clinician with data assessing other deficits which may occur following right hemisphere damage. The presence/absence of errors in these skills will provide the clinician with indirect information regarding the patient's ability to interact and communicate in his environment.

Part III of this protocol was developed to identify and assess various communication impairments exhibited following right hemisphere damage. These behaviors include primarily pragmatic and abstract language skills. Pragmatic behavioral evaluation was taken from the RICE protocol to provide information regarding the patient's ability to use nonverbal communication, conversational skills, context and narratives. These behaviors are important components in ones ability to assess, comprehend and respond to communication situations as an integrated whole. In addition, the protocol provides assessment strategies for evaluating the comprehension and use of abstract language. It assesses the individual's ability to comprehend and use metaphorical language, analogies and absurdities at isolated task levels and in conversational speech.

Several components have been added to the Communication Assessment section of the protocol not provided by the RICE protocol. First, this protocol recommends that the clinician assess the individual's receptive and expressive language skills with a

standardized aphasia battery of his/her choice. This evaluation would either rule out or include receptive and expressive language impairments as part of the overall communication impairment exhibited by the patient. Second, the assessment of the individual's pragmatic skills includes the assessment of his comprehension and use of vocal intonation and facial expression. These screening tasks were added since the previously cited literature strongly suggested that right hemisphere damaged individuals exhibit decreased comprehension and use of the nonverbal communication skills, resulting in communicative breakdowns. Screening for these skills functions to aid the clinician in identifying the presence of an impairment for a more detailed evaluation. Finally, the revised protocol provides more assessment items for abstract language skills. Subtest #1 was added to assess the individual's comprehension of metaphorical language when provided with context as well as a multiple-choice answer format. This format, adapted from Myers and Linebaugh (1981), provides the clinician with prognostic data regarding the patient's performance with increased structure. These results may be compared with those which provide cuing and structure to indirectly assess the patient's stimulability as well as to identify abstract language impairments.

Subtest #2 assesses the patient's ability to provide verbal analogies in a multiple-choice format. Again, this task provides identification of abstract thinking deficits as well as benefit from a structured task. Finally, the revised protocol adds assessment of the patient's awareness and reaction to verbal absurdities in Subtest #3.

This section was added to identify the individual's awareness or lack therein of inappropriate language use, since this has been hypothesized to be a deficit following right hemisphere brain damage in the literature.

In conclusion, a cautionary note should be made regarding the comprehensiveness of this protocol. Although it provides a rudimentary evaluation of basic skills associated with right hemisphere damage, it is not an encompassing model of these deficits. Diagnostic therapy may be a viable alternative for the clinician who wishes to evaluate these behaviors across all modalities and at a variety of task levels.

(Refer to Appendix A for Diagnostic Protocol.)

CHAPTER 5

REMEDIATION

Once the individual's relative strengths and weaknesses have been identified using informal and formal measures of communication and visual perception, the clinician will determine the patient's appropriateness for therapy. Important factors which have been previously cited as affecting the patient's ability to benefit from direct therapy include attention, orientation, memory and awareness of impairment. A patient who demonstrates unimpaired abilities in these areas may be more likely to benefit from therapy than a patient exhibiting impairments in one or more of these factors (Burns et al., 1985).

When considering remediation for communication impairments following right hemisphere brain damage, relatively little research has been compiled regarding the effectiveness of direct therapy for right hemisphere damaged individuals. However, general trends in remediation of communication disorders in brain-injured populations suggest two courses for treatment: compensation and stimulation. Compensation, for this purpose, will be defined as the individual's ability to use strategies to overcome irreversible loss of particular brain functions. Stimulation, on the other hand, refers to the ability to promote improved functioning of the impaired processes themselves. That is, compensation therapy focuses on teaching the individual alternative methods for communicating his message, whereas stimulation therapy attempts to facilitate functioning of the impaired

mechanism (Ylvisaker and Holland, 1985). When considering the problems (i.e., processing communication as a whole) exhibited by right hemisphere damaged individuals, both treatment approaches may be applicable.

Stimulation Therapy

In terms of the stimulation therapy approach, the goal of therapy would be to help the patient regain ability to process information as a perceptual and communicative whole. Burns et al. (1985) outlined a hierarchical therapy program for right hemisphere damaged individuals which focused on stimulation of attention, orientation and memory, as well as appropriate pragmatic behaviors and integration of abstract information. Although these researchers provided a thorough outline of behaviors to be treated with this program, they provided no guidelines for measurement of progress or generalization. It is the generalization of these behaviors to other situations and settings which provide proof that a behavior/skill has been relearned or stimulated. Without generalization documentation, this approach may result in continued therapy over extended periods of time which serve no functional purpose for the patient or the clinician. Also, one must address the effectiveness of stimulation therapy on impairments which are based upon a gestalt processing deficit. That is, can therapy directed at the symptoms of the problem (i.e., perceptual deficits, pragmatic and abstract language impairments) result in overall increased abilities in integrating information as a whole?

Until further research is documented regarding the effectiveness of stimulation therapy in terms of generalized communication behaviors in right hemisphere damaged patients, these questions cannot be answered.

Compensation Therapy

A second therapy approach, compensation therapy, may provide a more viable alternative for the remediation of gestalt processing deficits exhibited by right hemisphere damaged individuals. As stated previously, this type of therapy focuses on teaching the patient to compensate for his impairments by using his strengths or intact abilities. In terms of individuals with right hemisphere damage who exhibit impairments in gestalt processing, therapy would concentrate on facilitating functioning based on the patient's intact language skills (i.e., analytic processing) and structuring his environment to reduce his need to process information in a gestalt manner. Therapy, therefore, would focus on teaching the patient to rely on his intact language skills to "talk himself through" visual-motor tasks (i.e., activities of daily living, wheelchair propulsion, eating, cooking, etc.) as well as providing structure to his environment. In providing structure to the patient's environment, caregivers have decreased the need for processing information in a wholistic manner. Staff education will be important in managing the patient. The staff should be educated regarding the patient's deficits and best methods for interacting with him. In terms of right hemisphere damaged individual's communication abilities, several components must be

addressed. First, since right hemisphere damaged individuals exhibit decreased ability to attend to and integrate pragmatic and abstract language information, staff should avoid humor, sarcasm and abstract language as the patient is likely to take what is said literally. Equally important, staff should be educated regarding the patient's overall communication skills and ability to carry out tasks. These behaviors should not be interpreted as changes in personality or emotion but as an inability of the patient to express himself appropriately or to carry out tasks independently as a result of a general gestalt processing impairment (Burns et al., 1985; Myers, 1986). Also, staff who work with the patient on tasks requiring visual perception, memory and integration, may consult the speech pathologist regarding the most facilitative methods for modeling and cuing behaviors for these patients. These patients appear to benefit from short, verbal cuing which progresses through the task in a step-by-step manner (Burns et al., 1985; Myers, 1986). This cuing strategy takes advantage of the patient's intact analytic coding mechanism to help him compensate for his impairments.

Family and Patient Counseling

Whether the speech pathologist opts for a stimulation versus compensation approach for right hemisphere damaged patients, or a combination of the two, one must incorporate family and patient counseling into the program. Early in the intervention of these patients, it is imperative that family be counseled regarding the

changes undergone by the patient. The patient's communication skills as well as visual perception abilities should be defined for the family in terms of functional characteristics of the behaviors and their effects on the patient's ability to interact in his environment. Equally important, the family should be informed of the behaviors exhibited by the patient that are a result of his brain damage and not a change in personality, emotion or voluntary behavior of any sort. Finally, as recommended previously, the patient's environment should be structured so as to decrease his need to integrate and understand information as a whole. Family counseling should focus on educating the family in providing the patient with such an environment in communication interactions (e.g., say what you mean) and in activities of daily living in which the patient may be in danger to himself and others. Burns et al. (1985) provided the following communication guidelines for interacting with right hemisphere damaged patients:

- -Treat the individual as an adult.
- -Strive for communication, not perfection.
- -Provide reassurance and redirect attention to another task or topic when the patient swears, cries or displays emotional outbursts.
- -Routinize daily schedule.
- -Organize the home environment to aid memory.
- -Structure and minimize auditory and visual stimulation to permit better attention to the task at hand.
- -Rearrange the environment to use the right visual space.
- -Compensate for visual impairments through concrete verbal mediation.
- -Supplement all directions with simple repeated verbal cues.
- -Draw attention to visual reference points in the room, such as door and furniture.
- -Avoid rapid movements around the individual.
- -Establish attention prior to giving a message to the individual.
- -Repeat a statement when uncertain whether the individual was attending.

-Be aware that the individual's lack of affect does not necessarily signal disinterest or depression.
-Ask questions during a conversation to ensure that the individual remembers and follows topic changes.
-Encourage the individual to plan out a task by breaking up the task into a specified number of small steps.
-Decrease impulsivity by encouraging the individual to slow down.

In summary, when considering remediation for an individual exhibiting communication impairments following right hemisphere damage, one must keep in mind that the deficits exhibited are not modality specific but rather are manifestations of a gestalt processing impairment. This impairment in and of itself engulfs many abilities making direct treatment of these deficits much more elusive than traditional communication impairments. In the speech pathologist's attempt to treat the diffuse symptoms of this disorder, one could easily lose sight of the general impairment (i.e., gestalt processing). The speech pathologist must guard against this and keep in mind that the original goal of therapy was to enable the patient to communicate and interact in his environment as effectively as possible.

CHAPTER 6

CONCLUSION

Research Considerations

In conclusion, this paper has attempted to better define the communication impairments exhibited by individuals suffering from right hemisphere damage as well as to provide rudimentary diagnostic and remediation considerations for these individuals. In order to better diagnose and treat these patients, much more research is necessary in this disorder. Further research is necessary to better define and cite the incidence of specific communication impairments compared to other disorders (i.e., visual perception) as they relate to gestalt processing. Also, research is needed to assess the effectiveness of various treatment programs with these patients in terms of generalization behavior. Finally, research is needed to validate that the gestalt processing theory is indeed a specialized function of the right hemisphere.

Clinical Considerations

In addition to further research into right hemisphere damage and its affect on communication, speech pathologists in the clinical setting must also now address this disorder and methods for assessing and treating individuals with right hemisphere damage. With recent research uncovering pragmatic and abstract language impairments in right hemisphere damaged individuals as well as visual perceptual

impairments, the speech pathologist is called upon to assess and treat an array of impairments. No longer can the speech pathologist legitimately address only writing impairments in individuals with right hemisphere damage. This paper was written in an attempt to provide the reader with more than just a description of impairments exhibited by the individuals, but to provide this description with an underlying etiological basis whereby diagnosis and therapy may be developed to address the underlying disruption in gestalt processing rather than its symptoms alone. It is this writer's belief that unless speech pathologists are able to assess and remediate communication impairments in these individuals as a unified whole, utilizing other health professionals and family members to provide structure, generalization and support to the individual's environment, the patient's rehabilitation will result in being as disjointed as the brain-damaged individual's perceptions and communication interactions. However, if systematic evaluation and remediation approaches are applied to these individuals which focus on structuring and providing right hemisphere damaged individuals with methods for compensating for their gestalt processing deficits, both the clinician and patient may find rehabilitation a rewarding and successful process.

APPENDIX A

EVALUATION PROTOCOL

TEST PROFILE

Patient's Name_____ Clinician_____

Test Scores: Initial Test_____
Retest_____
Retest_____

I. BEHAVIORAL OBSERVATION [Adapted from RICE Protocol; Burns et al., 1985]

A. Environment:	Quiet	/50	/50	/50
	Noisy	/50	/50	/50
	3-way	/50	/50	/50
B. Severity Rating				

II. VISUAL PERCEPTION TESTING [Scoring format adapted from RICE Protocol; Burns et al., 1985]

A. Left Neglect				
	Subtest #1	/5	/5	/5
	Subtest #2 (# Errors)			
	Subtest #3 (# Errors)			
	Subtest #4 (# Errors)			
	Subtest #5 (# Errors)			
B. Constructional Disability				
	Subtest #1	/5	/5	/5
	Subtest #2 (# Errors)			
C. Visual Integration				
	Subtest #1	/4	/4	/4
D. Visual Memory				
	Subtest #1			
	Subtest #2			

TEST PROFILE (Continued)

E. Visual-Linguistic Skills

Subtest #1			
Subtest #2			
Subtest #3			
Overall Score	/55	/55	/55

F. Ancillary Tests Used: _____

III. COMMUNICATION ASSESSMENT

A. Standardized Aphasia Assessment
Tests Used:

Results:

B. Pragmatic Communication Skills

Rating			

C. Abstract Language Assessment

Subtest #1 (Comprehension)			
(Expression)			
Subtest #2 (# Errors)			
Subtest #3 (# Errors)			
Subtest #4 (Comprehension)	/10	/10	/10
(Expression)	/10	/10	/10

IV. COMMENTS:

[Scoring format adapted from RICE Protocol; Burns et al., 1985]

TEST PROTOCOL

I. BEHAVIORAL OVSERVATION

Functions Assessed:

- Attention
- Eye contact
- Awareness of illness
- Orientation to place, time and person
- Facial expression
- Intonation
- Topic maintenance
- Visual perception*

Testing Situations:

- Quiet
- Noisy
- Three-way conversation

Interview Questions:

1. What is your name?
2. Where do you live?
3. Where are you right now? (Simplification: Are you in the hospital?)
4. How long have you been here? (Simplification: When were you admitted? When did you become ill?)
5. What is the date today?
6. What is your occupation?
7. What time is it?
8. What specific problems are you having now? (Simplification: Can you read and write?)
9. Have you eaten today? (What meals have you eaten today?)
10. Have your family and friends been here to visit you?
11. Do you know who I am?
12. Can you show me where your television (telephone, closet, etc.) is?
13. How long would you say we've been talking?

*Information added to the RICE Protocol; behavioral observation adapted from RICE Protocol, Burns et al., 1985.

I. BEHAVIORAL OBSERVATION (Continued)

Observations:

1. Observe the patient in interactions with family and hospital staff to determine orientation to person.

2. Observe patient's ability to find the way from nursing station to own room to determine active orientation to place.

3. Observe patient's ability to dress himself, propel his wheelchair, eat his meals, etc., to determine his ability to sequence and integrate visual motor acts.*

Notes:

I. BEHAVIORAL OBSERVATION (Continued)

A. Scoring [Adapted from RICE Protocol, Burns et al., 1985]

	1	2	3	4	5
Attention	Inattentive Unresponsive to Cues	Responds to cue	Attentive 50% time	Attentive 75% time	Fully attentive
Eye Contact	None	Attends with cue	Present 50% time	Present 75% time	Appropriate
Awareness of Illness	Denies illness	Attends with cue	Aware of some prob.	Aware of most prob.	Fully aware
Orientation to:					
Place	Unaware		Passively oriented		Oriented
Time					
Person					
Use of Facial Expression	None		Limited/ inappropriate		Appropriate
Intonation	Flat/ sterotyped		Limited/ inappropriate		Appropriate
Topic Maintenance	Maintains topic <25% time, use of tangential comments		Maintains topic @ 50% time		Maintains topic
Visual Perception	Unable to carry out motor acts independently	Functions with cue	Independent @ 50% time		Carries out motor acts independently

QUIET_____

NOISY_____

3-WAY_____

TOTAL_____

I. BEHAVIORAL OBSERVATION (Continued)

B. Severity Rating Scale [Adapted from RICE Protocol; Burns et al., 1985]

TOTAL	DESCRIPTION
10 - 16	Severe Patient has severe impairments in attention, orientation, communication interaction and visual-motor perception. He does not or responds minimally to cuing.
17 - 24	Moderately Severe Patient has marked deficits in attention, orientation and communication interactions as well as visual-motor perception, but responds to some stimuli and benefits from cuing/assistance.
25 - 32	Moderate Patient has functional communication in simple, familiar contexts; responds appropriately to simple stimuli; but shows continued problems with attention, eye contact, denial, orientation, affect and/or visual-motor perception.
33 - 40	Mild Patient appears to function adequately in most situations, but specific impairments become apparent in distracting settings, and with abstract communication.
41 - 50	Minimal to Normal Patient communicates in full range of contexts but subtle deficits in integration of communication or visual perception persist.

II. VISUAL PERCEPTION TESTING

Behaviors Assessed:
A. Left Neglect
B. Constructional Diasability
C. Visual Integration
D. Visual Memory
E. Visual-Linguistic Behaviors

A. Left Neglect [All Subtests except #1 were adapted from RICE Protocol]

Subtest #1 Double Simultaneous Stimulation

-Instruct the patient to close his eyes and tell you which side of his body is touched (e.g., left or right shoulder, knee, face). Alternatively, tap left, right, and then both sides at once.

-Rating Scale

1	2	3	4	5
Does not identify tapping of left side		Extinguishes on left when both sides are tapped		Identifies tapping of both sides across three trials

Subtest #2

-Scanning for large, widely-spaced letters

FFF	F	R	T	A	F	G	E	F	V	D	F	J	U	I	K	O	F
FFF	T	R	A	F	E	F	D	S	F	B	G	E	F	D	C	M	N
FFF	F	R	G	U	T	F	V	C	A	D	F	C	E	O	P	F	N
FFF	D	E	F	G	V	B	N	M	U	I	F	X	W	F	E	T	H

Errors_____

Subtest #3

-Scanning for small, closely-spaced letters

aaa	ieypeakziwqlakekakrhamwoaneialfjeaqoekf
aaa	peoqbdjfubejhkrjbhaubdkejgyblakfirhtbsj

Errors_____

II. VISUAL PERCEPTION TESTING (Continued)

A. Left Neglect (Continued)

Subtest #4

-Scanning for large, widely-spaced words

Match	FETCH	HALF	MATH	MATCH	HATCH	MATCH
Round	SOUND	FOUND	SOUND	HOUND	ROUND	FOUND
Hard	HALF	PATH	HARD	HAND	FAND	HARD
Radio	RIDE	RODEO	RODEO	VIDE	RADIO	VIDEO

Errors_____

Subtest #5

-Scanning for small, closely-spaced words

the	hte	the	eth	the	then	the	hte
sit	tis	sit	sil	sit	cit	sit	sit
let	led	del	led	ted	let	del	let

Errors_____

B. Constructional Disability

Subtest #1 Copying Simple Shapes

Scoring: 3 points total; one point each

Subtest #2 Block Designs [Subtest of Weschler Adult Intelligence Scale]

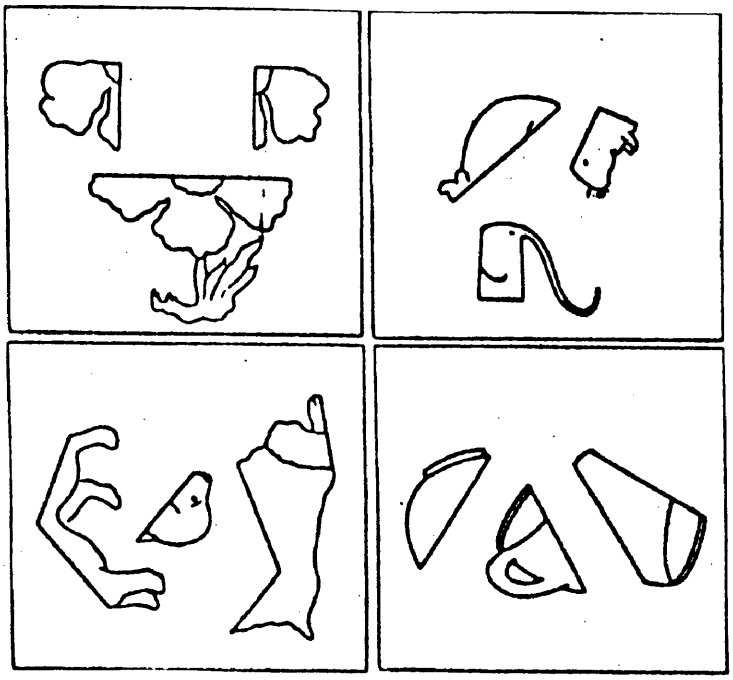
-Assesses ability to copy designs from concrete to abstract designs

II. VISUAL PERCEPTION TESTING (Continued)

C. Visual Integration

Subtest #1 [Subtest of Hooper Visual Organization Test]

Example:



D. Visual Memory

Subtest #1 Sequenced Motor Act [Subtest of Hiskey-Nebraska Test of Learning Aptitude]

-Scoring:

Subtest #2 Visual Attention Span for Pictures [Subtest of Hiskey-Nebraska Test of Learning Aptitude]

-Scoring:

II. VISUAL PERCEPTION TESTING (Continued)

E. Visual-Linguistic Behaviors

Subtest #1 [Subtest of Evanston Hospital Checklist]

-Patient should be instructed to copy the following alphabetically balanced sentence:

The quick brown fox jumps over the lazy dog.

Subtest #2 [Subtest of Evanston Hospital Checklist]

-Patient should be instructed to dictate the following words:

little
annual
coloring
January
phone
saw
ramp
butter
chimny
insist

II. VISUAL PERCEPTION TESTING (Continued)

E. Visual-Linguistic Behaviors (Continued)

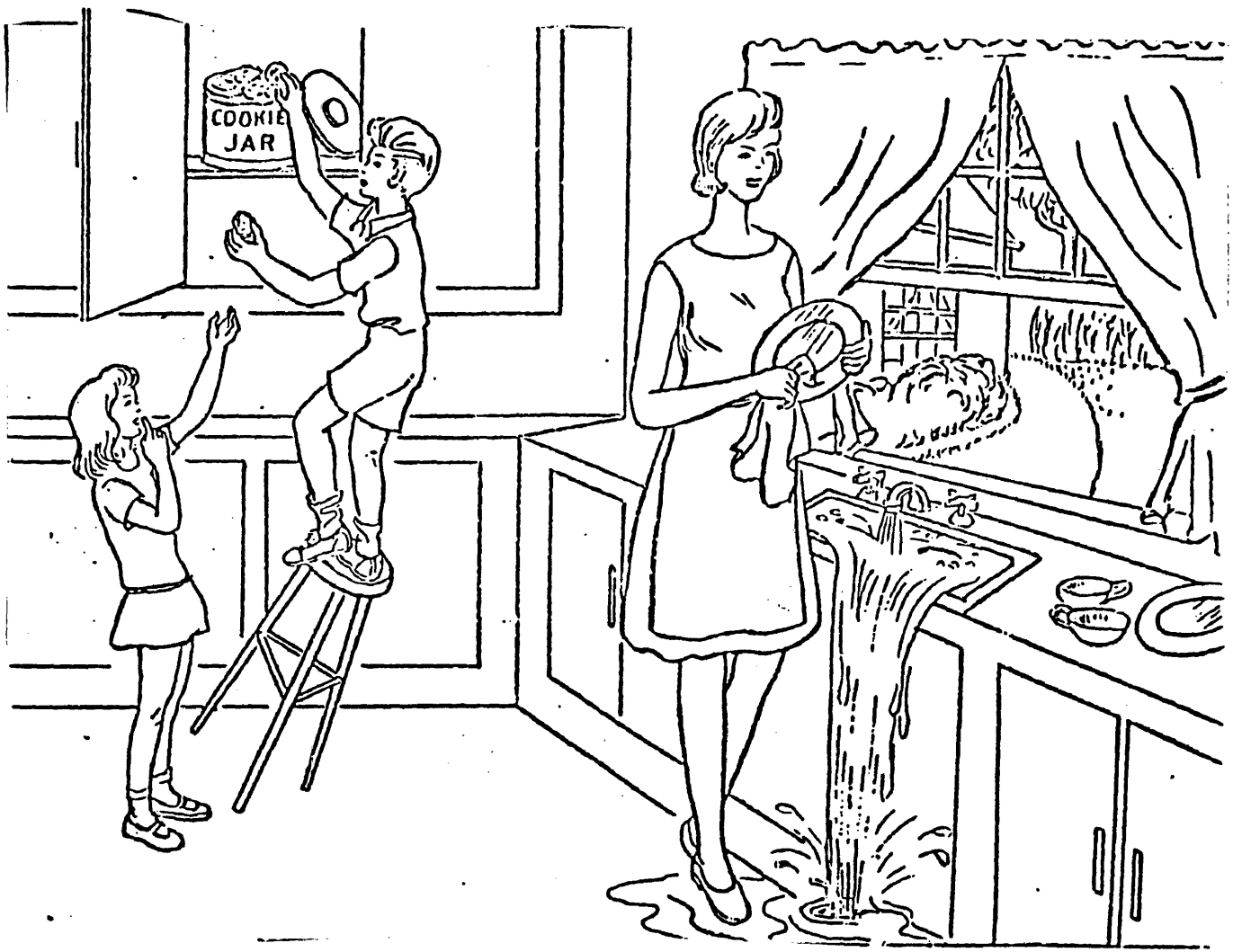
Subtest #3 Written Picture Description [Cookie Theft Picture, Boston Diagnostic Aphasia Examination]

-Patient should be instructed to write a written description of the picture (see next page).

-Scoring should be compared to the literal and interpretive cookie picture concepts provided by Yorkston and Buekelman (1977).

Table 1. Literal and interpretive cookie theft concepts

Two	little	*mother	*in the kitchen
children	girl	woman (lady)	(indoors)
little	*sister	children behind	*general
boy	standing	her	statement
*brother	by boy	standing	about disaster
standing	reaching up	by sink	lawn
on stool	*asking for	*washing (doing)	sidewalk
*wobbling	cookie	dishes	house next door
(off-balance)	has finger	*drying	open window
3-legged	to mouth	faucet on	curtains
*falling over	*saying "shhh"	*full blast	
on the floor	(keeping him	*ignoring	
*hurt himself	quiet)	(daydreaming)	
reaching up	*trying to help	water	
*taking	(not trying	overflowing	
(stealing)	to help)	onto floor	
cookies	*laughing	*feet getting wet	
*for himself		dirty dishes left	
*for his sister		puddle	
*from the jar			
on the high shelf			
in the cupboard			
with the open door			
*handing to sister			


COOKIE
JAR

II. VISUAL PERCEPTION TESTING (Continued)

F. Overall Scoring of Writing Skills [Adapted from RICE Protocol; Burns et al., 1985]

	1	2	3	4	5
Visual-Spatial Disorganization (superimposed letters, lines & lines on a diagonal)	Present 100%	Benefits from cue	Present @ 50%		Adequate
Left Neglect	Present 100%	Benefits from cue	Present @ 50%		Absent
Omission of Letters	>30 omissions		<15 errors		<3 errors
Omission of Strokes (unclosed a's & o's, i's undotted, t's uncrossed)	>100 omissions		@ 50 omissions		<10 omissions
Perseveration of Strokes &/or Letters	>30 errors		<15 errors		<3 errors
Ambiguous Sentences	≥50% sentences unclear		≥25% unclear		≤1 sentence unclear
Run-on Sentences	Always present		Present @ 50%		Not present
Incomplete Sentences	Always present		Present @ 50%		Not present
Grammatical Errors	>10 errors		@ 5 errors		≤1 error
Spelling Errors	>80% errors		@ 50% errors		Correct
Interpretation of Picture	Literal interpretation		50% Literal/ 50% interpretive		Interpretive description

III. COMMUNICATION ASSESSMENT

A. Evaluation of basic language skills:

Comprehension and expression of: Phonology
Syntax
Concrete Semantics

Recommend use of standardized aphasia battery of clinician's choosing.

B. Pragmatic Communication Skills

Behaviors Assessed:

1. Nonverbal Communication:
   - Intonation
   - Facial expression
   - Eye contact
   - Gestures & proxemics

2. Conversationsal Skills:
   - Initiation
   - Turn-taking
   - Verbosity

3. Use of Linguistic Context
   - Topic maintenance
   - Presupposition
   - Referencing skills

4. Organization of Narrative
   - Organization
   - Completeness

III. COMMUNICATION ASSESSMENT (Continued)
B. Pragmatic Communication Skills (Continued)

Nonverbal Communication

Intonation

Comprehension: Present patient with sentences comprised of different intonational contours; instruct patient to interpret tone of voice.

E.g., The dog ran out the door. (Anger)
(Statement)
(Question)

Expression: Present the patient with sentences to read with a variety of punctuation marks and emotions.

E.g., He is a nice person.
He is a nice person!
He is a nice person?
She is a hard worker. (Sarcasm)
They were in a car accident. (Worry)

Facial Expresion

Comprehension: Present the patient with pictures of various facial expressions.

E.g., happy, sad, worry, frustration, anger, etc.

Expression: Instruct the patient to pantomime various facial expressions.

Gestures

Comprehension: Provide the patient with various gestures to interpret.

E.g., "ok", "thumbs up"

Expression: Instruct the patient to gesture use of various objects.

E.g., spoon, match, soap, hammer and nail

III. COMMUNICATION ASSESSMENT (Continued)

B. Pragmatic Communication Skills (Continued)

Subtest #1 Rating Scale of Pragmatic Skills

a. Assessment: Pragmatic skills should be assessed from a dialogue between the clinician and patient in a naturalistic setting. In addition to the dialogue, discourse organization should be scored from a narrative told by the patient (Burns et al., 1985).

b. Rating Scale [Adapted from Burns et al., 1985]

Nonverbal Communication

Intonation	1 Flat/stereo-typed	2	3 Limited/ inappropriate	4	5 Appropriate
Facial Expression	1 None	2	3 Limited/ inappropriate	4	5 Appropriate
Eye Contact	1 No contact	2	3 Needs cue to establish/maintain contact	4	5 Appropriate
Gestures/ Proxemics	1 Inappro-priate/No use	2	3 Inconsistent appropriate use	4	5 Appropriate

Conversational Skills

Conversa-tional Initiation	1 Inappro-priate/No initiation	2	3 Infrequent initiation	4	5 Appropriate
Turn-taking	1 Does not obey signals	2	3 Inconsistently follows signals	4	5 Adequate
Verbosity	1 50% or more responses are verbose/tangential	2	3 25-50% verbose/ tangential	4	5 Appropriate

III. COMMUNICATION ASSESSMENT (Continued)

B. Pragmatic Communication Skills (Continued)

Subtest #1 (Continued)

b. Rating Scale (Continued)

Use of Linguistic Context

	1	2	3	4	5
Topic Maintenance	Maintains topic less than 25%		@ 50%		Adequate
Presupposition	Presupposes too much/little 50%		Presupposes too much/little 25-50%		Appropriate
Referencing Skills	Inappropriate referencing		Inconsistent appropriate referencing		Appropriate

Organization of Narrative

	1	2	3	4	5
Organization	Disorganized		Somewhat organized, lacks unifying theme		Adequate
Completeness	More than 50% details missing/inaccurate		25-50% missing/ inaccurate		Adequate

III. COMMUNICATION ASSESSMENT (Continued)

C. Abstract Language Assessment

Behaviors Assessed: Metaphorical Language (proverbs, idioms)
Analogies
Verbal Absurdities
Spontaneous Conversation

Subtest #1 Metaphorical Language

Comprehension: Read the following story to the patient. Have him interpret the story according to five pictorial choices (see Figures 1 to 5 on following pages). [Adapted from Myers and Linebaugh, 1981]

"Jim knew that the office accounts were wrong by $1000 because of mistakes he had made. For weeks, he hesitated to show the account books to the boss, but finally he had to go and just face the music."

-Response Categories:

Correct context - Correct interpretation (CC; Fig.1)

Correct context - Literal interpretation (CL; Fig.2)

Wrong context - Correct interpretation (WC; Fig.3)

Wrong context - Literal interpretation (WL; Fig.4)

Correct context - Opposite interpretation (CO; Fig.5)

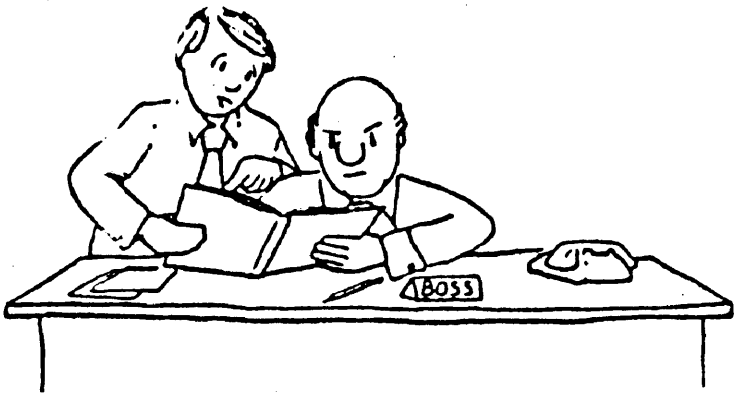


Figure 1. Correct context - Correct interpretation (CC): The setting and the idiom interpretation are correct.

Figure 2. Correct context - Literal interpretation (CL): The setting is correct, but the idiom is interpreted literally.

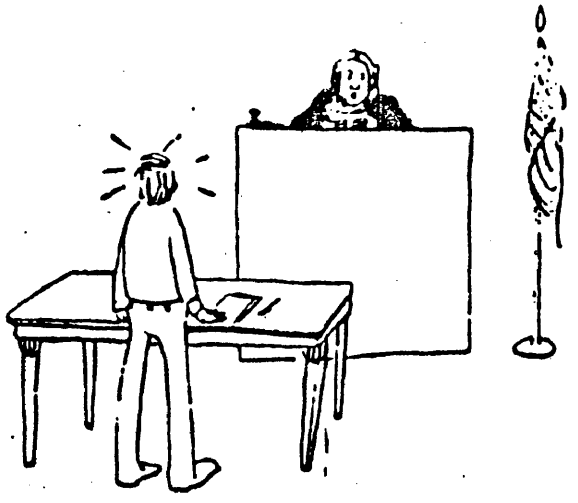


Figure 3. Wrong context - Correct interpretation (WC): The setting is incorrect, but the idiom is interpreted accurately.

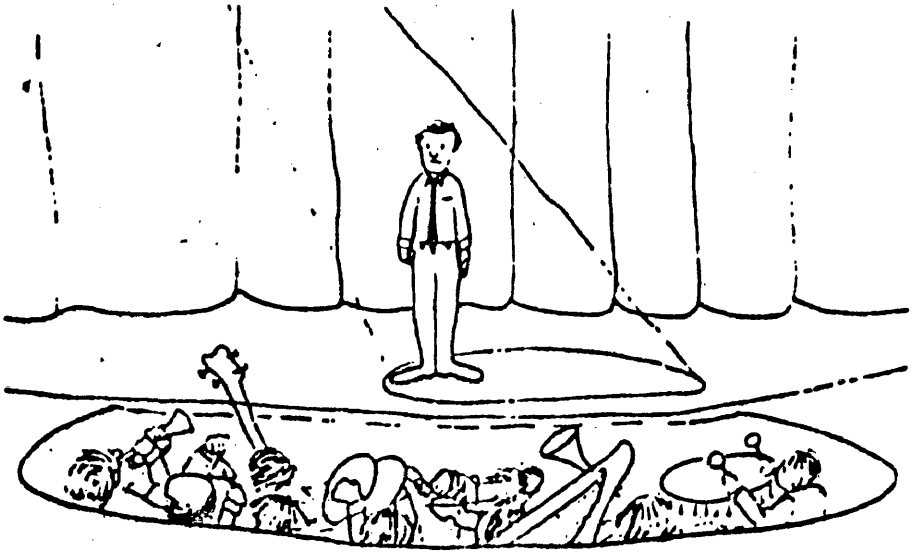


Figure 4. Wrong context - Literal interpretation (WL): The setting is incorrect, and the idiom is interpreted literally.

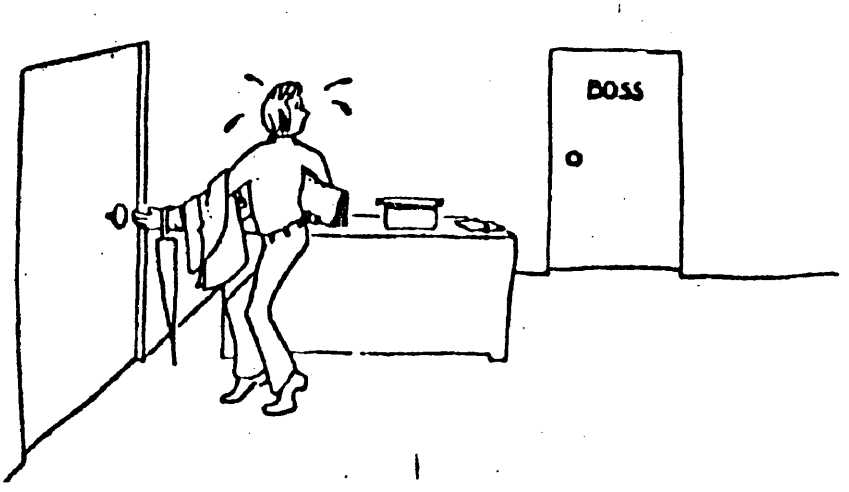


Figure 5. Correct context - Opposite interpretation (CO): The setting is correct, but the opposite interpretation of the idiom is selected.

III. COMMUNICATION ASSESSMENT (Continued)

C. Abstract Language Assessment (Continued)

Subtest #1 Metaphorical Language (Continued)

Expression: Instruct the patient to explain the following proverbs and idioms from auditory presentation by the clinician. Check response category applicable to each item. [Adapted from RICE Protocol; Burns et al., 1985]

	Completely Incorrect	Literal Interpretation	Repeats or Nearly Repeats the Phrase	Personal Interpretation	Partially Correct	Perseverative Response	Normal Abstract Interpretation
1. Nothing ventured, nothing gained.							
2. Look before you leap.							
3. A stitch in time saves nine.							
4. He's a chip off the old block.							
5. A penny saved is a penny earned.							
6. It's raining cats and dogs.							
7. Beat around the bush.							
8. Save it for a rainy day.							
9. Your name will be mud.							
10. It takes two to tango							

Total Correct_____

III. COMMUNICATION ASSESSMENT (Continued)

C. Abstract Language Assessment (Continued)

Subtest #2 Analogies [Adapted from Evanston Hospital Right CVA Checklist]

Comprehension: Underline the correct word in each sentence.

1. Airplane is to fly as sailboat is to (fly, sink, sail).

2. Barber is to hair as dentist is to (feet, teeth, clothes).

3. Rain is to moisture as dust is to (dirt, time, day).

4. Smell is to odor as beauty is to (hearing, sight, touch).

5. Failure is to loss as success is to (gain, music, farm).

Errors_____

Subtest #3 Verbal Absurdities [Adapted from Evanston Hospital Right CVA Checklist]

Expression: Explain what is wrong with the following:

1. The water was cold, so I put on my wool coat before I went swimming.

2. We lit the firecracker on top his birthday cake.

3. I needed my flashlight because it was so light.

4. The man decided to grow a toupee after his hair fell out.

Errors_____

III. COMMUNICATION ASSESSMENT (Continued)

C. Abstract Language Assessment (Continued)

Subtest #4 Conversational Speech (Response and use of metaphorical language and humor in conversation with clinician) [Adapted from RICE Protocol; Burns et al., 1985]

Comprehension: Rating Scale [Adapted from RICE Protocol; Burns et al., 1985]

Metaphor	1 Inappropriate	2	3 Appropriate @ 50%	4	5 Appropriate
Humor	1 Inappropriate	2	3 Appropriate @ 50%	4	5 Appropriate

Expression: Rating Scale [Adapted from RICE Protocol; Burns et al., 1985]

Metaphor	1 No use/ Inappropriate	2	3 Appropriate @ 50%	4	5 Appropriate use

IV. COMMENTS:

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