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LANGUAGE REALIZATION IN PHONEMIC JARGONAPHASIA: A CASE STUDY

City University of New York PH.D. 1980

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LANGUAGE REALIZATION IN PHONEMIC JARGONAPHASIA:

A CASE STUDY

by

ELLEN PERECMAN

A dissertation submitted to the Graduate Faculty in Linguistics in partial fulfillment of the requirements of the degree of Doctor of Philosophy, The City University of New York.

1980

This manuscript has been read and accepted for the Graduate Faculty in Linguistics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

LANGUAGE REALIZATION IN PHONEMIC JARGONAPHASIA:

A CASE STUDY

by

Ellen Perecman

Adviser: Professor Michael Studdert-Kennedy

This dissertation addresses the following questions:

1. Given a dissociation between sound and meaning, what will be the phonological properties of speech?
2. Will those properties be fixed or will they change depending upon whether the aphasic is engaged in a dialogue, producing a lengthy uninterrupted flow of jargon, or reading from written text?
3. Will longitudinal observations provide evidence of recovery toward meaningful speech?

The results of the investigation may be summarized as follows:

1. KS produces virtually all of the sounds of normal English and German;
2. While, overall, the frequency distribution of sounds in his jargon is significantly correlated with the distribution found for normal speakers, in terms of individual phonemes, the two distributions differ largely due to a greater than expected proportion of labials in the jargon;

3. Across samples, the jargon is characterized by a stereotypic, repetitious quality attributable to the consistent preference for /r/ and /s/ among consonants and /a/ among vowels;
4. Units of production tend to be initiated and terminated by central consonants. In vowel clusters, there is a transition from low back to high front. For consonant clusters the sequence is typically a centrally articulated stop followed by a centrally articulated fricative. Manner tends to change across consonant clusters, while voicing remains the same. Thus, the most common consonant cluster is a voiceless stop followed by a voiceless fricative. In CV clusters, central consonants are followed by back vowels; in VC clusters, back vowels are followed by central consonants;
5. The jargon elicited on reading tasks essentially conforms to the pattern found in spontaneously produced jargon, indicating a single stereotyped mode of production;
6. Over a period of 2 1/2 years, the fixed distributional properties of the jargon do not change. Indeed, there is an appearance of greater homogeneity of the jargon at Time 2 in that the phoneme frequency distributions of samples obtained at the end of the 2 1/2 year period are more similar to one another than samples obtained at the beginning

of that period.

The jargonaphasias provide insight into the relationships among levels of representation of linguistic knowledge and particularly into the nature of the translation from a representation of meaning into a representation of sound. For they are assumed to indicate the level of representation which is translated into sound in that particular form of jargonaphasia. In phonemic jargonaphasia, where sequences of sounds transmit no linguistic meaning, the cognitive differentiation of a representation of meaning into a representation of sound cannot take place. Phonemic jargonaphasia thus points to the fundamental independence of a semantic level from a phonological level of language and furthermore, indicates those properties of the phonological code which are fundamental to the sound structure of normal language.

For those who represent
the meaning in my life,
a meaning which cannot
be encoded in sound.

Acknowledgements

During my years as a graduate student, I have known the good fortune of having teachers who have been my friends and friends who have been my teachers. The time has come for me to publically express my gratitude to them. To Tom Bever, who set me on this sometimes tortuous course and saw to it that I got back on course when I began to deviate. To Bob Fiengo for trying to keep me on my toes. To Bob Vago, Ellen Grober and especially Lucia Kellar for their advice and encouragement. To Kathy Harris for believing in me and for providing me with a role model. To Michael Studdert-Kennedy for his wise guidance and dedication. And to Jason Brown for sharing with me his wealth of knowledge, for opening my mind up to a new world of ideas and for being a source of moral support I could not have done without.

I would also like to express my deepest appreciation to Mr. KS, the Reverend Weaving and Dr. J. Luwish without whom this dissertation would not have been possible, and to Donna Kwilosz Lyons for giving me so much of herself during those seemingly endless nights at the typewriter.

Finally, I would like to thank my husband Stephen for his loving support and his unrelenting patience.

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Terminology

In the standard terminology used to designate the types of speech errors made by posterior aphasics, the term paraphasia refers to some modification of a target word. There are essentially two types of paraphasias: semantic paraphasias and phonemic paraphasias. In addition, the term neologism refers to a phonetic sequence with no recognizable relationship to any standard lexical item.

Semantic paraphasias, also referred to as verbal paraphasias, are substitutions of entire target words by words which are either semantically related or totally unrelated to the target. Phonemic paraphasias are produced by processes of elision, addition, substitution or metathesis of segments within an identifiable lexical item. Phonemic substitutions are alternatively referred to as literal paraphasias.

INTRODUCTION

Aphasia is a language disturbance associated with focal brain damage. The disturbance may take one of many qualitatively distinct forms, each of which consists of some degree of deficiency in expression and comprehension of both oral and written language. Each form is characterized by a particular constellation of symptoms which defines the quality of the aphasia type.

Aphasia has been attributed to the destruction of a speech center in the brain, on the one hand, and to a disruption of cerebral function, on the other. Proponents of a structuralist hypothesis (Wernicke, 1874; Geschwind, 1974) conceive of aphasia as either the destruction of a "center" in which motor or sensory memory images are stored, or destruction of the pathways which convey these images from one center to another. Regarding aphasia as a disorder of function, there are several positions: 1) that aphasia is a deficit not in language function per se but rather in the comprehension and expression specifically of propositional language (Jackson, 1932); 2) that aphasia is a disturbance in symbolic formulation and expression (Head, 1926); 3) that the language deficit in aphasia is the result of a change in the quality of basic mental functioning (Marie, 1906; Goldstein, 1948); 4) that aphasia is fundamentally a deficit in language processing, but that the language deficit has consequences for other mental functions of a non-linguistic nature (Weisenburg and McBride, 1935). For Brown (1972, 1979) an aphasia does not show language in disorder

but rather "displays" a preliminary stage in the "micro-genesis" of a language act.

It was in view of the variety of language behaviors disturbed in aphasia that Marie (1906) originally argued that aphasia is an intellectual disorder that exists in only one form, that produced by lesions in Wernicke's area. Marie claimed that there was no frontal speech zone and that what was commonly referred to as Broca's aphasia was in fact this unitary form of aphasia combined with anarthria.

After a thorough program of research involving language and non-language functions in a large population of aphasic and non-aphasic subjects, Weisenburg and McBride (1935) concluded that aphasia is not a general defect in intelligence but rather a particular deterioration of language and that "intelligence suffers in so far as the language processes disturbed are necessary to the carrying out of intelligent behavior and in so far as non-verbal activities are handicapped by changes in mental functioning which extend beyond language processes and are not dependent upon them" (p. 462).

Linguistic investigations of aphasia indicate that the breakdown of language is orderly and systematic, and is furthermore, compatible with principles assumed to underlie the organization of normal language. One such principle is that the organization of the sound system is independent of the organization of the meaning system and that a linguistic meaning is expressed, quite arbitrarily,

through a sequence of sounds which are in themselves meaningless. Indeed, it is a paradox of language that too often the difficulty one encounters in trying to convey one's thoughts through words lies not in succeeding to evoke meaning through combinations of meaningless sound elements, but rather in evoking a select, intended meaning from among a set of alternative meanings which are automatically evoked, as a product of convention, by that particular string of meaningless elements.

It is therefore of interest that among the ways in which language may be disturbed by brain injury, there exists a condition in which it appears that sequences of phonetic units remain meaningless elements evoking no semantic content at all. This condition is known as phonemic jargonaphasia.

The speech of a phonemic jargonaphasic violates what might be conceived of as a social contract. Indeed, there is a sense in which language is a social contract whereby as speakers of a given language community, we agree to conform to the dictates of a common code, producing and interpreting sequences of phonetic units according to the prescribed convention. For example, we agree that when we hear the sequence /t/-/r/-/i/, this shall be interpreted as roughly a "woody perennial plant having a single usually elongate main stem generally with few or no branches on its lower part." This code is perhaps best conceived of as a set of guidelines for the interpretation of a particular

phonetic string. The notion of this code as a set of informal guidelines as opposed to strictly defined rules, accounts for the range of phonetic and semantic deviation permitted in the production and perception of an utterance. Just how much deviation will be permitted cannot be precisely and uniformly determined, given the context-specificity of language use. Yet, it is obvious that there is a certain point at which /t/-/r/-/i/ will no longer be allowed to designate an intended object, as there is a certain point at which a "woody perennial plant..." is no longer designated by the particular sequence of sounds uttered.

For the phonemic jargonaphasic, conventional relationships between sound and meaning are no longer stable. As a result, the communicative function of language is lost to him both from the point of view of perception and production.

In the pages which follow, I shall describe this rare form of language disturbance as it is observed in a single patient whom I shall refer to as KS. Although the fact that the present research is based on a single case description is a matter of availability rather than of choice, it is important to recognize the value of studying individual cases as opposed to large populations of patients. For, in the leveling and simplification which is an unavoidable consequence of studying large populations, the complex mechanism underlying aphasia is likely to be obscured.

Before addressing the problem of phonemic jargonaphasia as a very specific form of language disturbance, I shall discuss aphasia more generally. Chapter I presents a brief and select history of the study of aphasia, tracing it from its origin in neurological investigations of localization of cerebral function, to its present place within the domain of linguistic science. Chapter II will outline the major categories of aphasia, introducing jargonaphasia within the context of the system of aphasias, and phonemic jargonaphasia as one of its manifestations. Chapter III discusses the problem of classification in aphasia and presents a summary of data on lesion sites in the various forms of jargonaphasia, along with the issues on lesion localization as explanation in aphasia. Chapter IV reviews two neuroanatomical models which have been proposed to account for the various forms of aphasia. Chapter V presents a case study of phonemic jargonaphasia. Finally, Chapter VI discusses the results of the study and their implications for the relationship of phonemic jargon to other forms of fluent aphasia.

CHAPTER I

Historical Background

Speculation on neuroanatomical correlates of human behavior began with the ancient Greeks. Their belief that aspects of the soul were located in three ventricles in the brain persisted through the middle ages. Sensations of taste, smell, sight and hearing were believed to be in the anterior ventricle; cognition and reasoning in the middle ventricle; and memory in the posterior ventricle. The anatomical investigations of Vesalius in the early 16th century finally falsified this notion, substituting for it the belief that the brain's "animal spirits" or vital energy were distributed to all parts of the body through a system of nerves.

Gall (1758-1828) was the first to suggest that the nervous system was composed of constituent parts and that the various human faculties were localized within different organs in the brain. He regarded the brain stem as the organ of vital force, the basal ganglia as the seat of inclinations and affections of the soul and the cerebral hemispheres as the locus of intellectual qualities. Gall and his student and collaborator Spurzheim claimed that any one or part of these components may become diseased independently of the others.

Gall's conclusions on localization of function were based upon portraits or casts of the skull of persons pre-eminent or deficient in certain mental characteristics.

His belief that memory for words was situated in the frontal lobes stems from his youth, when he first noticed that classmates with protruding eyes were more adept than he at learning lessons by heart, but were inferior in written composition. That speculation received confirmation when he observed two cases of speech loss due to frontal lobe damage.

Gall focused on speech as a symbolic act, directly reflecting aspects of memory located in different parts of the anterior lobes. His follower Bouillaud (1796-1881) addressed himself to the problem of localizing speech in its physical aspect as an articulatory act. Bouillaud argued for the existence of a center in the brain which coordinates movement for the purpose of speech as opposed to non-speech functions. Based upon cases in which he observed a selective disruption of motor activity in the domain of speech but not in movement for non-speech functions, Bouillaud (1825) argued that "puisque les mouvements de la parole peuvent être anéantis, tandis que tous les autres persistent, il s'ensuit évidémment et nécessairement que les unes et les autres ne sont pas sous l'influence d'un seul et même centre nerveux..." (p. 29). In two out of three post-mortem cases, he claimed to have located the "organe legislateur de la parole" in the anterior lobes. However, he appears not to preclude the role of the posterior brain in the control of some other aspect of speech. Rather he claims to have shown only that "les lesions de

parties moyens et posterieurs du cerveau n'exercent pas sur les mouvements des organes de la parole le même influence que celles des lobules anterieurs" (p. 39). Yet he was so convinced of the role of the anterior lobes in the coordination of speech movement that he offered 500 francs to any one who could bring him a case in which a severely damaged anterior lobe was not accompanied by a speech disturbance.

It is Paul Broca who is credited with attributing the motor speech function to a very specific site in the frontal lobe of the anterior brain. Whether it is Broca who deserves the credit for attributing speech to the left hemisphere or whether this distinction should go to another French neurologist named Dax, who made a similar suggestion eight years previously, nonetheless it is the impact of Broca's work which explains his place in the history of aphasia. For in the words of Geschwind, "...it appears that the work of Dax like that of other forerunners, was at best an isolated flash of insight which set no new activities in motion" (1974, p. 46).

Broca's initial contribution to the debate on the localization of the speech function was made at a meeting of the Societe d'Anthropologie as a minor point in a discussion devoted primarily to the importance of the volume of the brain to intellectual capacity. According to Head (1926), Auburtin, the son-in-law of Bouillaud, was the catalyst in focusing Broca's attention on the matter of localization. For it was Auburtin who, in the subsequent

discussion, made a major issue of Broca's secondary point, dwelling upon the association of speech with the frontal lobes.

At the next meeting of this society, Broca demonstrated an anteriorly lesioned brain of a patient known to have had a speech disturbance. But he was careful not to commit himself to any firm position on localization, and Head (1926) quotes him as asserting "I do not pronounce for or against particular localizations, I seek only to establish a general principle by considering the cerebral convolutions, not one by one, but in groups or if you will by regions" (p. 18). Indeed, throughout his writings Broca remained undogmatic and even cautious in his arguments supporting localization of the speech function.

In 1861, Broca reported two cases upon which he based the claim that pathological evidence pointed to the existence of a specialized center for language. He localized this center in the region of the third and optionally, the second frontal convolutions of the left hemisphere, which he considered "indispendable à l'exercise de la faculté du langage articulé" (p. 405,1861a). In fact, the precise anatomical correlations in these original cases were quite speculative given that the actual damage at the time of autopsy was rather diffuse.

Following Bouillaud, Broca maintained that the specialized center he postulated was the site of "la faculté du langage articulé, qu'il faut bien se garder de confondre

avec la faculté generale du langage"(p. 331, 1861a), thus distinguishing between the motor aspect of speech and general language capacity, which he defines as the ability to establish a systematic relationship between an idea and a symbol ("signe"), whether that symbol be a sound, a gesture, or a drawing.

Broca introduced the term "aphémie" (α privative; φημι I speak, I pronounce) to refer to the speech disorder associated with damage to this specialized speech center. This term was eventually abandoned in favor of the term "aphasia," following an etymological polemic between Broca (1864) and Trousseau (1864), who questioned the appropriateness of referring to the disorder as "aphémie."

Broca described "aphémie" as characterized by a reduced vocabulary which may consist of motor stereotypy and select residual utterances, with a given patient ordinarily showing a bias toward production of a "mot de prédilection." He notes that anger or intense emotion can be seen to drive additional words. Comprehension and gesture were notably intact. Broca believed that "ce qui a péri en eux, ce n'est donc pas la faculté du langage, ce n'est pas la mémoire des mots, ce n'est non plus l'action des nerfs et des muscles de la phonation et de l'articulation. C'est autre chose, c'est une faculté particulière considerée par M. Bouillaud comme la faculté de coordonner les mouvements propres au langage articulé..." (p. 333, 1861a). Broca dismisses the possibility that aphemia is a form of motor ataxia

limited to muscles used in speech production, preferring instead to think of articulated language as an intellectual rather than muscular function.

Broca pointed out that it was difficult to maintain the principle of localization by areas corresponding to invariant loci on the surface of the brain, in view of the conflicting reports of speech disturbance due to lesions in both anterior and posterior areas of the frontal lobe. He suggested that such data might be reconciled only on a hypothesis of localization by convolutions, since the extension of a convolution in both anterior and posterior directions might account for these apparently incompatible reports.

In 1865, Broca gave an explicit statement of his views on the question of a left hemisphere preference for language. He argued that although lesions causing aphemia are typically found in the left hemisphere, with exceptions to this rule being quite rare, the left hemisphere does not have exclusive control of either "la faculté générale du langage," by means of which the relationship between an idea and a symbol is established, or "la faculté spéciale du langage articulé," which establishes a relation between an idea and a spoken word. Circumscribing that which he believed to be the exclusive domain of the left hemisphere as the executive as opposed to the conceptual aspect of language, he wrote "...la faculté de concevoir ces rapports appartient à la fois aux deux hémisphères, qui peuvent, en

cas de maladie, se suppléer réciproquement; mais la faculté de les exprimer par des mouvements coordonés parait n'appartenir qu'à un seul hémisphère, qui est presque toujours l'hémisphere gauche" (p. 385). It is disturbance of this function which is associated with lesion of the third frontal convolution and constitutes aphemia, defined as "la perte de la parole sans paralyse des organs de l'articulation et sans destruction de l'intelligence." He attributes lateralization of this specific coordination function to the earlier development of the left hemisphere "dont l'innervation est alors le plus parfaite," and argues that it is the earlier development of this hemisphere which causes it to be called upon from infancy onward to perform tasks of any complexity.

In Head's (1926) estimation, Broca and his contemporaries "were not interested in a detailed examination of the forms assumed by the loss of function, their attention was concentrated on the remarkable fact that a local lesion of the brain could produce destruction of the power of speech" (p. 29).

It was precisely a distinction in form to which Wernicke called attention in 1874, when he described a language disturbance whose symptoms differed from those found in the motor aphasia which Broca had described, and which was associated with a lesion in the first temporal convolution of the posterior left hemisphere. In contrast to the motor aphasias which were most commonly described, these

cases of what Wernicke called 'sensory aphasia,' demonstrated abundant but often confused expressive language in which words might be distorted or nonsensical and comprehension was severely impaired.

Wernicke suggests that "the fact that cases of this kind have until now not been observed or at least not yet been published is the result, not only of the infrequency of such cases but also of the fact that even thoroughly experienced and intelligent physicians interpret this condition as a confusional state, as I myself have had the opportunity to observe" (p. 53).

In fact, as Geschwind (1974) points out, comprehension impairments had been described prior to Wernicke, by Bastian in 1869 and Schmidt in 1871. But it was Wernicke's paper in 1874 "which brought home to the neurological world the existence of the sensory varieties of aphasia" (p. 46). Moreover, by providing post-mortem evidence of lesions accompanying these disorders in locations different than those found in Broca's (motor) aphasias, Wernicke "resolved the confusion that had followed on the finding of aphasic patients without lesions in Broca's area" (p. 46).

Based on the work of the neuroanatomist Meynert, on the projection systems of the cortex, Wernicke constructed a neuroanatomical model of speech perception and production, in which the frontal lobe played an important role as a motor structure, the occipito-temporal lobe played an important role as a sensory structure and normal language

function depended upon the pathways connecting these areas. Wernicke believed that the existence of two distinct forms of aphasia, which he referred to as 'pure motor aphasia' and 'pure sensory aphasia,' "must be considered an irrefutable proof of the presence of two anatomically different centers for language" (p. 66). He took the evidence of an association between sensory aphasia and damage to the first temporal convolution to support the existence of a second speech center, in addition to the motor speech center in the frontal lobe and claimed that the anatomical disconnection of these areas from one another as well as damage to the areas themselves, was the cause of aphasia.

Head (1926) criticizes the cases Wernicke used to support his deductions, asserting that, with regard to one of the cases, "there is nothing to indicate that situation of the lesion" and as far as the other cases are concerned, "the clinical records are inadequate or the details of the post-mortem findings unconvincing" (p. 62).

Marie (1906) did not believe that aphasic disturbances represent breakdowns of different aspects of the speech function, and consequently rejected the possibility of two distinct speech centers. He believed that the speech center posited by Wernicke in the first temporal convolution was the only true speech center. But he interpreted the impairment caused by damage to this center as a general intellectual deficit and not as an inability to associate words with meanings due to a destruction of the store of

sound images for words, as suggested by Wernicke.

Marie denied the existence of both Broca's aphasia as a form of language disturbance, and of a motor speech center in the frontal lobe. In his view, the syndrome referred to as Broca's aphasia is in fact, an aphasia produced by a lesion in Wernicke's area combined with anarthria. His grounds for rejecting the third frontal convolution of the left hemisphere as the seat of the motor speech function, were: 1) that damage to that site in right handers does not necessarily produce aphasia; and 2) that aphasia is found to occur without damage to that particular location. He thus concludes that "lorsque cette lésion de la troisième frontale existe, c'est donc purement et simplement une coincidence, un fait surajouté, dû à l'extension du territoire vasculaire oblitéré, et rien de plus" (p. 243).

Marie considered the emphasis on cortical function itself to be misguided, attributing the more important role in speech to subcortical function. He claimed that lesions associated with Wernicke's aphasia always extend into the white matter below Wernicke's area, making cortical localization of function impossible to confirm, and that severity of aphasia is proportional to the extent of damage to the white matter which connects the parieto-occipital lobe to the region of the basal ganglia and to the retrolenticular region sometimes involving the lenticular nucleus itself. He believed that "cette notion de l'aphasie par lésion profonde de la substance blanche de l'hémisphère

gauche permet de comprendre les infinies variétés cliniques due à la combinaison d'une aphasie de Wernicke plus ou moins marquée avec un degré plus ou moins grand d'anarthrie" (p. 246). That is, the degree of intellectual deficit in this unitary aphasia which is a function of damage to Wernicke's area, will depend upon the extent to which the lesion reaches Wernicke's area proper. If the lesion only reaches the white matter underlying this region, the intellectual deficit will be less severe, as is the case in the so-called Broca's aphasia.

While French and German neurologists were occupied locating the precise site of the speech faculty in the brain, and treating aphasia as a problem in anatomy, in England, Hughlings Jackson attended to the psychological aspect of language and to aphasia as a disorder of function, an approach which was receiving only sporadic support at the time. Jackson was suspect of the anatomical approach, asserting that "to locate the damage which destroys speech and to locate speech are two different things" (p. 130).

Jackson believed that language is organized in the brain as a hierarchy of levels. He regarded symptoms of aphasia as analytical examples of the mechanism of normal language insofar as he believed these symptoms to be an expression of released activity of lower centers in the brain when higher centers are destroyed by brain injury. Thus, rather than attempting to account for aphasic symptoms in terms of what has been lost or damaged, he con-

sidered aphasia to reflect the activity of the uninjured parts of the brain. He felt that "To say that the disease 'caused' these (abnormal) utterances, a positive condition, is absurd, for the disease is destruction of nervous arrangements, and that could not cause man to do something... these positive mental syndromes arise during activity of lower centers or lower nervous arrangements which have escaped injury" (p. 112).

Jackson divided verbal behavior into two distinct forms which might be separated in aphasia: 1) intellectual language which has the power to convey propositions; and 2) emotional language, which is used to exhibit stress and feeling. He considered intellectual or propositional language to be a voluntary behavior and emotional language to be automatic.

Jackson criticized Broca's notion of aphasia as the loss of a speech faculty consisting in "la mémoire des moyens de coordination que l'on emploie pour articuler les mots." He found this notion misleading in view of the variability of performance in aphasia and the fact that the motor aphasic is capable of articulating some words. He argued instead that words are stored in duplicate in the brain, one for use in propositional speech and one for use in emotional speech, and that the aphasic has lost those words which serve in propositional speech, "the nervous arrangements for them being destroyed." He proposed that the distinction between voluntary, propositional speech

and automatic verbal behavior might explain the observed variability in a single aphasic if aphasia is assumed to affect "language processes not so much as language processes but as they are some of the voluntary actions." Jackson accounted for the occasional expression of propositional content by an aphasic on the basis of the possibility that intellectual, propositional content might in some instances be emotionally driven.

Jackson anticipated many of the issues which were to become central to linguistic science. Among these was his contention that "it is not enough to say that speech consists of words. It consists of words referring to one another in a particular manner; and without a proper interrelation of its parts a verbal utterance would be a mere succession of names embodying no proposition" (p. 130). His views on language led him to be regarded by Jakobson as one of the precursors of modern linguistics.

A dissatisfaction with neuroanatomical "pseudo-explanation," saw a shift in the focus of attention in aphasia away from anatomical differences and toward differences in behavior (Lesser, 1978). Goldstein (1948), like Jackson, distinguished between two aspects of normal language behavior which might be differentially impaired resulting in different aphasic symptoms: concrete (or automatic) language and abstract (or intellectual) language. But where Jackson conceived of these different aspects of language as reflecting distinct levels of complexity of the language

act, Goldstein attributed the distinction not to some property of the language event but rather to a difference in the psychological state of the speaker as he engages in that language event. Concrete language includes automatisms, emotional utterances, "instrumentalities of speech," e.g., sounds, words, series of words, sentences, naming and comprehension in familiar situations. Abstract language involves volitional, propositional, rational language, such as repetition, object naming, reading, where words are used as symbols representing the concept underlying an object.

For Goldstein, these aspects of language are a specific case of a more general dichotomy between "two different kinds of attitudes which we call the concrete and the abstract" (1948, p. 6). He characterizes the concrete attitude as one in which "we are given over passively and bound to the immediate experience of unique objects or situations. Our thinking and acting are determined by the immediate claims made by the particular aspect of the object or situation" (p. 6). In the abstract attitude, on the other hand, "we transcend the immediately given specific aspect of sense impressions, we detach ourselves from the latter and consider the situation from a conceptual point of view and react accordingly. Our actions are determined not so much by the objects before us as by the way we think about them..." (p. 6).

Goldstein argued that aphasia reflects an inability to

adopt the abstract attitude. According to Goldstein, the abstract attitude is required for assuming a mental set, initiating a performance, shifting from one aspect of a situation to another, keeping two stimuli or two aspects of the same stimulus in mind at the same time, isolating and recombining parts of a whole, abstracting properties, thinking abstractly. He suggests that because the abstract attitude is "a very high mental function," it is probably related to complex anatomical structures which are easily susceptible to damage even by small lesions.

The discovery in the 19th century that focal cerebral damage can cause disturbances of language of a very distinctive nature, had led to an explosion of interest among neurologists and psychologists in the relationship between the organization of the brain and the organization of language. But it was not until 1939, when Roman Jakobson embarked on his campaign to bring linguistic science to the study of aphasia, that language disturbance became recognized as a domain of linguistic research. Jakobson was the first linguist to consider the investigation of aphasic phenomena as a means of isolating the components of normal language functioning and to demonstrate the insight that was to be gained from subjecting symptoms of aphasia to rigorous linguistic methodology.

Lesser (1978) sums up the two major contributions which linguistics has made to the study of aphasia: 1) the concept of linguistic structure and the notion that

language consists in more than simply a temporally ordered sequence of units but rather that it has internal structure which furthermore is presumably hierarchical in nature; and 2) the concept of levels of organization of language which "providing a basic framework for the analysis of language which cuts across the conventional one...of behaviors in the modalities" (p. 24). The adoption of these fundamental linguistic principles in aphasia has provided the means for an objective typology of aphasias in terms of purely linguistic criteria.

Jakobson (1953) became convinced that "there obviously exists a very intimate interrelation between problems of normal language in operation...and the disintegration of language, exemplified by the various types of aphasic impairments," and "that linguists cannot abstain from taking a more active role in the investigation of speech disorders and in the revision of previous theories" (p. 39, 1971). He argued that a linguistic approach to aphasia was crucial, since "to study adequately any breakdown in communications we must first understand the nature and structure of the particular mode of communication that has ceased to function" (p. 49, 1971). He maintained that a purely quantitative approach to aphasia was incompatible with the linguistic facts because it ignores the qualitatively distinct levels of linguistic structure, namely phonemic, morphologic and syntactic, to which the particular aphasic disorders have been shown to correspond.

Jakobson found patterns of disruption in aphasia to be compatible with phonological laws derived from child language, historical and descriptive linguistics, and argued that aphasia obeys structural laws underlying every modification of language both diachronic and synchronic, seeking to explain the regularity of disorder in aphasia by demonstrating its necessity.

In 1956, Jakobson proposed parallels between syntactic processes in normal language and disorders of syntax in aphasia. He interpreted aphasic disorders in terms of two fundamental operations underlying normal language behavior: selection, an operation based on similarity of linguistic units, and combination, an operation based on contiguity of linguistic units. With regard to selection, he held that "the choice of differential elements within a language, far from being arbitrary or fortuitous is on the contrary regulated by laws (or tendencies) of universal and immutable nature" (p. 19, 1971). The dimension of combination refers to the hierarchy of linguistic units in progressively larger contexts. At the level of the word, combinatory possibilities are highly restricted. At the level of the sentence, although there are rules governing the combination of words in sentences, the sentence is not a compulsorily coded linguistic unit in that there are numerous alternatives for each slot in the sentence.

Jakobson established a typology of aphasias based on a deficiency in one or another of these operations. His

essentially dichotomous classification opposed disturbances in selection, which he referred to as similarity disorders, to disturbances in combination, which he referred to as contiguity disorders. He maintained that with an impairment in selection, the identity of an independent linguistic unit does not exist, for the word or phoneme is inseparable from its context. Moreover, there is an inability to use two symbols for the same referent. In a contiguity disorder, the more independent the unit is from its context, the more likely it is to be preserved, since it is precisely the combination of contiguous elements which is difficult to implement.

Jakobson elaborated this dichotomy in an attempt to account for the specific verbal symptoms which distinguish the six types of aphasia outlined by Luria (see Luria, 1964). The fundamental dichotomy was recognizably linked to the sensory-motor dichotomy. Jakobson considered this link to mark a turning point in the study of aphasia, which he felt "can no longer by-pass the pertinent fact that an intrinsically linguistic typology of aphasic impairments, outlined without any regard to the anatomical data, yields a patently coherent and symmetrical relational pattern, which proves to be remarkably close to the typology of those lesions of the brain which underlie these impairments" (p. 45).

By 1973, the linguistic approach to aphasia was tradition. In an introduction to a collection of papers attesting to that development, Goodglass and Blumstein remark on

the fundamental role aphasia has come to play in the study of language: "Aphasia not only offers a testing ground for linguistic theories; it also provides raw data crucial for constructing theories with some psychological reality" (p. 10, 1973).

CHAPTER II

The Position of Jargonaphasia Within the System of Aphasias

Historically, a distinction between two fundamental forms of language disorder has been recognized. In 1825, Bouillaud argued that since one observed the loss of "memory" for words as symbols representing concepts, on the one hand, and loss of ability to pronounce words as sequences of sounds, on the other, "il est de toute nécessité dans l'acte de la parole, deux phénomènes différentes, savoir, la faculté de créer des mots comme signes de nos idees, d'en conserver le souvenir, et celle d'articuler ces mêmes mots" (p. 43).

In 1861, a motor speech deficit was shown by Broca to be associated with focal cerebral damage to a specific region in the frontal lobe of the left hemisphere. Thirteen years later, a deficit manifested in a loss of ability to associate words with meanings was attributed by Wernicke to a focal lesion in the temporal lobe of the left hemisphere.

Two major clinical categories of aphasia have thus come to be distinguished on the basis of anatomical locus of the lesion associated with the aphasia. An aphasia secondary to a lesion in the area of the speech center circumscribed by Broca and subsequently referred to as Broca's area is known as Broca's aphasia; an aphasia associated with a lesion in the area of the posterior language zone demarcated by Wernicke and referred to as Wernicke's area, is known as Wernicke's aphasia. A third major clinical cate-

gory of aphasia, but one whose anatomical correlation is less certain, is commonly known as conduction aphasia, a term referring to the classical hypothesis that this type of aphasia is caused by damage to the pathway which "conducts" a speech stimulus from Wernicke's area to Broca's area. Recent studies, however, implicate temporal damage.

Aphasia caused by damage to Broca's area is characterized by a reduced vocabulary and non-fluent speech with articulatory errors. Residual utterances may consist exclusively of the repetition of some jargon stereotypy, an utterance of up to several words which may or may not have lexical meaning. Fluency may be preserved within such stereotyped utterances or automatic expressions. The prosodic aspect of the speech is generally disturbed, a feature perhaps related to the typically laborious manner of production. Naming and repetition may be slightly better than spontaneous speech (Brown, 1977). While comprehension is often relatively well preserved, reading and writing are typically impaired to the same extent as speech. Patients with Broca's aphasia characteristically demonstrate apathetic and passive behavior, although frustration is often identified with this disorder (Brown, 1977).

Motor aphasia is distinguished from dysarthric and apraxic disorders. In spite of the fact that Marie (1906) argued that motor aphasia is essentially a form of anarthria and Liepmann (1900) initially interpreted motor aphasia as an apraxic disorder, these arguments have not

proved compelling. While aphasic symptoms may be accompanied by anarthric or apraxic features, these features are taken to reflect disturbances of mechanisms of speech production which support the language faculty rather than disturbances of the language faculty per se, as is assumed to be the case in aphasia.

Anarthria or dysarthria refers to a group of speech disorders which result from deficient muscular control over the speech mechanism due to damage to the central or peripheral nervous system. Anarthric speech is a result of paralysis, weakness or incoordination of the speech musculature. Apraxia of speech, regarded as a disturbance of higher order motor planning and sequencing for speech, is contrasted with aphasia, which is characterized as inefficient processing of linguistic units (Darley, Aronson and Brown, 1969).

For Buckingham (1978), the distinction between apraxia and aphasia rests on the assumption that phonological functions of selecting and sequencing of phoneme-like units are epi-phenomena operating in parallel with sensory motor practic functions. Since selection and sequencing operate in terms of phonemes, which have no motor correlate, they are not motor functions but psychological functions. Buckingham thus considers aphasia an impairment of such psychological functions and apraxia an impairment of their motor correlates.

Damage to Wernicke's area causes aphasia distinguished by a degree of comprehension impairment which is characteristically more severe than that found in Broca's aphasia, and fluent, paraphasic and often logorrheic (pressured) speech.

The various manifestations of Wernicke's aphasia form a single class on the basis of the relative comprehension impairment. With respect to expression, however, the category is more heterogeneous. The speech may be well-formed in all respects, but simply empty of informative content. Alternatively, it may be marked by semantic anamoly and/or phonemic errors. Finally, the semantic structure may be entirely masked by meaningless phonetic sequences. Augmentation and perseveration occur in all forms to varying degrees. Occasionally, sentence fragments may appear, but syntax is not grossly disturbed. Prosody and intonation are normal. Naming is usually impaired but may be preserved in the context of circumlocutions. Disturbances in repetition and writing are common.

The degree of impairment in Wernicke's aphasia has been found to fluctuate depending upon the psychological context of the performance. That is, an informal or familiar environment have been observed to improve performance while formal examinations and illness related conversations have been found to aggravate the disturbance. It has been suggested, however, by Brown (personal communication) that constraints on the performance of certain tasks in fact facilitate performance.

Conduction aphasia, which for some authors is a form of Wernicke's aphasia, is associated with fluent, often copious spontaneous speech marked by abundant literal paraphasias. Patients are able to distinguish correct from incorrect forms and self-correction in speech is observed. There is, at most, a mild comprehension impairment, both for written and spoken language, while writing is impaired to the same extent as speech.

A repetition impairment is a common but not invariant property, which is characteristically related to the length of the target. Naming is poor. In addition, facial and limb apraxia are often found in conduction aphasia.

Aphasic symptoms produced by anteriorly placed lesions are, in general, predominantly motor in nature. With posterior lesions, symptoms demonstrate an unstable relationship between the form of the word and the meaning underlying that word. Within the more general anatomical classifications of anterior and posterior aphasias, minor categories of clinically distinct forms may be identified on the basis of more specific properties of the particular disturbance.

Jargonaphasia is a variety of Wernicke's aphasia first identified as a distinct aphasic syndrome by Alajouanine, Sabouraud and De Ribaucourt (1952). Its properties consist of copious, fluent speech, normal prosody and articulation, preservation of syntax (where this can be determined), equal impairment in oral and written language, and poor comprehension. What distinguishes jargonaphasia from Wernicke's aphasia proper is the largely unintelligible quality of the speech, due to various degrees of semantic and/or phonemic paraphasia, as well as a tendency toward alliteration and assonance and often anosagnosia (denial of illness).

The term jargonaphasia designates a superordinate category referring to several distinct and relatively homogeneous forms of language disturbance. Alajouanine et al (1952) first distinguished between jargon consisting of neologistic

sequences and jargon consisting of inappropriate word substitutions. Alajouanine (1956) described three forms of jargonaphasia differing in degree of meaningfulness or linguistic organization. In what Alajouanine called paraphasic jargon, recognizable words were simply used inappropriately; asemantic jargon included neologisms in addition to recognizable words, while preserving syntax; in undifferentiated jargon, the utterances consisted of stereotyped sequences which were totally meaningless.

Brown (1972) proposes a more or less linguistic classification of these forms of jargon, based upon the level of linguistic analysis at which the predominant error type occurs. Thus, Alajouanine's paraphasic jargon, which is characterized by semantic deviance, is referred to by Brown as semantic jargon. When jargon includes neologism which Brown assumes to be a product of combined semantic and phonemic errors, he refers to neologistic jargon. Finally, phonemic jargon refers to jargon consisting entirely of phonetic strings with no semantic interpretation.[1]

Clinically, the difference between one form and another is not very straightforward, for as in most cases of aphasia, theoretically pure forms are almost never observed in practice. Phonemic paraphasias commonly co-occur with semantic paraphasias and it is not clear at what point phonemic para-

[1]Note that French authors also refer to the phonemic paraphasias of conduction aphasics as phonemic jargon.

phasias become neologisms. Moreover, it is apparent that the greater the degree and extent of the phonemic deviance in neologistic jargon, the more opaque the semantic content will become. It may thus be impossible to identify a phonemic deficit which is distinct from a combined phonemic and semantic deficit.

The production of jargon as a paraphasic phenomenon has been variously attributed to: 1) loss of the monitoring function of the auditory images of words in Wernicke's area (Wernicke, 1874; Alajouanine et al, 1964); 2) disinhibition of word selection or word formation processes (Pick, 1931); 3) diminished attention (Kussmaul,1887) or redistribution of attention (Pick, 1931); 4) an attempt to mask uncertainty in the use of language (Weinstein, Lyerly, Cole and Ozer, 1966; Kinsbourne and Warrington, 1963); and 5) a thought disorder (Brain, 1961). It is not clear whether the various forms of jargon represent progressively more severe forms of the same disorder (Kertesz, in press) or whether each constitutes a qualitatively distinct disturbance (Alajouanine, Lhermitte, Sabouraud, De Ribaucourt, 1952; Brown, 1979).

Alajouanine et al (1964) attribute jargon to "la désintégration des valeurs phonémiques et semantiques du langage" resulting from a disruption of the mechanisms by which "l'intention idéique" and verbal formulation of that intention become integrated. They argue furthermore, that jargon reflects a disturbance of processes which unite thought and language.

These authors take the classical position that auditory images are stored in Wernicke's area and that these auditory images are necessary to the normal production of language. In their view, jargonaphasia manifests a disruption of these "patterns d'origin auditive" since "l'émission des sons dépend êlle-meme de l'audition des sons produits." They argue that phonemic paraphasias represent a disinhibition of verbal expression, which is normally constrained by these auditory images. With respect to semantic paraphasias, in view of the preservation of perceptual discrimination in semantic jargonaphasia, "ce n'est donc pas dans l'organization sensorio-motrice de base qu'il faut situer la perturbation, mais dans le processus qui unit pensée et langage."

Based on a highly selective population of jargonaphasics with either exclusively semantic or exclusively phonemic jargon, which these authors concede is not representative of jargonaphasia, they conclude that jargonaphasia results from the disturbance of two elementary and distinct mechanisms for "l'elaboration fonctionelle du langage," which correspond to two levels in the elaboration of an utterance.

Other theories of jargon production treat jargon as a problem in the selection and sequencing of linguistic units, a procedure presumed to govern normal linguistic functioning. As put by Luria (1977), the ability to produce or perceive language

> "...requires the mastering of a highly complex system of oppositions and the no less complex hierarchy which includes the meanings of words which are never restricted to the mere indication of any single object,

> but always include that object in a highly complex system of relationships... Such proficiency in the codes of language...requires the simultaneous viewing of a great number of possibilities and ensures the choice of the system of alternatives which at any given moment is necessary to the speaker and the hearer"(p. 240).

LeCours and Lhermitte (1972) argue that phonemic jargon is a disorder of both selection and sequencing of linguistic units, from a demonstration that paraphasic errors are determined either by paradigmatic relations between the target item and other units, or by the syntagmatic relations between the structure of a target segment and the structure of a segment in its immediate environment.

Buckingham and Kertesz (1976) propose a model of lexical selection which purports to account for the various types of paraphasias. The authors point out the difficulty in distinguishing between verbal paraphasias and phonemic paraphasias which result in a real word related to the target only fortuitously. Phonemic jargon which cannot be related to a target is attributed to 1) a failure of lexical selection and consequent disinhibition of a phoneme transformation component; 2) a phonological transformation of an incorrectly selected lexical item (see Brown, 1972); and 3) perseveration or post-activation of earlier produced items which "fill in the temporal gaps where actual words are missing..."(p.55).

While LeCours and Lhermitte offer an account of these errors which depends upon the context in which these errors occur, such an account explains neither phonologically un-

related errors nor utterances in which a target cannot be identified. Similarly, Buckingham and Kertesz account for structural relationships between items in the utterance in terms of perseveration but do not attempt to explain why the failure of the phoneme transformation component yields what it does. These authors therefore provide nothing more than a description of the behavior.

From the point of view of linguistic theory, forms of jargonaphasia are treated as disturbances predominantly at one level of linguistic analysis, a feature captured by Brown's classification of jargon types. In this regard it is reasonable to characterize the semantic deviance in semantic jargon and in neologistic jargon as a violation of restrictions on context-sensitive subcategorization (Chomsky, 1965). However, there is no sense in which meaningless sequences in neologistic jargon are phonologically deviant. For they have been found to include only phonemes of the speaker's language in phonetically plausible sequences. Moreover, neologisms often incorporate the grammatical morphemes of the standard language (Caplan, Kellar and Locke, 1972).

The same objection to an interpretation of meaningless jargon as phonologically deviant language can be raised with regard to phonemic jargon, where, as will be shown below, meaningless strings are indeed phonologically plausible. The view held by Alajouanine and colleagues, that jargon reflects a disturbance in processes necessary for uniting

thought and language, is therefore the most appealing interpretation.

It will be argued that linguistic deviance in phonemic jargon as observed in KS, may be explained in one of two ways: 1) appropriate meaning representations achieve incorrect phonetic realization; or 2) meaning representations which are themselves inappropriate or degraded, achieve incorrect phonetic realization. Both of these hypotheses will be shown to be equally consistent with the data obtained. In both cases, what is at issue is not phonological deviance, since the phonetic form which is realized is phonologically plausible. Rather it seems that what is at issue is a failure to integrate sound and meaning.

An alternative to the view of jargon as linguistically deviant is the conception of jargon as a reflection of elemental properties of linguistic organization (Brown, 1972; 1979). Thus, semantic jargon is thought to reveal aspects of the organization of linguistic meaning. In Chapter VI, I adopt this interpretation and consider phonemic jargon to point to properties of the organization of sounds for language, which become apparent when the sound component is disengaged from, or fails to unite with the meaning component. Phonemic jargon will thus point to a fundamental independence of the organization of the sound structure of language from the organization of linguistic meaning.

CHAPTER III

Classification

> "Divisions and arrangements are easy, distinctions and classifications are difficult. But in the study of a very complex matter, we must first divide, and then distinguish...Harm comes not from dividing and arranging, but from stopping in this stage, from taking provisional divisions to be real distinctions, and putting forward elaborate arrangements, with divisions and subdivisions, as being classifications."
>
> Hughlings Jackson

Aphasia constitutes a multi-disciplinary domain of research, with each discipline offering its own criteria for classification of aphasic disorders and any one system of classification reflecting a particular theoretical position regarding the nature of aphasia. From a neurological point of view, a crucial distinction among aphasia types has been the site of the lesion causing aphasia and the aspect of physiological activity which is presumed to be disturbed by damage in that location. Thus, Broca's or motor aphasia (Wernicke, 1874) is distinguished from Wernicke's or sensory aphasia (Wernicke, 1874), on the basis of the motor function of Broca's area in the anterior brain, and the sensory function of Wernicke's area in the posterior brain. Mixed aphasia implies the involvement of both motor and sensory functions; global aphasia or total aphasia (Wernicke, 1874) designates the absence of linguistic behavior other than occasional repetitive verbalization or motor stereotypy.

Benson (1967) showed that a site of lesion is correlated with fluency of expression, proposing a classification in terms of a dichotomous scale referring to the quantity of speech produced. In relation to the normal speaker, non-fluent aphasics produce a reduced output, characterized by slow and laborious speech, while fluent aphasics are those judged to produce a normal or super-normal flow of speech. Anterior or motor aphasics were found to be typically non-fluent, and posterior or sensory aphasics were found to be typically fluent.

The nomenclature of Luria (1964) includes terms which describe the neurodynamic events he believes to be involved in that aspect of language which is impaired in a particular form of aphasia. Thus, for example, in addition to the more or less standard terms, motor, sensory and semantic aphasia, he refers to acoustic-amnesic aphasia, where speech is disturbed because of an "impaired retention of stable audio-speech traces"; afferent or kinesthetic aphasia, a disturbance in the afferent or kinesthetic basis of speech movement; efferent or kinetic aphasia, a disorder of the sequential organization or "kinetic melody" of articulation; and dynamic aphasia, in which there has been a disturbance. of contextual speech.

From the point of view of behavior, an aphasia has been considered to fall into one of two categories: deficits which primarily affect encoding processes and deficits which primarily affect decoding processes. Encoding or ex-

pressive deficits are associated with expressive aphasia (Weisenberg and McBride, 1935) and decoding or comprehension deficits are associated with receptive aphasia (Weisenberg and McBride, 1935). A disorder combining both deficits is referred to in this classification as expressive-receptive. A fourth category of deficit based on a patient's behavior, namely, amnesic aphasia, is designated to refer specifically to problems in using words as labels.

Head (1926) proposed a classification based on the assumption that aphasia disrupts the capacity for symbolic formulation. He outlined four aphasia types, each of which represents an impairment in some aspect of symbolic expression or formulation: verbal aphasia, syntactical aphasia, nominal aphasia and semantic aphasia.

A deficit in the formation of words, either internally or externally, constitutes verbal aphasia; syntactical aphasia involves a disturbance in the rhythmic properties of an utterance and in the ability to use function words to make speech comprehensible to the auditor; nominal aphasia refers to a disorder in the use and appreciation of words as names; and semantic aphasia involves recognition of the ultimate significance and intention of words or phrases apart from their direct meaning, as well as an appreciation of the logical conclusion of a train of thought.

Wepman and Jones (1964) also distinguish among different forms of aphasia in terms of the semiotic properties of language which appear to be predominantly disturbed. In

syntactic aphasia, there is a loss of the grammatical function of language, while the ability to nominate a symbol remains intact. A second form of disturbance is marked by a loss of semantic relationships between a sign and its object referent. A disturbance of the pragmatic aspect of language functioning constitutes a third form of aphasia in this typology, this disturbance residing in a disability to obtain meaning from a stimulus and to use it as a basis for symbol formation. Jargonaphasia is the fourth form of aphasic disorder, which they characterize as consisting in the production of a profusion of phonemically disorganized combinations in unrecognizable word form. A final category is reserved for patients commonly referred to as global aphasics, who, from the point of view of Wepman and Jones "seem to retain little ability to formulate verbal symbols either in the sense of comprehension or use."

Jakobson (1963) demonstrated that purely linguistic criteria offer a systematic basis for classification of aphasia types. Analyzing aphasias in terms of the two fundamental operations involved in language behavior, he distinguished between contiguity disorders, in which the combination and integration of linguistic units is impaired, and similarity disorders, in which the operation or selection and identification of linguistic units is disturbed.

The orderliness with which language breaks down in aphasia is attested to by the fact that each of the linguistically motivated types of aphasia described by Jakobson

correspond to a category of aphasia based on anatomical or behavioral criteria. Thus, contiguity disorders are coextensive with motor aphasias and expressive aphasias. Similarly, similarity disorders, sensory aphasias and receptive aphasias refer to roughly the same form of disturbance.

The theoretical underpinning of the system of classification which Brown (1972) proposes is that aphasic phenomena are manifestations of preliminary levels in the microgenesis of a language act. Brown classifies aphasias on the basis of the predominant symptom of disturbance, for he believes that each symptom "displays" properties of a cognitive stage in the emergence of an utterance. From the point of view of the motor development of language, these stages in emergence of language correspond to a progression of anterior aphasias from akinetic mutism, an inability to evoke the motor envelope of the speech act; to transcortical motor aphasia, characterized by a lack of spontaneous speech but good repetition; to agrammatism, characterized by incomplete differentiation of syntactic units; to Broca's aphasia proper, presumably occuring at a level at which anterior and posterior systems converge, where there is an inability to actualize lexical frames into phonological sequences.

The posterior aphasias in Brown's classification, reflect the microgenetic sequence leading from a semantic to a phonological level. Confabulation represents a limbic disorder of language, in which "the ultimate relationship

between the linguistic and mnemonic aspects of the deficit is most apparent." Semantic jargon represents the transition from confabulation into aphasia proper. In semantic aphasia the link between a word and its object referent is obscured, and Brown believes that each of the variety of naming errors "reflects" a different stage of language microgenesis. In associative paraphasias, misnaming reflects situational, experiential and affective factors; categorical paraphasias refer to within category substitutions; evocative disorders represent the point at which an item has been selected beyond the level at which category errors occur, but the word cannot be evoked. Levels in phonological realization are represented by phonemic (conduction) aphasia, disturbance in the phonological realization of appropriate targets, and neologistic and phonemic jargon, where targets are presumably inappropriate.

Indeed, no system of classification has proven adequate to the task of providing a standard procedure for distinguishing reliably among clinical forms. For no system can represent the actual complexity of any one aphasic disorder and still be useful both as an objective organizational device and as a means for cross comparison among investigators. A single aphasic may behave very differently from one moment to another, while at any one moment manifesting only some of the symptoms associated with a particular category. It is therefore inevitable that classificatory systems represent an oversimplification of facts.

Any system will be misleading insofar as its terminology refers to a single characteristic of a disorder instead of representing the overlap among aphasic disorders. The classification which opposes comprehension deficits to expressive deficits is a case in point, in that pure forms of aphasia characterized by exclusively receptive or exclusively expressive deficits are extremely rare. Weisenberg and McBride (1935) showed that aphasia does not affect one aspect of language behavior to the exclusion of others and that the notion of a typical case manifesting a predominant disturbance in one aspect or another is fallacious. In fact, sensory aphasias usually involve a very distinct disturbance in expression, which is as fundamental to the disorder as the comprehension impairment but which is ignored by the term receptive aphasia. On the other hand, expressive aphasias involve some degree of comprehension impairment as well.

An objection as valid today as it was at the turn of the century when it was raised by Marie and then later by Head, is that in applying any a priori system of classification, clinical facts often are undermined in order to satisfy a particular theoretical model. Note, for example, that it is common practice, in the absence of confirming data, to assume that non-fluent aphasics have anterior lesions although one occasionally sees fluent anteriors and non-fluent posterior aphasics. Indeed, one risks a theoretical bias in the interpretation of clinical observations

with any system of classification.

Localization

Each type of aphasia is associated with a lesion in a particular location in the brain. With regard to the question of whether there are specific structures within these particular regions which govern one or another cerebral function, these associations have been interpreted in several ways. Despite the caution explicit in Jackson's (1932) assertion that "To locate the damage which destroys speech and to locate speech are two different things" (p. 130), there exists on one extreme, the view that it is possible to assign particular language functions to definite areas of the brain and to strictly differentiate those areas underlying the different functions. This view is represented by the work of Henschen.

A less extreme version of this atomistic approach to the organization of language in the brain maintains that a disturbance in a language function is attributable to a lesion of a specific location, but that the site of the lesion does not identify the "center" responsible for some normal function (Geschwind, 1969, 1970).

Still another position on localization is represented by those who do not attribute the language disturbance to the particular site of the lesion at all, claiming instead that the disturbance depends upon the destruction of a cortical function which involves the entire brain as a single interrelated system (Goldstein, 1948; Brown, 1972, 1977).

On this view, a particular locality in the brain matter is characterized by the influence which the structure of that locality exercises on the total functioning of the brain. This view does not deny that different regions of the brain differ in the role they play for a particular function, or that the location of the lesion determines the specific way in which a disturbance is manifested. Rather, this view is characterized by its emphasis on the brain as a unitary organism.

Until recently, determination of lesion sites was possible only through autopsy. Presently, indirect methods of localization include Isotope Scanning (IS) and Computerized Axial Tomography (CAT or CT), which are techniques in nuclear medicine for visualizing transverse sections of the brain. In a procedure used by Kertesz and colleagues, localization is established by tracing the lesion which appears on the IS or CT image and transferring the tracing onto a template which maps out standard neuroanatomy. The quality of an IS or CT scan, as well as individual differences in brain structure, can influence localization significantly. As a result, IS and CT scans provide only an approximation of the size and location of the actual lesion.

The classical anatomical correlation of Wernicke's aphasia is with the posterior superior temporal gyrus of the dominant hemisphere, which is the auditory association area. The major contributor to the work on localization of lesion sites in jargonaphasia is Kertesz, who presents an

historical review of the literature on this subject in Kertesz (in press).

Although cases of jargon production were documented long before Wernicke first described sensory aphasia, the early literature does not isolate jargonaphasia as a phenomenon distinct from sensory aphasia. Thus Pick (1892) makes reference to a case of sensory aphasia due to focal atrophy of the left temporal lobe, which in fact appears in retrospect to have been semantic jargonaphasia. Kertesz (in press) also cites a paper by Starr (1889) who reviewed 50 cases of sensory aphasia with and without paraphasic phenomena and found no constant anatomical difference between these clinical forms.

The conception of jargonaphasia as a unitary but heterogeneous syndrome persisted until 1952, when Alajouanine, Sabouraud and De Ribaucourt defined three clinically distinct types of jargon. Until then, the particular form of jargonaphasia was not indicated when lesion locations were specified. Henschen (1922) reports 8 cases of jargonaphasia with involvement of the first two temporal gyri and in most cases Heschel's gyrus. Head (1926) attributes a case with jargon to the posterior region of the sylvan fissure. In Nielson's (1946) review of the literature on temporal lobectomies, cases of jargonaphasia were in general, related to similarly placed lesions of the temporal lobe, with some cases also involving the supramarginal gyrus. Cohn and Neumann (1958) report bilateral damage in a

case in which speech is described as consisting of "little syllabic or proper word formulation," of which the quality is not clear from their description, alternating with correct and appropriate expression. Lesions were found in the posterior superior temporal lobe, supramarginal gyrus and underlying subcortical white matter, including the arcuate fasciculus. In addition, there was less extensive sub-cortical damage in the right posterior frontal region.

Neologistic jargon was specified in two of the cases reported by Kleist (1962). He attributed the jargon to lesions affecting Heschel's gyrus and the neighboring cortex of the first temporal convolution. Kertesz and Benson (1970) report 10 cases with copious neologistic jargon, from which they conclude that neologistic jargon appears in lesions of both the posterior portion of the first temporal gyrus and the arcuate fasciculus which underlies the supramarginal gyrus, connecting this area with the frontal lobes. Buckingham and Kertesz (1974) describe a case of neologistic jargon associated with a unilateral infarction of the left posterior sylvan region and involvement of the first temporal convolution, supramarginal gyrus and left parietal lobule. Based on localizations in 10 cases of neologistic jargon, Kertesz (in press) concludes that the most consistently affected regions are in the left posterior superior temporo-parietal area: the supramarginal gyrus, the posterior parietal operculum, the inferior parietal lobule, the posterior portion of the first temporal gyrus, the pos-

terior temporal operculum and the angular gyrus. Kertesz considers the more peripheral regions of the occipital, temporal and parietal lobes to be optional. Moreover, he regards the severity of the jargon to be a function of the size and extent of lesion (see Naisser and Hayward, 1978).

Weinstein, Lyerly, Cole and Ozer (1966) describe 18 cases of jargonaphasia, primarily semantic in quality, with relatively good comprehension, but also including two cases of neologistic jargon with poor comprehension. All cases involved bilateral damage. Brown (1972) has found bilateral damage to be common in cases of semantic jargon. He believes that milder forms of semantic jargon may be found with unilateral lesions, but that the presence of bilateral lesions may account for the extremely deviant cases. He maintains that right-sided lesions in such disorders have not been given sufficient attention, pointing out that "one of the best anatomical cases of semantic jargon," namely Kleist (1962), attributes the jargon to left temporal damage, while neglecting the possible contribution of the right temporal lesions which were also present.

With regard to phonemic jargonaphasia, the bi-lateral temporo-parietal lesions observed in the present case constitute the only evidence to date on lesion location in this form of jargonaphasia, which has been verified by CT scan. Whether or not such bi-lateral damage is necessary to produce phonemic jargon in this extreme form will depend upon anatomical evidence from further investigations

of such cases.

Kertesz (in press) points out that damage invariably associated with neologistic jargon, namely lesion of the supramarginal gyrus, the posterior parietal operculum and the arcuate fasciculus, is also the area involved in cases of conduction aphasia, which is characterized by phonemic errors and at times may resemble neologistic jargon. Indeed, neologistic jargon has been found to recover to conduction aphasia. The lesions in conduction aphasia are usually smaller and more anteriorly placed. Kertesz believes that "these cases form a link between Wernicke's aphasia with neologistic jargon and conduction aphasia with severe phonemic paraphasia" (p. 36). The good comprehension and less jargon found in conduction aphasia is regarded by him as a result of more involvement of the inferior parietal region and supramarginal gyrus, and less involvement of the temporal lobe. On the other hand, Kertesz maintains that it is the temporal lobe lesion which accounts for the severe neologistic jargon.

With regard to an anatomical distinction between semantic jargonaphasia and neologistic jargonaphasia, Kertesz suggests that although lesion localization is similar, lesion size differences are significant, with neologistic jargon produced by larger lesions.

Due to limitations on attempts to locate lesion sites in aphasia generally, which include a restricted data base and the very nature of the task, the localization of jargonaphasia and its various manifestations is in its infancy.

Yet, even with an expansion of the data base, the extent to which anatomical factors are instructive as a means toward gaining insight into the mechanism of jargonaphasia or aphasic disturbances in general, is not clear. For as Kertesz (in press) points out, "the disturbance by lesioning the superior temporal and supramarginal area may indeed affect individuals differently, possibly because of anatomical differences in the lesions so far undetected by our methods or because of individual differences in cerebral organization" (p. 44). Moreover, according to Brown (1972) "there is no evidence that anatomical discontinuity precludes functional relatedness. There is a possibility of temporal interdependence among processes lacking anatomical contiguity" (p. 11). In other words, to paraphrase the quotation from Jackson with which this section began: to locate the damage which causes jargonaphasia and to locate the mechanism of jargonaphasia are two different things.

CHAPTER IV

Neuroanatomical Models of Aphasia

> "...the logical formulae of the intellect do not correspond absolutely to physical events and... the universe does not exist as an exercise for the human mind."
>
> Henry Head
> 1926

One is tempted to find Head (1926) justified in denouncing theoreticians for imagining that "all vital processes could be explained by some simple formula with the help of a few carefully selected assumptions..." (p. 65) and in accusing "the diagram makers" of being "compelled to lop and twist their cases to fit the procrustean bed of their hypothetical conceptions" (p. 63). And yet, if the neuroanatomical substrata of aphasia are ever to be understood, it will be through the confirmation or falsification of features of theoreitcal models which offer a rigorous and methodic program for the investigation of aphasia.

In the mid 19th century, the history of aphasia saw a proliferation of diagrams purporting to plot the course of an utterance in the brain during its formulation or perception, and to predict how and where that course might be interrupted. It was in 1869, that Bastian originated the view that disorders of speech can be classified in terms of damage to independent centers or paths between them. This view provided the foundation for the neuroanatomical model proposed by Wernicke (1874) and recently revived by Geschwind (1965), which has come to be the traditional account of the anatomical basis of the various forms of lan-

guage disturbance found in aphasia. The model attributes aphasia to a disruption of a process of information transfer from one area of the cerebral cortex to another, the particular locus of the damage determining the quality of the aphasia by destroying either an information center or a neuronal pathway connecting these centers.

Wernicke portrays the surface of the brain as "a mosaic of (elementary psychic functions) which are characterized by their anatomical connections with the periphery of the body. Everything beyond these elementary functions, such as the linking of different sense impressions to form a concept, thought and consciousness, is a function of the fiber tracts that connect different cortical regions with each other" (p. 35). He divided the brain into two large areas which had been shown by the neuroanatomist Meynert to be of functionally different significance; the frontal lobe, subserving the motor function by virtue of containing representations of movement and performing the release of movement, and the temporo-occipital lobe, performing sensory functions and containing memory images of past sense impressions. He regarded the parietal lobe which lies between the frontal and temporo-occipital regions to be a transitional area.

On Wernicke's view of cerebral functioning, a sensation reaches a point in the occipito-temporal lobe along a particular pathway and deposits a memory image at that location, which is the central termination of the acoustic

nerve. With the occurrence of a new external stimulus, the stored memory image becomes activated and is transmitted to a motor point in the frontal lobe through association fibers connecting the center for sound images in the occipito-temporal lobe with the center of representations of movement in the frontal lobe. The excitation of a second centrifugal pathway connecting the frontal and occipito-temporal areas gives rise to movement. The nerve fibers of this pathway leave the brain through the medulla. Wernicke believed that the calling into consciousness of a representation of movement and release of the movement itself are a function of the degree of intensity of cellular excitation, since this excitation must be strong enough to overcome resistence of the centrifugal path to produce movement. In normal speech, the calling into consciousness of a representation of movement is accompanied by simultaneous unconscious innervation of the corresponding sound image, which serves to monitor the movements.

On Wernicke's model, aphasia can be caused by 1) an interruption of the pathway running between th entrance of the acoustic nerve into the brain at the medulla and the termination of that nerve at the center for sound images in the temporo-occipital lobe; and 2) the interruption along the centrifugal pathway between the center for representations of movement in the frontal lobe and the medulla. Sensory aphasia is assumed to be caused by damage to the center for sound images itself.

Wernicke did not identify the location of the center of sound images with the entire projection of the acoustic nerve in view of cases of presumed word-deafness, in which hearing for non-verbal sounds is preserved. Such cases suggested to him that central terminations of the nerve projection branch out to different places in the cortex and that the projection which contains word sounds may be destroyed independent of the projection containing noise or musical tones. Moreover, since he believed that it was the sound image of the word which was destroyed, it followed that the conceptual base of the word, consisting of visual and tactile sense images, would remain intact. This model thus predicted that given damage to the sound image center, which Wernicke located in the first temporal convolution, words will no longer be innervated by sound images. As a result, the patient will be able to neither repeat nor understand. The capacity to speak will be retained because sensory images of objects other than the sound image will be able to directly innervate the production of a word. However, the speech will deviate from normal usage because the continuous corrective function normally served by the sound image will be lacking. Within this model, jargon results from the absence of this regulatory function of auditory images on motor speech and innervation of the movement center by other sensory images associated with a given word.

Wernicke recognized the role of psychological factors in aphasia. He pointed out that although the patient has the potential capacity to use words correctly, "the degree

to which he is master of that capacity varies depending on his mood and affect," (p. 52) and his verbal behavior may be inconsistent. However, since he attributed aphasia to structural damage, he interpreted these psychological factors in terms of structural changes, explaining that "in states of intense emotion, which favor explosion into movement without the intervention of associated memory images, the absence of corrective function will be least noticeable" (p. 52).

Wernicke's disconnectionist model fell into disrepute in the early 20th century, with the advent of a holistic approach to brain function, represented by the work of Marie, Von Monakow, Head and Goldstein. The revival of the model is due to Geschwind (1965) who argues that only the disconnectionist approach provides testable theoretical implications and, therefore, the basis for a scientific approach to aphasia. While recognizing that such a theory "can readily degenerate into naively anatomical systems," Geschwind maintains, perhaps defensively, that "this is.... not inherent in the structure of this approach and there is no conflict between this kind of reasoning and sophisticated psychological analyses" (p. 223, 1974).

Geschwind attributes his interest in reviving the model to a review of the literature, from which he concluded that the model had never been superceded and that none of the so-called "reformers" made as great a break with the classical scheme as is generally thought.

Focusing primarily on Goldstein's work, Geschwind argues that it is to be regarded as "a brilliant extension of the works of his illustrious predecessors, not as a completely new approach based on the destruction of older unsound views" (p. 53, 1974).

Clearly, there is a sense in which every new approach is an extension of the work of predecessors. Yet, as Geschwind points out, "Most people who advance their field must disagree with their predecessors to some extent and in some measure destroy the past" (p. 70, 1974). Judged on this criterion, J. W. Brown may well prove to be a good candidate for this distinction.

Brown (1972, 1979) challenges the assumptions underlying the classical model, rejecting the notion that aphasia can be explained by postulating a "mosaic" of cortical speech centers and connecting pathways which convey "cognitive packets," i.e., memory images, from one processing center to another. Instead, he proposes a model of aphasia in which language is processes simultaneously by complementary systems in the anterior and posterior divisions of the brain and pathways serve to "maintain in phase" the different regions of the brain. He refers to the microgenetic emergence of a language act, conceiving of that event both in production and in perception as a differentiation of some diffusely represented thought into verbal realization. For Brown, language is a form of thought.

The model is based on a theory of the evolution of the

brain. It presents the development and breakdown of a language act as a temporal rather than spatial event, occuring over a series of cognitive levels corresponding to an evolutionary series of anatomical levels. Each level in linguistic realization is therefore a level in cognitive realization and "every disorder of language also incorporates aspects of a corresponding level in cognition" (1977, p. 27). The most primitive level biologically as well as psychologically and linguistically is the limbic system. The left lateralized focal neocortex, which includes Broca's area in the anterior portion of the brain and Wernicke's area in the posterior portion, is the most recently evolved area of the brain and mediates the final stages in language realization. The particular site of a brain lesion is regarded as "the site of the medium by means of which cognition may be advanced one stage further" (1977, p. 8).

Brown sees psychopathological disorders as breakdowns in hierarchic systems, with aphasia "a result of a disturbance within the linguistic phase of this hierarchy, although analogous patterns of breakdown occur within all of the functional systems, e.g., language, praxis and perception" (1972, p. 277). Language, is then not a unique and special human capacity, but rather emerges, or is achieved in the same way and according to the same principles as movement or perception.

The aphasias "display" stages in the actualization of a language act. The properties of an aphasic symptom thus

reflect the level of cognitive organization that has been affected by the brain lesion, that level corresponding to a stage in the microgenesis of language.

Central to Brown's model of language organization in the brain is the development of both the anterior and the posterior systems out of a "common limbic core," establishing a fundamental unity of the two systems. The anterior division of this core mediates the initial stage in the motor speech differentiation. Emergence of language in the anterior system corresponds to a differentiation of the motor configuration or motor envelop of the language act, becoming increasingly more focused as it develops toward the ultimate articulatory units. These stages in the emergence of language correspond to a progression of anterior aphasias: from akinetic mutism, to transcortical motor aphasia, to agrammatism and Broca's aphasia proper.

Wernicke's area in the posterior system mediates phonological processing on this model, while the region surrounding Wernicke's area mediates semantic processing. Brown suggests that both phonological and semantic functions are bilaterally organized. As a result, he predicts that unilateral lesions of the left hemisphere will involve phonological or semantic functions only partially and leave speech relatively intelligible. On the other hand, bilateral lesions will involve "a more severe erosion into these components," yielding unintelligible jargon. The posterior aphasias reflect the microgenetic sequence lead-

ing from confabulation, semantic jargon and a variety of naming disorders at a semantic level to phonemic aphasia, neologistic jargon and phonemic jargon at the phonological level.

Brown believes that "...connections between homologous levels in the anterior and posterior systems of the same hemisphere, as well as commissural connections to the corresponding anterior or posterior level of the opposite hemisphere...link up temporally, i.e., maintain in phase, homologous levels of different brain regions" (1979, p. 12). While firm in his position that "there is no rostral conveyance of language content, but rather a simultaneous realization of the entire hierarchic system within its anterior and posterior sectors" (1979, p. 9), he maintains that "the proposed model...does predict some effect of pathway interruption, for example anterior-posterior asynchrony or elevation of discharge thresholds in the interconnected areas. The central point is that the cortico-cortical fibers relate to timing or phase-relationships in separate, conically organized systems, rather than serving as conduits for the transfer of cognitive packets" (1979, p. 191).

In summary, Brown's model makes two fundamental claims about the organization of language in the brain and the consequences of that organization for aphasia: 1) that "no matter how highly differentiated their endproducts, both speech and speech perception differentiate out of the same deep organization" (1977, p. 26); and 2) that, with regard

to formation of aphasic symptoms, at early structural and functional levels, where language organization is more diffuse, bilateral lesions are essential for symptom formation. At later levels, as brain organization becomes more differentiated functionally and language becomes more and more lateralized to the left, symptoms occur with unilateral and focal lesions.

CHAPTER V

Phonemic Jargonaphasia

The most thorough descriptions of aphasic jargon found in the literature refer to semantic jargon (Alajouanine, Sabouraud, and DeRibaucourt, 1952; Kinsbourne and Warrington, 1963; Weinstein, Lyerly, Cole and Ozer, 1966; Kriendler, Calavuzo and Mihailescu, 1971) or neologistic jargon (Alajouanine, Sabouraud and DeRibaucourt, 1952; Green, 1969; LeCours and Rouillon, 1976; Buckingham and Kertesz, 1976). Although there are occasional anecdotal references to cases with totally phonemic jargon (Wepman and Jones, 1964; LeCours and Rouillon, 1976), descriptions are lacking. Presumably, descriptions of phonemic jargonaphasia are absent from the literature because the disorder is so rare.

Perhaps the earliest case report of jargon consisting of uninterpretable phoneme strings, was documented by Jonathan Osborne in 1833. Osborne's patient was a 26 year old university scholar who was proficient in French, Italian and German. The man apparently suffered a stroke which left him with speech which "caused him to be treated as a foreigner." Osborne characterized his patient's "imperfection" as a "loss of recollection of the mode of using the vocal apparatus so as to pronounce [words]" (p. 158). He describes the jargon only by saying that it consisted of a variety of syllables. Other symptoms included: 1) excellent comprehension for oral as well as written language;

2) good writing; 3) intact ability to perform arithmetic calculations; 4) repetition confined to certain monosyllables, with an inability to repeat sounds corresponding to the letters k,q,u,v,w,x, and usually i. When asked to read the sentence "It shall be in the power of the College to examine or not examine any licentiate, previously to his admission to a fellowship, as they shall think fit," he produced the following: "An the be what in the temother of the trothotodoo to majorum or that emidrate ein einkrastrai mestreit to ketra totombreidei to ra fromtreido asthat kekritest." Several days later he read the same passage as: "Be mather be in the kondreit of the compestret to samtreis amtreit emtreido am temtreido mestreiterso to his eftreido tun bried rederiso of deid daf drit des trest." The patient appeared to be aware of his impairment and evidence in the case report indicates normal affect. Osborne also reported the progress of the patient's recovery. At 6 months following the onset of the disturbance, the patient read the original test sentence as follows: "It may be in the power of the college to evhavine or not, ariatin any licentiate seviously to his amission to a spolowship, as they shall think fit." Finally, after one year, Osborne reports the patient to have improved almost totally.

A patient described by Browne (cited in Bateman, 1890) produced incessant jargon consisting of sequences such as: "kalluios, tallulios, kaskos, tellulios, karoka, keka," and appeared surprised that she was not understood.

Cénac (1925) described a form of jargon in which he observed long stretches of unintelligible speech including only the phonemes of the standard language in phonologically acceptable sequences. He referred to this disturbance as glossolalia.[2] The neologistic units in glossolalia were observed to bear structural resemblance to one another and to other utterances of the patient. A predilection for certain segments or sequences was also indicated.

Alajouanine (1956) introduced the term undifferentiated jargon to designate a form of aphasic jargon he described as consisting of meaningless strings of speech sounds not clearly segmentable into word-like groupings. As an example of this form, he gave the following brief excerpt: sanénequéduacquitescapi. Subsequently, Alajouanine and Lhermitte (1964) emphasized other clinical aspects of this disorder (in this paper referred to as jargon with apraxia of mouth or face), including the tendency to stereotypy and perseveration, oral apraxia and the involvement of repetition and reading aloud. Oral and written comprehension were said to be preserved.

The study of KS presented here is perhaps the first thorough investigation of a form of jargon consisting en-

[2]More recently, Cénac's term glossolalia has been revived by LeCours and colleagues to refer to a variety of phonemically deviant forms of jargon including that of aphasics, schizophrenics and persons said to be in charismatic states. The use of a single term to refer to phenomena of such diverse origins is presumably intended to capture a structural similarity among them.

tirely of semantically vacuous phoneme strings. This patient differs from those described by Osborne and Alajouanine in that he demonstrates severe deficits in oral and written comprehension and shows no evidence of oral apraxia. The jargon to be described here is characterized by distinct articulation of a diversity of phones corresponding to the phonemes of the patient's standard language, i.e., English and German. The term phonemic jargon[3] is preferred over the term undifferentiated jargon since phonemes are indeed differentiated in the jargon. The term glossolalia was judged inappropriate insofar as its use has not been restricted to aphasic jargon.

Linguistic Analysis of Phonemic Jargon

Phonemic jargonaphasia presents a situation in which the meaning-bearing function of speech sounds has been lost. This form of jargonaphasia therefore, provides the opportunity to study the sound structure which emerges from a linguistic network in which there is no systematic correspondence between sounds and meanings. This sound structure may reveal properties at the foundation of the phonemic level of the speech production system for intact expressive language, which are obscured under normal conditions by the demand to achieve meaningfulness.

[3]Note that the term phonemic jargon has been used by the French school in referring to cases of phonemic (conduction) aphasia. However, this term is inappropriate since the phonemic paraphasias which mark the speech of a phonemic (conduction) aphasic usually do not render his speech uninterpretable, and the speech should therefore not be considered jargon.

Phonological investigations of aphasia have adopted from linguistic theory a descriptive framework in which the phonological aspect of language is represented at two levels of organization: a phonemic level at which the phonological representation of the language act is encoded and the phonetic level, at which the motor plans for the execution of the language act are organized. Phonological disturbances have been attributed to level-specific deficits.

Speech characterized by distorted articulation or sounds which are not part of the inventory of the native language are assumed to reflect disorder at the phonetic level. Disorders at this level of linguistic organization may, however, be attributed to a difficulty in the execution of motor movements themselves stemming from disruption at some stage in the linguistic process after the message has been encoded for transmission to the speech musculature, e.g., dysarthria, syndrome of phonetic disintegration. Verbal apraxia and apraxia for speech are terms used to suggest dysfunction in motor planning for speech.

Phonetic level disturbances with obvious motoric origins will be distinguished from symptoms of an aphasia. The distinction between aphasia and apraxia is less straightforward. Still, although the distinction is not an easy one, perhaps not even an instructive one to make, aphasia is regarded as a disturbance of the psychological operations in language formulation and not as a dysfunction in basic perception and movement. While the latter may have

consequences for language behavior and indeed cooccur with the aphasia, they are not disturbances of language per se.

Phonetic level difficulty in the evocation of phonetic units is distinguished from disturbance at the phonemic level where the ascription of linguistic significance to those units is effected. At the phonemic level, disorder is characterized by normal articulation of sounds from the phonemic inventory of the language but which may be incorrectly chosen in a particular context or incorrectly sequenced in that utterance. In the present case study, phonemic jargon is assumed to reflect a dysfunction not in the ability to evoke phonetic units but rather in the ability to evoke those units with reference to their phonemic significance in a linguistic message.

This study addresses the following questions:

1. given a dissociation between sound and meaning, what will be the phonological properties of speech?
2. will those properties be fixed or will they change depending upon whether the aphasic is engaged in a dialogue, producing a lengthy uninterrupted flow of jargon, or reading from written text?
3. will longitudinal observations provide evidence of recovery toward meaningful speech?

Case Report

Ks is a 74 year old male carpenter who suffered a cerebro-vascular accident (CVA) resulting in aphasia, in September of 1976. The patient was born in Germany and lived there until he was 20 years old. He spoke a Bavarian dialect at home and standard German in school. At age 20 he moved to Argentina, where, over a period of several years, he learned to speak Spanish. He then came to the United States where he has been living for more than 50 years. His command of English is said to have been excellent, though he spoke with a heavy German accent.

At the time of his stroke, KS showed mild left-sided weakness and EEG slowing over the left temporal lobe. He was subsequently evaluated by a neurologist at two months post stroke, at which time he was found to be neurologically normal except for the aphasia. A CT Scan obtained in March 1977, demonstrated two discrete lesions (Figure 1). One lesion, which appears as two in the section shown in Figure 1, involves the left temporo-parietal region; the other involves the temporo-parietal region of the right hemisphere. Mild ventricular dilation was noted. After reviewing the CT Scan findings, an effort was made to obtain information on a prior CVA, since it was considered unlikely that both lesions were incurred simultaneously. However, no such history could be obtained. Evidently, this was his first known hospitalization.

KS appears to be right-handed as judged from the

preferential use of that hand and dexterity in writing. On examination he was alert and very cooperative. Indeed, he was eager to participate in testing. He obeyed normal speaker-listener conventions, responding when addressed, and remaining quiet and attentive when he observed others speaking.

Conversational speech was, on the whole, clearly articulated, consisting of fluent, voluble jargon produced with an apparent logorrhea. He did not appear to be aware that his utterances were jargon, but from time to time evidenced frustration, suggesting that he was aware of a failure to communicate. Active gesture was observed both as an accompaniment to speech and as a substitution for speech. Prosody and intonation were quite normal.

Comprehension was severely impaired, initially suggesting cortical deafness. It was difficult to distract him with loud noise, or by calling his name from out of sight. Occasionally he followed simple whole-body commands such as "stand up," even when the command was whispered from behind him. There was no response to other body, limb or facial commands, though the examiner noted a difference in KS's response depending upon whether he was addressed in the form of a statement, a command or a question. Jargon spoken by the examiner was rejected. At times, KS's jargon would incorporate segments from words spoken by the examiner. He was unable to point to objects named, either when the object was placed before him or when it was somewhere in the

room. However, if the object was given a functional context, by means of a pantomimed demonstration of its use, he was sometimes able to point to the target object correctly.

Over several months, comprehension improved to the point where he was able to indicate many single objects named aloud, and even to answer "yes" and "no" to very simple questions. It was apparent that KS's performance on a task was more likely to be successful once a behavioral or psychological set for that particular task had been established.

Audiometric testing indicated a mild hearing loss with normal pure tone thresholds.

KS demonstrated no repetition upon request, although, as mentioned above, words or portions of words produced by the examiner were occasionally detected in his jargon output.

Naming was jargonized and only rarely could the target word be discerned in his utterance. There was considerable augmentation with the response including many more syllables than the target in fact included. Perseveration was noted.

Reading comprehension was possible to a limited extent. Though unable to follow simple written commands, he was able to match many written words with correct objects or line drawings of those objects. Performance on this task was better in English than in German. When the written words ENGLISH, GERMAN, FRENCH were displayed before him,

and he was asked to match a written or spoken word to the word indicating the language in which the item was presented, he was unable to do so. Over a period of several weeks, he was able to complete simple written phrases with a word selected from a choice card, where the choice included nouns, verbs and functors. Semantic category information appeared to be intact. When shown the word "tool," he pointed to a picture of a hammer, pliers, etc.; in response to the word "fruit" he pointed to an apple, banana, etc.

Writing was poor and jargonized for spontaneous productions, but copying was excellent. He showed an ability to transliterate, correctly matching words written in block letters with the same words written in script. In addition, he could write numbers from 1-10. In contrast to the apparent lack of awareness for the content of his speech, he was often frustrated by the difficulty in written expression, suggesting an intact regulatory mechanism functioning through either some form of visual or kinesthetic feedback.

Limb praxis was difficult to evaluate. Some actions were carried out to imitation, such as eye closure, lifting the hand and standing up. He was able to match body parts from the examiner to himself, but finger identification on a matching test was poor.

Drawing ability was fairly good. Little perseveration was observed in action and drawing, with such behavior more

apparent in writing. There was no evidence of neglect. Line bisection was normal.

Simple written calculations could not be performed.

Method of Investigation

Tape recorded sessions with the patient over a period ranging from 4 to 30 months after onset of aphasia were phonetically transcribed (see Table 1). Based on these transcriptions, the phonetic content of conversational jargon and reading was analyzed. Conversational samples at 5 and 8 months post are from conversations between the patient and a speech therapist during therapy sessions at Goldwater Memorial Hospital. A conversational sample at 30 months post is from a dialogue between the patient and this investigator which took place in the patient's apartment. Reading was sampled at the single word level and in short passages of English and German prose. The English passage is the story of The Hare and the Tortoise, taken from Luria's aphasia battery; the German, is the introduction to Carnap's Logische Syntaxe. The English and German passages were read both at 4 and at 30 months post onset of aphasia. The period from 4-8 months after onset will be referred to as Time 1; 30 months after onset will be referred to as Time 2. A second English text, an adapted excerpt from Chomsky's Reflections on Language, was included at Time 2.

As there are no identifiable targets in KS's jargon, the descriptive framework judged to be most appropriate was

Table 1a

KS's Consonant Inventory

	FRONT		CENTRAL		BACK				
	bilabial	labio-dental	dental/ alveolar	alveo-palatal	palatal	velar	uvular	pharyngeal	glottal
stop	p b		t d			k g			ʔ
nasal	m		n			ŋ			
fricative		f v	θ ð s z	ˇ ˇ c ɟ ˇ ˇ s z		x		h	
liquid				l r			R		
glide	w				y				

Table 1b

KS's Vowel Inventory

	FRONT		CENTRAL	BACK	
	UNROUNDED	ROUNDED		UNROUNDED	ROUNDED
HIGH	i	ü	ɪ	ʊ	u
MID	e	ø	ə		o
	ɛ			ʌ	ɔ
LOW	æ		a		

an analysis in terms of the relative frequency distribution of the phonetic content of the jargon and in terms of the sequential properties of pairs of phonemes. Although any unit of analysis larger than the phoneme will be arbitrary, such a unit has been defined in order to permit determination of properties of the frequency distribution for particular positions within an articulatory sequence. These units are defined over sequences of phones occuring between subjectively determined pauses. The criterion used for marking boundaries between such units was lengthened pause duration and/or lengthened voicing or aspiration in voiced and voiceless stop consonants, respectively. These units are in no way intended to suggest a relation to actual target words, which may or may not exist for KS in some sense. Rather, they are intended to suggest a relation to segments which may be regarded as single units of production at some level in the organization of articulation.

Samples of conversational jargon and of jargon produced in reading the English and German passages described above, were compared with one another and with various normative data. The frequency distributions of consonants and vowels were analyzed separately. The glides /h/, /y/ and /w/ were treated as consonants. Two consonants which are non-phonemic in both German and English were included in the analyses. Glottal stops were noted out of interest in the use of glottal articulation; the uvular /R/ is distinguished from the alveo-palatal /r/ in view of the important

role of place features in characterizing the jargon.

Normative data were obtained from several sources. The English language norms were taken from Roberts (1965) and Denes (1963); German norms were taken from Kucera and Monroe (1968). Data were also collected from a normal 70 year old native German speaker whose language history is similar to that of KS in several respects: both speakers grew up in the Bavarian region of Germany; both have been living in the United States for at least 40 years; and, for both speakers, the pronunciation of English is known to be (or to have been, in KS's case) marked by a heavy German accent. These similarities were believed to justify the decision to base predicted phoneme frequency distributions for KS on the distributional properties of this normal speaker's phoneme inventory in the various contexts.

Presentation of Data

The data are presented in two parts. Part I describes properties of a sample containing the longest uninterrupted episodes of spontaneous jargon. This sample, referred to as the monologue sample is then contrasted with a sample of jargon extracted from a dialogue between the patient and a normal speaker. Part II presents data on reading jargon. This is followed by a comparison of jargon produced in the reading mode with jargon produced spontaneously in conversation.

Spontaneous Jargon. While KS will be shown to produce virtually every phoneme of standard English and German, it will become equally apparent that the frequency distribution of those phonemes in his jargon is not exactly proportional to the pattern found in normal speakers. Indeed, in the case of the monologue sample, the distribution departs quite dramatically from normal.

Figures 2 and 3 illustrate the relationship between the consonant distribution in the monologue sample and the typical distributions in normal English and German. KS produces [m] and [b] with markedly greater frequency than normal. [r], [s], [f] and [p] are also found in higher proportions in his jargon. Note, furthermore, that [ð], [y], [h], and [k] occur in much lower proportions while [t], [d] and [n] fall somewhat below the normal proportions.

With regard to vowels (Figures 4 and 5), [i], [a] and [e] are most frequent in the monologue sample. Moreover, the diphthong [ai] is the most common vowel sequence. The graph in Figure 5 must be interpreted with caution. The vowel [e] appears there to be very common in KS's jargon. But note that because the data source for German norms includes [ə] as an allophone of [e], it was necessary that the [e] in this graph represent a category which collapses [e] and [ə] for KS as well. In relation to both English and German [i] occurs in the jargon with a higher than normal frequency. The relative frequency of [a] is consistent

with German, but greater than the expected frequency for English. In addition, the frequencies of [o] and [ɔ] exceed the English norms; the frequencies of [ə] and [ae] are lower than English norms.

The pattern of phoneme distribution in the monologue sample is observed in a second spontaneous jargon sample as well. Figure 6 displays the relation between the monologue sample and jargon produced in the context of a dialogue with a normal speaker. The distributions are nearly identical. In both cases a preference for [r] [s] and [b] is observed. Of the more frequent English and German consonants, glides [y,w,h] and velars [k,g] are noticeably rare in this jargon sample as well as in the monologue sample. The vowel distributions in these samples are given in Figure 7. In both monologue and dialogue jargon there is a preference for [i] and [a].

The Monologue Sample. It was pointed out in the case report that KS was often observed to include in his jargon, sequences of sounds resembling words spoken to him by his examiners. Presumably, the monologue sample, representing the longest uninterrupted samples of jargon is least likely to have incorporated repetitions of speech addressed to him or in general, to have been influenced by linguistic stimuli in his environment. It was, therefore, predicted that this sample would differ significantly from other samples of jargon, in which linguistic context was immediately present. Recall that

all samples of jargon except the monologue sample, were produced either in conversation with a normal speaker or in response to written words.

The monologue sample was found to be significantly correlated with all other samples of KS's speech on a Spearman Rank Order Correlation Test. Still the monologue sample is the only sample of KS's jargon found to deviate from a normal English consonant distribution to a significantly greater extent than did the sample from the normal control speaker on a test of the Significance of the difference between rank order correlation coefficients ($z = 2.158$). This result taken together with the fact that the monologue sample is the only sample to have been produced in the absence of an immediate linguistic context, may suggest that the distinct quality of this sample is attributable to the absence of such context and that it is the monologue sample which reveals properties intrinsic to the jargon. What then are these properties, and is there evidence of them in other jargon samples?

Articulatory parameters. Characterizing the monologue sample in terms of articulatory parameters, we find the most common place of articulation for consonants to be labial (relative frequency = 45.20%). Velars occur least often with a frequency of 1.9%. Dental/alveolar consonants account for 35.04% of the consonants, alveo-palatals, 15.07%, uvulars 1.56% and

other 1.23%. The most common stop is labial; the most common fricative is dental/alveolar. Nasals occur more often in the labial place of articulation than in the dental.

With respect to voicing features, labials are more commonly voiced and labiodentals, voiceless. Dental/alveolar consonants tend to be voiceless. Among the relatively few velars, there is a preference for the voiced member.

In standard English, dental/alveolars, occurring with a relative frequency of 63.58% by far outnumber labials (22.11%) and velars (14.31%). The reduced frequency of dental/alveolars in KS may reflect the fact that in English, the dental/alveolar class includes the liquid /r/, while for KS that phoneme is an alveo-palatal or less frequently uvular. As in KS, the stop manner is most common among labials. In contrast to KS, who prefers labial nasals, the dental/alveolar nasal is more common in normal English. The predominance of voiced over voiceless labial phonemes is not characteristic of normal English, while the predominance of voiceless over voiced dental/alveolars is. It is typical of speakers of southern German dialects to produce all stops and fricatives as voiceless (Moulton, 1967).

In the articulation of vowels, the position of the tongue in the oral cavity varies along two dimen-

sions: front to back and high to low. In terms of the front to back dimension, front vowels [i, ü, e, ø , ɛ, ae] occuring with a relative frequency of 42.96% are preferred over central vowels [ɪ,ə] which account for 17.31% and back vowels [ʊ,ʌ , a, u, o,ɔ] with a relative frequency of 39.72%. From the point of view of tongue height, high vowels [i, ü,ɪ ,ʊ , u] produced with a relative frequency of 36.36% are less frequent than mid vowels [e, ɛ, ø , ə, ʌ, ɔ,o] with a frequency of 43.85%, but are preferred over low vowels [ae, a] at 19.80%. On a two-dimensional plane, the most common vowels are the high front [i] at 24.91%, the low [a] at 19.43%.

In normal English front vowels are most frequent at 43.11%, followed by central vowels at 32.73% and back vowels at 24.15%.

Consonant clusters. The frequency distribution of consonant combinations was analyzed for each of three positions within the word-like units of KS's jargon: unit-initial, intervocalic and unit-final. For each position, different combinations were found to predominate. Recall that the unit over which a position is defined is a sequence bounded by an increase in relative pause duration.

The most frequent initial clusters are: [br] (36%; 9 occurrences), [vw] (20%; 5), and [pr] (12%; 3). In normal English, only [pr] is relatively frequent

in this position. Among intervocalic clusters, [br] is by far the most frequent (13%) with [ts] next most frequent (8%). The four most common final clusters are: [ts] (46%; 25), [ps] (11%; 6), [ns] (11%; 6) and [sč] (9%; 5). Of 3-consonant clusters, [sts] is most frequent.

Thus, across positions, the most common consonant combinations in KS's monologue jargon sample are [br] and [ts]. [br] accounts for 13% of the 2-consonant clusters and 11% of the total. Among 2-consonant clusters in normal English, br occurs with a relative frequency of .44% and ts with a relative frequency of .67%. Of the total inventory of consonant clusters in normal English, .37% are [br] and .56% are [ts]. Thus we may conclude that KS's monologue jargon reflects a more skewed distribution of consonant clusters than is found in normal English, where the most common cluster, [nt], is only 5.33% of all clusters across positions within a word.

Summary. Of all jargon samples analyzed in the present study, the longest episode of jargon referred to as the monologue sample, shows the most extreme departure from the normal phoneme frequency distribution for English and German consonants. This sample is characterized by a marked preference for [r], [s], [m] and [b], in that order. In the case of vowels, the high proportions of [i]

and [a] are not incompatible with the general pattern of the distribution of normal English and German. Yet, the diminished frequency of [ə] and the absence of the characteristically English [ae] suggests a German vowel system.

In terms of phonemic features, it appears that the most frequently produced phonemes in this sample, for stop consonants and vowels, are those articulated in the front of the oral cavity, with phoneme frequencies decreasing as articulation moves toward the back. Thus, labials [m, b, p] tend to be more common then dental/alveolars [t, n, d], and dental/alveolars more common than velars [k, g]. With respect to vowels, front vowels [i, ü, e, ø , ɛ, ae] are more common than central vowels [ɪ , ə] and back [ʊ, ʌ, a , u, o, ɔ].

Across initial, intervocal and final positions defined over an inter-pausal sequence, the most common consonant combinations are [br] and [ts]. Due to the very high frequency of these combinations, the jargon reflects a more skewed consonant cluster distribution than is found in normal English.

Reading Jargon. Having identified the differences between the phoneme frequency distribution for jargon produced spontaneously and the distribution found in normals, it is of interest to determine whether the distribu-

tion in the jargon is a fixed property of jargon production in KS, or whether the distribution can be manipulated by asking the patient to read written words.

Single-word Reading. Individual English words, letters and numbers printed on 8" x 10" index cards, were presented to the patient one at a time. The target items are given in order of presentation in Appendix 3a. Phonemically transcribed responses to each stimulus card are displayed in Appendix 3b, where target words and letters are listed alphabetically and target numbers appear in an ordered list. The column labeled "Reference Number of Related Items" indicates numbers of those items listed in Appendix 3a by order of presentation, which are phonologically or morphologically related to the target word on a given trial. This cross-index demonstrates the lack of correspondence found between responses to, e.g., minimally contrastive pairs of words, in terms of both number of syllables and identity of phonemes.

It seems reasonable to assume that if KS's jargon responses can be shown to be phonemically related to target items, such relationships will be most convincingly demonstrated by cases in which it is clear that the appearance of a phone in a jargon response cannot be attributed to the high probability of occurrence of that phone in the jargon generally. Given the low frequency of occurrence of velar consonants in KS's jargon

across samples in this investigation, we shall consider the distribution of velar consonants in KS's responses to target words as representative of the degree to which the jargon response is phonemically related to the target.

The proportion of instances in which KS's response to a velar-initial target word includes a velar consonant in some position in his utterance, is .304 (7 out of 23 occurrences). When the target word includes a velar in any position, the proportion of instances in which KS's response includes a velar is .286 (20/70). On the other hand, in target words which do not in fact include a velar consonant, KS produces a velar with a relative frequency equal to .277 (18/66). Thus, the likelihood of producing a velar consonant in response to a given target word appears to be independent of the presence or absence of a velar consonant in that target. As a result, one can argue that there is no systematic correspondence between the presence of a given phone in a target and the presence of that phone in KS's response to that target.

Upon each presentation, the patient took the stimulus card in his hand and, often using his index finger to guide him across the card, uttered a lengthy sequence of sounds, regardless of the syllabic length of the target. Following each response, the patient would pause, hand the investigator the card he had just read and reach

for the next stimulus card. Thus while the structure of the patient's verbal response was manifestly independent of the actual target, his behavior indicated that he believed himself to be completing the task appropriately.

One particular characteristic of his responses is noteworthy. Frequently, after producing a sequence of syllables at a normal intensity level, the patient's voice began to trail off into a faint whisper, indicating a failure to regulate, in this case, to "turn off," his vocal machinery, as suggested by the notion of pressured speech often associated with jargon production.

In view of the lack of correspondence between stimulus and response, one might wonder whether the patient's behavior was in fact stimulus bound, or whether it was entirely independent of the particular stimulus. A halting verbal response to the target letter 'Q' as well as a non-verbal response which did not conform to the stereotypic pattern of behavior characterizing the preceding and subsequent responses, suggested that the stimulus items might be presenting different levels of difficulty for the patient. In addition, KS was able to correctly point to the referent of a word on a stimulus card, e.g., CHIN, BED, indicating that the semantic structure underlying these written words was available to him. These observations motivated the construction of a second reading task. For it was not clear whether KS would have re-

sponded in his typical fashion to a graphemic sequence which had no semantic content.

This second task was designed to investigate the extent to which KS's responses to words were stimulus bound. In essence, this task was a lexical decision task. The target items to be read included English words, German words, Hebrew words, representing a language presumably unfamiliar to him, and pronounceable nonsense words. Items presented in this task are listed in Appendix 3 c.

KS responded to the English and German words in the stereotypic pattern of behavior described above. He indicated rejection of the Hebrew and nonsense words by spending much time examining the cards with a puzzled expression on his face, as opposed to responding immediately as he did for English and German words. Moreover, in response to these non-words, he tended to shake his head, turn his palms upward in resignation and on several occasions uttered "no." This behavior suggests that KS can recognize the difference between a word and a non-word, and thus that the jargon he produced in response to a target item is indeed to some extent determined by the lexical properties of the target item.

Connected-Prose Reading. The stereotypic quality of KS's jargon is obvious in the consistency between the distribution of phones in his spontaneous speech and the distribution of phones in reading written text. Indeed,

no apparent relation was found between the single words presented to KS in the single-word reading task and his responses to those target words. Yet, there is evidence in the overall pattern of jargon elicited in response to short texts of connected prose, to suggest an element of context-dependence in jargon production. In particular, the striking similarity between samples of jargon produced in reading the same passage twice, suggest that the phoneme distribution in his jargon is not fixed, but rather may be responsive to the actual content of the text being read.

The practically diagonal difference curve in Figure 8 suggests that KS's jargon may be to some extent text-specific. This curve shows the difference between consonants in two jargon readings of the same text on the same day. The near identity of phoneme distributions contrasts with the greater difference between readings of the different texts on the same day (Figure 9).

Figures 10 and 11 illustrate this difference for vowels. While vowel distributions, in fact, tend to be quite consistent across texts, the difference between readings of the same text is still smaller especially with respect to the relative frequency of [i].

To precisely what extent does the specific phonemic content of a text impose constraints upon the content of his jargon? Figures 12 and 13 plot the jargon produced

in the reading of English and German passages against readings of those same passages by the control speaker. KS's jargon differs from the expected curve as a result of the higher proportion of those consonants typically preferred in his jargon across all samples. Similarly, those consonants which tend to occur rarely in all samples, account for the negative deviation from the expected.

For vowels, the only major difference between KS and the control for readings in both languages (Figures 14 and 15) is a lower proportion of [ə]. In the English reading, KS produces higher than expected proportions of [i], [ɛ] and [a], and lower than expected proportions of [ʌ] as well as [ə] . In reading German, KS's vowels are more consistent with the control distribution perhaps only in appearance, since the distribution of vowels produced by the control is similar to the monologue sample.

We may conclude from this comparison with the control reader that the identity between the respective phonemic contents of the two readings of the same text does not stem from specific phonemic constraints within the text. On the contrary, these graphs illustrate the extent to which it is the stereotypic pattern alone which predetermines the quality and content of his jargon reading.

In order to determine more conclusively whether

specific phonemic content plays a role in constraining KS's jargon production, he was asked to read an English passage edited to include only one instance of the consonant [b], which had earlier been found to predominate in the jargon. The jargon reading, however, included no fewer [b]'s than were produced in reading an unweighted passage in which eleven [b]'s were actually present.

There appears then to be no evidence that the text imposed specific phonemic constraints. There is, however, evidence of a reading mode in jargon production. Let us reconsider Figures 9, 12, 13. As we have seen, the reading jargon reflects reduced proportions of consonants [m] and [b] which were preferred in the spontaneously produced monologue jargon, and increased proportions of consonants common in normal English, namely [t] and [d]. In these respects, the reading jargon differs less from normal English than does the monologue jargon. In other words, in the presence of a text, KS's jargon patterns more closely with a normal English phoneme distribution. Figure 16 shows the difference between the normal control speaker's conversational speech and KS's jargon produced in dialogue. Figure 17 compares the control's conversational speech and KS's monologue jargon.

The vowel content of the conversational jargon is represented in Figure 18, where it is compared with vowels in the control's spontaneous speech. Major departures from the expected distribution consist in much higher proportions of [a]and [ɔ], and lower proportions of [ɪ] and [ʌ].

Possible evidence of conversational constraints is presented in Figure 19. Here two samples of jargon produced in the context of dialogues with normal speakers (and obtained 2 years apart) are shown to be more similar to each other in phoneme distribution than either one is to the monologue sample (see Figures 20 and 6). The fact that the jargon produced in dialogue with a normal speaker has a less deviant phoneme distribution suggests either specific but not consistent influence of the auditory linguistic context of the conversation, or nonspecific psychological effects induced by the conversational situation, e.g., the requirement that participants in a dialogue attend to one another.

Summary. Reading jargon does not appear to reflect specific phonemic content in a written text. Rather, the jargon seems to be predetermined by a stereotypic pattern of production. There are, however, indications that jargon production is sensitive to the presence of normal language context. Visually, a written text pro-

vides constraints on reading jargon; auditorily, the normal speech of a partner in conversation may constrain spontaneous jargon.

Properties Common to Spontaneous and Reading Jargon. The phoneme distributions for jargon produced in reading passages of connected prose, are displayed in Figure 9. The preference for [r] and [s], as well as the paucity of [y], [w], [h], [k], [ð] and [g] are compatible with the pattern observed in spontaneous jargon.

The vowel distributions in these samples are given in Figure 11. The reading samples are consistent with the monologue jargon only in their high proportions of [a] but do not show consistently high proportions of [i]. In fact, reading jargon demonstrates a strong preference for [ɛ].

Figures 9 and 11 in effect summarize the findings with regard to internal consistency of KS's jargon. Figure 9 indicates that all jargon samples are consistent with the monologue sample in terms of relative proportions between consonants. Of the most common consonants, only [r][4] and [s] are consistently highest in frequency.

[4]An alveo-palatal [r] and a uvular [R] are found to be in almost complementary distribution across reading and spontaneous speech: the uvular is most common in samples of reading and the alveo-palatal, in spontaneous speech. These phonetic variants are theoretically in free variation in standard German although native speakers tend to produce the uvular variant almost exclusively (Moulton, 1962).

The high correlation among jargon samples is indicated by the high levels of significance found for consonants on Spearman Rank Order Correlation Tests. The internal consistency of the jargon is furthermore confirmed by the fact that while the difference between the values of correlation coefficients for samples from the normal control approaches significance ($t = 1.896$), the difference between correlation coefficient values for samples from KS is quite minimal ($t = .294$).

Figure 11 illustrates the most salient property of KS's vowel distribution, which is the sustained and pronounced preference for [a]. The higher consistency within reading and within spontaneous speech than across the two modes is striking.

Summary. For consonants, all samples of KS's jargon indicate consistently high proportions of [r] and [s] and consistently low proportions of [y], [w], [h], [k], [ð] and [g]. In terms of vowels, [a] is found to predominate in all samples, while there is a consistently low frequency of occurrence for the rounded front vowels [ü, ø], the central vowels [ɪ, ə], and the low front [ae]. in all samples the diphthong [ai] is the most common vowel combination.

Consonants:Vowel Ratio. The proportion of consonants to vowels in the jargon tends to be compatible with a normal German distribution. In German, consonants out-

number vowels by about 1.6:1 (61%:39%); in English, the ratio is about 1.8:1 (64%:36%). In all jargon sampled there is a slight shift away from the skew which favors consonants in the normal ratios. The shift is most extreme in the monologue jargon, which consists of 1.1 consonants to every vowel (53%:47%).

Sequential Properties of Jargon. Both in conversation and in reading, KS produces fluent and clearly articulated jargon. A distinct reading style is characterized by very deliberate pronunciation and great concentration on performance often reinforced by the use of his index finger to guide him through the text. The deliberate quality is expressed in his tendency to release stop consonants and aspirate those that are voiceless. This tendency suggests the standard German practice of nearly always releasing and aspirating final stops. In fact, the authoritative grammar of German pronunciation, Siebs, prescribes strong aspiration for initial and medial positions as well.

The rhythmic pattern of his reading is often iambic, e.g., opay' edis' bedens'. His intonation, defined over interpausal units, is characterized by a flat contour which falls prepausally. These properties of his reading speech are in striking contrast to his conversational speech in which rhythmic structure is more variable and intonation fluctuates, often producing a sing-song quality. Note that a similar contrast between reading and conversational speech is found in normal speakers.

A greater than normal flow of speech is characteristic of his jargon in general. In conversation this is simply an impression, but the impression is confirmed by studies of jargon reading, where he is found to produce approximately twice the number of syllables (measured in CVC units) produced by the control reading the same texts.

The ratio of single consonants to consonant clusters is 1.95 for conversational jargon and 1.83 for reading jargon. A normal English speaker typically produces 2.59 single consonants for every consonant cluster.

Transitional properties of diphone sequences were determined for the dialogue sample at Time 1 and the English reading sample at Time 1a. Vowel clusters and consonant clusters, as well as consonant-vowel clusters (CV) and vowel-consonant clusters (VC) were included in the analysis. Vowel and consonant clusters were analyzed in terms of place of articulation; consonant clusters were also analyzed in terms of manner of articulation and voicing features. Appendix 5 contains matrices which present the data on phone pairs in terms of these features. In each matrix, the property in question for the first member of a pair is given in the rows; the property for the second member is given in the columns. Each box contains the actual frequencies of occurrence of diphone sequences in

these samples. The Ø's in effect indicate pause boundaries between units of jargon production. The box in a matrix corresponding to Ø followed by Ø indicates a relatively long pause between units.

Let us consider first the properties of the Dialogue Time 1 sample as represented in these matrices. The data suggest that units of production are most often initiated by a consonant and end on a consonant, with initial and final consonants most often central. Among stops and fricatives, voiced stops occur initially, voiceless fricatives occur finally. For those units which are initiated or terminated on a vowel, that vowel is most likely to be a back vowel.

With respect to vowel clusters, it appears that most common vowel sequences are low back vowels followed by high front vowels. When high or mid, front or back vowels appear as the first member of a sequence, they are followed most often by mid central vowels. In consonant clusters, the most common transition for any place of articulation seems to be into a central consonant, a sequence of two central consonants being most common. In terms of manner, stops are most commonly followed by fricatives and liquids. Affricate sequences constitute the only instances in which manner remains unchanged across a sequence of two phones. For the most part, the voicing property of the first consonant is maintained across the sequence except in the case of voiced fricatives, which are followed by voiceless stops.

Regarding CV sequences, place of articulation tends to move backward, with most pairs consisting of central consonants followed by back vowels. In VC sequences, the most common transition is from a back vowel into a central consonant.

Turning to the reading jargon, one finds that, as in the dialogue sample both the initial and final phones in a unit of production are consonants and furthermore, central consonants. Among stops and fricatives in initial position, one observes voiced stops or voiceless fricatives and in final position voiceless fricatives. In those cases in which a vowel initiates a unit of production, the place feature of that vowel is back. Final vowels tend to be either front or centrally articulated.

Sequences of two vowels most often consist of a low back vowel followed by a high front vowel. For consonant clusters as well, the two types of jargon samples are similar insofar as all consonants tend to be followed by a central consonant, the most common cluster being a central consonant followed by a central consonant. In terms of manner of articulation of consonant sequences, it is most often the case that consonant sequences consist of a stop followed by a fricative. In general the voicing fea-

ture remains constant across the members of the pair. Thus, the most common consonant sequence is a voiceless stop followed by a voiceless fricative.

CV sequences most often consist of central consonants followed by front vowels. In the typical VC sequence, a front vowel is followed by a central consonant. In general, for all three places of articulation of the vowel, the consonant is central.

A sequential pattern found to recur in spontaneous jargon samples takes the form

/b (r) V (DENTAL C) $\underset{z}{s}$/

where V is a vowel, C is a consonant and parentheses indicate that the phones which they surround are optional. Forms which appear to be variations of this pattern may be accounted for as resulting from processes of epenthesis, metathesis or diphthongization operating on the above string. Thus the addition of an epenthetic [ə] separating the [br] cluster in the basic form will yield the observed unit of production [bəras]. Metathesis in the /...rV.../ portion of the string will produce the observed sequence [bɛrz]. Finally, diphthongization will derive forms with diphthongs in the vowel nucleus, such as [biɛs].

Most of the stereotyped sequences occur in the monologue sample, of those found in the dialogue sample, most occur as a variant of this stereotyped form. One might, therefore, argue that the sequential properties of the

monologue sample are more constrained than those of the dialogue sample. For, the appearance of these variants in the dialogue sample may indicate that the jargon produced in this sample manifests a less rigidly structured sequence and that whatever mechanism was operating in the production of the monologue jargon to induce a highly stereotyped output, is weaker or less effective in the dialogue jargon.

Regarding the difference between these spontaneous samples in terms of sequential properties, it is of interest that they differ with respect to the feature of phones repeated in contiguous perseverations. In the monologue sample, labiodental fricatives are most commonly perseverated, while in the dialogue sample such perseverations are most common on dental stops.

KS's tendency to produce open juncture between CVC units (that is, to terminate each unified articulatory gesture with a consonant phone, as in fot-an-bed-ist, rather than with a vowel, as in fo-tan-be-dist) appears to violate the rules of traditional English and German pronunciation. In English, a consonant or consonant sequence which begins a word is grouped with the following vowel if the preceding vowel is long or unstressed. In German, according to Schulz and Griesbach (1960, p. 11) "a single consonant or the last of a sequence of consonants is grouped with the following vowel."

In consonant sequences of standard English words, place usually remains constant across the sequence while

manner changes. The affricate sequences in KS's dialogue jargon thus contribute a non-English quality to his speech. The sequential properties of consonants in KS's dialogue sample also are similar to standard English in that the most frequent initial consonant in English and for KS is centrally articulated.

KS's tendency to produce the fricative /s/ followed by a stop is characteristic of English, but not typical of German, where the sequence /s/ plus a stop is more common. Indeed, KS produces several such affricate plus stop sequences as well. Similarly, the occurrence of /sl, sn, sm/ sequences in the jargon reflect English rather than German quality. There is yet another aspect in which the quality of KS's jargon differs from standard German speech, residing in the fact that while most native German speakers use the uvular [R] exclusively or at least in the environment preceding a vowel, for KS, the alveo-palatal variant is more common in conversational speech generally and specifically in the environment preceding a vowel. Consistent, however, with German phonology is the presence of affricate plus stop sequences, and the relative absence of final voiced stops in KS's jargon.

Longitudinal Aspects. We turn now to the longitudinal aspects of the investigation and to the question of recovery. Does the sound pattern of KS's jargon, as measured by phoneme frequency distribution, change over a two year period? If so, does the change reflect recovery toward the

distribution characteristic of normal speech?

Figure 19 illustrates the similarity between the conversational jargon produced at Time 1, which is 5 months post onset of aphasia, and the conversational jargon produced at Time 2, at 30 months post onset. In Figures 21 and 22, the curve represents the difference between the distributions of consonants in passages read at Time 1 and again at Time 2. For both the English and German passages, the frequency of occurrence of [b] increases over time as the frequency of occurrence of [r] and [m] diminishes. In addition, [s] occurs more frequently in the German reading at Time 2. Notice that for both passages there is a large increase at Time 2 in the proportions of [t], [n] and to a lesser extent [g]. These consonants accounted for much of the negative deviation from the expected distribution at Time 1.

Thus, in contrast to the conversational jargon at Time 2 which reflects the production bias established at Time 1, the reading jargon at Time 2 is compatible with a shift toward a normal distribution. It is equally apparent from the relation between each of the jargon curves and the control, that this shift is independent of text-specific constraints.

Regarding the change in the vowel distribution over time, Figures 23, 24, and 25 show that across readings and conversational speech, there is a significant increase in the relative frequency of [i] and a less marked increase

in the frequency of [a] and [o]. Furthermore, there tends to be an increase in the occurrence of the dipthong [ai]. For the reading samples alone, [ə] increases as the proportions of [ɪ] and [ɛ] decrease. It appears then, that the direction of change in the vowel distribution reflects the production bias found in the monologue sample.

A pattern reflecting higher Spearman rank order correlations among samples within Time 2 than among samples within Time 1, indicates that KS's jargon is more homogeneous at Time 2. Table 2 presents the correlation coefficients. The table displays the following results: 1) higher correlations obtain between readings of different texts at Time 2 than between readings of the same text across Times 1 and 2, where the difference between the r's is significant at the .01 level, ($z = 4.076$); 2) higher correlations obtain between conversational jargon and each of the readings at Time 2 than between conversational speech and each of the readings at Time 1; and 3) across Time 1 and 2, conversational speech samples are more highly correlated than any two reading samples. Together these results suggest that the influence of a written text upon the quality of KS's jargon increased over time.

With respect to C:V ratio, there appears to be no major change over time. The dialogue samples at Times 1 and 2 both consist of 59% consonants and 41% vowels. The mean ratio in the reading jargon also remains relatively unchanged, with 59% consonants and 41% vowels at Time 1 and

Table 2

Correlations Among Samples of KS's Jargon[ab]

	GR1	GR2	ER1	ER2	D1	D2
GR1		.81	.84	.86	.79	.78
GR2	.70**		.79	.91	.79	.82
ER1	.96***	.67*		.77	.74	.79
ER2	.78**	.90***	.79**		.84	.82
D1	.79***	.71**	.87***	.84***		.90
D2	.85***	.83***	.85***	.91***	.91***	

[a]values for consonants above diagonal
values for vowels below diagonal

[b]all consonant correlations $p < .001$

***$p < .001$
**$p < .01$
*$p < .05$

Table 3

Length of Reading Samples in Syllables.

Text	KS	Normal Control	Ratio KS/ Control
German Reading 1	396	275	1.44
German Reading 2	401	-	
English Reading 1	259	147	1.76
English Reading 2	247	-	

58% consonants:42% vowels at Time 2.

Finally, the longitudinal analysis indicates the tendency toward augmentation found in KS's jargon at Time 1, and at Time 2 (see Table 3).

Summary. In conclusion, there is no evidence of recovery. What we do observe is evidence that the jargon is more homogeneous across samples obtained at 30 months post onset (Time 2) than across samples obtained at 5 months post (Time 1). There is no indication that the homogeneity stems from an across-the-board enhancement of the production bias found at Time 1. The important change over time is not in the content of the jargon, but rather in the context-sensitivity of the jargon production. At Time 2, the jargon is apparently more sensitive to the presence of orthographic context, insofar as reading jargon at Time 2 is observed to deviate more from the monologue sample's distribution and conversational jargon is observed to deviate less.

Summary of Results

The results of the present investigation may be summarized as follows:

1. KS produces virtually all of the sounds of normal English and German;
2. While, overall, the frequency distribution of sounds in his jargon is significantly correlated

with the distribution found for normal speakers, in terms of individual phonemes, the two distributions differ largely due to a greater than expected proportion of labials in the jargon;

3. Across samples, the jargon is characterized by a stereotypic, repetitious quality attributable to the consistent preference for /r/ and /s/ among consonants and /a/ among vowels;
4. Units of production tend to be initiated and terminated by central consonants. In vowel clusters, there is a transition from low back to high front. For consonant clusters the sequence is typically a centrally articulated stop followed by a centrally articulated fricative. Manner tends to change across consonant clusters, while voicing remains the same. Thus, the most common consonant cluster is a voiceless stop followed by a voiceless fricative. In CV clusters, central consonants are followed by back vowels; in VC clusters, back vowels are followed by central consonants;
5. The jargon elicited on reading tasks essentially conforms to the pattern found in spontaneously produced jargon, indicating a single stereotyped mode of production;
6. Over a period of 2 1/2 years, the fixed distributional properties of the jargon do not change. Indeed, there is an appearance of greater homogen-

eity of the jargon at Time 2 in that the phoneme frequency distributions of samples obtained at the end of the 2 1/2 year period are more similar to one another than samples obtained at the beginning of that period.

CHAPTER VI

Discussion and Concluding Remarks

Evidence that different aspects of language can be affected to varying degrees depending (among other factors) upon the region of the left hemisphere which is damaged, indicates a relationship between the organization of language and the organization of the brain with respect to language. Symptoms of jargonaphasia may provide evidence for the psychological reality of levels of linguistic description insofar as errors may reflect either semantic or phonologically related substitutions. Moreover, aphasic jargon may involve the perseveration[5] of units ranging from single phones to whole words.

Changes in predominantly one or another aspect of language behavior suggest at least some degree of functional independence among the neural mechanisms underlying these aspects of language capacity. In phonemic jargon as seen in KS, the predominant change in language behavior is that sounds of language are no longer used in a way which conveys linguistic meaning, indicating the extent to which the phonic aspect of language may function autonomously. This is not to say that there may not be meaningful intentions underlying the jargon, but whether or not such intentions exist, they cannot be realized in sound according to any known linguistic system.

[5]In the present usage, this term refers to abnormal persistence and excessive recurrence.

How does this change in language behavior manifest itself? First of all, although the overall distribution of sounds in the jargon correlates significantly with the overall distribution in normals, the particular order of preference with regard to specific phonemes is consistently different from normal. The four most common consonants in English are [t, y, r, n], in that order. KS, on the other hand, tends to produce [r, s, m, b] more than any other consonants. Furthermore, labials as a class consistently occur in greater than normal proportions. Moreover, in the sample representing the longest stretches of uninterrupted spontaneous jargon, the proportion of labials is considerably greater than normal. This apparent bias toward labials is reduced, however, when jargon is produced in the presence of normal linguistic context.

How shall we characterize the language behavior in phonemic jargonaphasia? Since one cannot speak of a phonological system in phonemic jargon, neither can one speak of a phonological disturbance in the sense of presenting violations of phonological rules. But if the function of the phonological component of language is to map sound configurations onto meanings, it is arguable that what is at issue is a phonological disturbance, where that phonological disturbance consists in an inability to assign linguistic values to phones and therefore a failure to select and sequence phonetic units in a linguistically

meaningful way.[6]

It was indicated above that in reading aloud and in conversation with a normal speaker, the distribution of phonemes in the jargon is more compatible with the distribution found in normal language, as the dental/alveolar place of articulation becomes predominant. This suggests that the presence of linguistic context may provide KS with occasional lexical targets, thus 'anchoring' the jargon in a normal phoneme distribution. This anchoring context has the effect of constraining the production bias manifest in the absence of linguistic context. An enhancement of the correlation between KS's distribution and a distribution typical in normals, would then be explained by the incorporation into the jargon of some of the phones present in the context. Presumably, phonemes are incorporated into the jargon only sporadically since the distribution curves for the reading samples did not match those for a normal control reader. Such sporadic behavior is not unusual in aphasia, where there is commonly great variability in performance from one moment to the next. The mechanisms underlying the

[6]If phonemic jargonaphasia is a problem in the assignment of phonetic or phonemic values to segments and <u>therefore</u> a problem in the selection and sequencing of units, this property might distinguish phonemic jargonaphasia from phonemic (conduction) aphasia. For in phonemic (conduction) aphasia, the assignment of phonemic values may be unstable but the capacity for self-correction indicates that the phonemic value of sounds is preserved and the problem may be simply in selection and sequencing.

sporadic behavior is not clear. But since dental/alveolars are common in normal speech it is most likely that they will be candidates for inclusion in the jargon. On the other hand, since labials are relatively uncommon in normal speech, but very common in the jargon, it is likely that they will be replaced by other phonemes by virtue of their high frequency of occurrence.

The bias toward [r] and [s] may be related to the relatively high frequency of those consonants in normal speakers of English and German, since they are among the four most common consonants in these languages: /r/ ranks third in German and second in English; /s/ ranks fourth in both German and English.

Indeed, other investigators of jargon have also found a predisposition toward /r/ and /s/. Green (1969) described a stereotypic sequence recurring in the speech of HP, which always included the consonant /r/. LeCours and LHermitte (1972) divide their patient's neologisms into three classes, each of which is characterized by a stereotypic sequence of phonemes. In all three classes /r, s, b and m/ always occur in one position or another. Finally, the phoneme frequency distribution of a corpus of neologisms from Buckingham and Kertesz (1976) also shows a preference for /r/ and /s/.

The preference for [m] and [b], however, has no explanation in terms of occurrence in normal language. For, /m/ ranks seventh in German and eighth in English and /b/ ranks

fourteenth in German and fifteenth in English. Perhaps the greater than expected frequencies of these labial consonants is interpretable with reference to Jakobson's implicational hierarchy of phonemic structure (Jakobson, 1939). This hierarchy constitutes Jakobson's theory of a universal phonemic system. Jakobson observed that a child's earliest meaningful utterance consists in a labial stop consonant followed by a vowel and that the opposition between labials and dentals becomes stable in the child's phonology before other oppositions. He noted also that with respect to the phonemic inventories of the languages of the world, the opposition between labial and dental stops is rarely lacking while other place oppositions are optional. The universality of the labial-dental opposition qualifies this distinction as linguistically fundamental. The priority of labials in the acquisition of speech may be seen to establish that class as a foundation for later phonological development. Thus the predominance of labials in KS may reflect their fundamental role in language.

While this may be a plausible interpretation of the high frequency of labials in the jargon, relative to the proportion of labials in normal speech, it cannot explain the presence of [r] and [s], which do not have the high priority of labial stops in the implicational hierarchy. Still, although one might prefer to find a single explanation for why jargon is what it is, it may in fact be the case that some form of the 'nature-nuture' question is as

relevant to the study of aphasic jargon as it is to the study of language development. Thus one observes in the jargon a preference for a class of sounds which provides a foundation for phonological development and for phonemic systems of the languages of the world, and for which the articulators happen to be the most visible and manipulable. In this regard the jargon may be reflecting the salience of labials in perception and production.

Although clearly frequency alone cannot explain the high proportions of [r] and [s] in the jargon, frequent exposure to these sounds in the environment may have some influence on the content of the jargon. In sum, the quality of the jargon may be a product of both linguistic (and perhaps biological) priority (nature) and experience or environmental cultivation (nurture).

Child Language and Jargon

The question of a relationship between the child who is acquiring the sounds of his language and the aphasic with a deterioration of the phonological aspect of his language was raised by Jakobson (1939) and Goldstein (1948) who referred to a phenomenon of phonemic "regression" in aphasia. Jakobson formalized this speculation in a hypothesis which predicted that the likelihood of preservation of phonemic categories in the dissolution of language observed in aphasic speech would mirror a universal order of acquisition of phonemic categories by children learning language, that universal order is characterized by an implicational

hierarchy in which the development of certain sounds presupposes the prior development of others. The universal order of acquisition, as defined by those implicational laws, forms part of the basis of Markedness Theory, which provides for a notion of naturalness in generative phonology.

Wepman and Jones (1964) support a notion of regression in aphasia, in which each stage of language, from speechlessness to grammatical speech, is "mirrored" in aphasia, although within each stage, the order of acquisition of elements is not. They view the implications of such a regression hypothesis as follows:

> "Aphasia as a regression to an earlier stage of linguistic development would be predicted on the concept that the cortical insult reduced the invididual to a level of language ability consonant with his decreased cortical function. Further, as compensatory mechanisms become available or as the patient experiences recovery of language functions, he would be expected to progress upward through the hierarchy of language skills. In contrast, for an individual with an active progressive cortical lesion, the functional capacity of the system would be reduced stage by stage downward through the hierarchy of language processes. Since language is so often viewed as a mirror of cognitive behavior, another corollary to the regression hypothesis would be that the general level of cognitive behavior would reflect to some extent the language level to which the individual had receded, and again, as he improved in language so too should his over-all behavior become more mature" (p. 197).

Still it is not clear from their discussion which stage they would presume to be mirrored by a jargonaphasia as seen in KS. For they describe a stage at which "a child speaks in jargon while developing an increasing ability to utilize his previously learned phonemic alphabet..." but

point out that "by the time his phonemic roster is more complete...his speech no longer has the meaningless character that it previously had" (p. 198).

Wepman and Jones state that they see no evidence for the universality of a specifically phonemic regression. In particular, they question the viability of the notion phonemic regression in aphasia on the basis of a case of severe phonemic jargon where, in their view, phonemic regression would have been expected, but where "the phonemic roster is quite complete" (p. 198).

A strict interpretation of Jakobson's regression hypothesis, however, requires that the acquisition of phonology be regarded as the acquisition of phonemic categories. For a child to have "acquired" a phonemic category is for him to manifest systematic behavior with respect to the use of the distinctive features defining that category. Thus, the order of preservation of phoneme categories in aphasia predicted by Jakobson, must be based on the systematic use of phonemic contrast by the child, and not simply the appearance of a phoneme in the child's inventory. Accordingly, the predictions of the "regression hypothesis" apply to aphasic speech in which there are identifiable target words and where the systematicity of the substitutions can be evaluated. Since there are no identifiable targest in KS's jargon, strictly speaking it does not provide a testing ground for the "regression hypothesis." Nevertheless, it is of interest whether KS is more likely

to produce phonemes from less marked categories, which tend to appear early in the acquisition of language.

A preponderance of stop consonants as opposed to fricatives and nasals is predicted as a consequence of the fundamental contrast between stop consonants and vowels in Jakobson's implicational hierarchy. However, the distribution of consonants in KS's jargon fails to satisfy this prediction. KS's jargon tends to reflect just the opposite behavior, consisting of a higher proportion of fricatives than nasals than stops. Indeed, the fricative /s/ and the liquid /r/ are most common in his jargon yet they are most often found to remain unstable throughout language development (Leopold, 1953; Ingram, 1976).

The jargon does conform to the predictions of the regression hypothesis in several other respects: front articulated consonants (ANTERIOR and CORONAL in the Chomsky-Hall distinctive feature system), are more common than back consonants; the most common fricative in the jargon, /s/, has the lowest markedness value for fricatives; the most common vowel phoneme in the jargon is the unmarked /a/. The other vowel commonly observed in the jargon /i/, also has a low markedness value. These two vowels together with /u/ constitute an optimal minimal vowel system (Chomsky and Halle, 1968). Note that the /u/, which is a high, back vowel is rather uncommon in the jargon. But since Chomsky and Halle make no judgement as to whether back or non-back

is less marked for non-low vowels, one might interpret this to indicate a functional equivalence between the front and back high vowels, /i/ and /u/. Thus /u/ can be regarded as superfluous in the presence of /i/ in the jargon.

With respect to markedness values for phonemes in particular positions within a sequence, the high frequency of /b/ in initial position in the jargon is compatible with the suggestion of Chen (1973) that labials are unmarked in syllable-initial position.

Thus, while the phonemic regression hypothesis, broadly interpreted, does not predict the content of KS's jargon, from the point of view of markedness theory, the jargon reflects a natural, that is, phonetically plausible, sound inventory. Indeed, the phones which predominate in KS's spontaneous jargon provide an optimal minimum phonemic inventory.[7] With the exception of the class of glides, the jargon includes consonants representing each manner of articulation. Stop consonants are represented by /b/, fricatives by /s/, nasals by /m/ and liquids by /r/. With respect to place of articulation, /b/ and /m/ represent labials, while /r/ and /s/ are dental or alveolar. Only the back region of the oral cavity does not appear to be well-represented in the jargon. However, if we shift our perspective from articulatory to acoustic parameters, the gap

[7] Strictly speaking, since KS's jargon conveys no meaning, it has no phonemic content, and one cannot speak of phonemes. However, in order to provide a framework for analyzing the jargon, phonemic values have been assigned to sounds in the jargon on the basis of standard English and German phonemics.

in this inventory of sounds disappears. For, since labials and velars are acoustically similar, i.e., grave and compact (Jakobson, Fant and Halle, 1952), the absence of velars may be interpreted as a minimization of redundancy within the inventory.

The principle of maximal phonemic contrast is central to Jakobson's theory of language development and dissolution (1939, p. 14). It is therefore of interest that where a more highly marked segment appears in place of a less marked segment, that more highly marked segment provides for greater phonemic contrast within the inventory. Thus, the optimal contrast achieved between a voiced labial stop /b/ and a voiceless dental fricative /s/ explains the lower relative frequency of the expected less marked labial /p/. For note that /b/ and /s/ differ on every parameter, voicing, place of articulation and manner of articulation, whereas the predicted preference for /p/ would have presented less of a contrast. The high frequency of dental/alveolars, represented by /r/ and /s/ might furthermore explain the lower frequency of the expected dental nasal /n/, which would have contributed a lower markedness value than the /m/ which appears more frequently. Optimal vowel contrast is provided by KS's most common vowels, a maximally open /a/ and a maximally close /i/. This tendency toward maximum contrast among sounds, reflects the preservation of a basic principle of the organization of a phonology.

KS's tendency to maintain the same place of articulation in a consonant cluster is consistent with the pattern of behavior in consonant assimilations of children learning language. Vihman (1968) analyzed these consonant assimilations and found that while in most cases assimilations involve changes in both place and manner features (39%), when only one of those features was assimilated it was more likely to be place (35%) than manner (27%).

In spite of the apparent structural similarities which have been observed between jargon production and the production of sounds in early child language, it is not obvious that the same underlying mechanism will account for both language behaviors. For, it is difficult to imagine that what constitutes a deteriorated language function in an aphasic and a developing language function in a child, are attributable to the same neurodynamic events. If indeed they are not, what can be the theoretical implications of a surface similarity which only masks an essential difference in mechanism?

Relationship of Phonemic Jargon to Other Jargons in Fluent Aphasia

The phonemic diversity of phonemic jargon stands in contrast to the restricted inventory of sounds found in the jargon stereotypies which form the residual utterances of motor or global aphasics. In such patients, whose aphasias are associated with large peri-Sylvin lesions, the jargon seems to be a vestige of fluency in the presence of an

otherwise profound motor speech impairment. These utterances usually consist in the repetition of a single CV syllable such as 'titi,' but may be observed to include a limited extent of phonemic variation due to the repetition of several CV sequences. These cases may be transitional to others where there is a still richer flow of CV strings consisting of all the phonemes of the speaker's language (Brown, personal communication). Conceivably there is a kind of expansion within the limits of the residual utterance. Such cases may be similar to the original description of undifferentiated jargon by Alajouanine et al (1952) where comprehension was said to be relatively well-preserved and there was severe oral apraxia. It is questionable whether a relation exists between the jargon stereotypies of motor and global aphasics and the form of jargon observed in the present case. Of more immediate interest is the relationship between phonemic jargon and the other fluent jargons.

One possibility is that phonemic jargon is a type of deteriorated neologistic jargon. It is generally held that neologisms conform to the phonological constraints of the speaker's language, i.e., patients rarely produce consonant clusters not found in their native language, or clusters in initial position which are restricted to final position in the native language. Alliteration and assonance are characteristic of neologistic jargon. The neologisms often incorporate standard morphemes of the language, e.g., plur-

al markers for nouns, tense markers for verbs. Moreover, since function words are usually intact in neologistic jargon, it is often possible to establish that in most cases neologisms take the place of nouns in surface structure.[8]

Certain structural relationships between phonemic jargon and neologistic jargon are apparent. Both forms of jargon respect the phonological constraints of standard language. They also share the properties of alliteration and assonance.[9,10] The most obvious difference between the two jargons is that in neologistic jargon there is a preferential disturbance of nouns, while in phonemic jargon all grammatical categories are equally affected. This difference may simply reflect the greater severity of phonemic jargon. Indeed, it is difficult to establish whether or not grammatical morphemes are preserved in phonemic jargon

[8] Browman (1978) found that the majority of speech errors in normals occur on nouns.

[9] Browman (1978) found that the rhythmic pattern of lexical items is generally recalled accurately regardless of whether segments are recalled accurately. This suggests that rhythm and rhyme play as great a role in normal language as they do in jargon. Jargon may appear to involve these parameters to a greater extent because there is no meaning to engage the listener, who, when listening to normal speech is distracted from the sound content by the more salient meaning relationships.

[10] It is of interest that semantic jargon as well is characterized by rhyming and other phonological relationships among verbal paraphasias. Kriendler, Calavuzo and Mihailescu (1971) describe a semantic jargonaphasic in whom "the criterion for selection of (verbal paraphasias and neologisms) was not the semantic one but exclusively the criterion of auditory similarity determined by the rhyme" (p.221).

in view of its entirely unintelligible quality.

An order of preference for phonemes which is distinct from the normal pattern may be characteristic of phonemic jargon. Wepman and Jones (1964) provide a brief description of a jargonaphasic with "a profusion of phonemically disorganized combinations." They noted that "although this patient uses a complete phonemic roster, his phoneme distribution appears to be considerably (and statistically) different from that of a matched normal speaker" (p. 195). The statistical treatment applied was not indicated.

Butterworth (1977) found that, as in the present case, and in a case reported by Wepman and Jones (1964), the neologisms produced by his patient did not reflect normal phoneme frequencies. Butterworth compared the frequency of occurrence of the initial phonemes in a corpus of neologisms with their frequency in forms representing other error types and in standard content words. He found that relative to standard English phoneme frequencies, the mean frequency values for phonemes in neologisms were much lower than for phonemes in other lexical categories. He concluded that the source of neologisms is not the same as the source for other errors.

LeCours and Lhermitte (1972) also found no correspondence between the phoneme distribution in neologisms of their patient and phoneme frequencies in French. The neologisms which LeCours and Lhermitte analyzed were composed of non-standard combinations of standard morphemes.

These findings are compatible with studies indicating the apparent preservation of distributional properties in aphasic speech, only when either 1) neologisms are not included in the analysis (Blumstein, 1973), or when 2) the distributional properties are determined over a heterogeneous group of aphasic patients, in which case any differences among aphasia types will have been obscured (Mihailescu, Voinescu and Fradis, 1967). (See Howes, 1964, for comparison of word frequencies in normals and aphasics.)

If neologistic and phonemic jargon are distinct from other forms of aphasic speech, that common distinction may point to a common source of error in both jargons. Evidence of a combined phonological and semantic deficit in neologistic jargon, where phonemic errors would occur on incorrectly selected lexical items, is consistent with the finding that neologistic jargon requires a large lesion of posterior T1 and T2 (Kertesz, in press), i.e., involving that region (Wernicke's area proper), lesion of which alone produces phonemic aphasia plus surrounding temporo-parietal "integration" cortex, lesion of which alone leads to semantic disorders (Brown, 1979).

On the other hand, the evidence that the semantic code is to some extent preserved in KS suggests that phonemic jargon may be a severe form of phonemic (conduction) aphasia, in which relatively good comprehension for spoken

as well as written language, and the ability to self-correct, indicate access to semantic as well as phonological information.

Phonemic (conduction) aphasia is associated with lesions of the posterior superior temporal convolution (T-1) (Brown, 1972). No cases of exclusively subcortical lesions have been reported, controverting the classical arcuate fasciculus model of this disorder. Indeed, there is a report (Brown, personal communication) of a surgical section of the arcuate fasciculus without aphasia.

There is evidence that the mild to moderate sound errors which occur in the speech of the phonemic aphasic reflect bilateral phonological processing (Brown, personal communication). A left temporal lesion produces either a phonemic or a jargonaphasia depending on the extent of right hemisphere language. A bilateral lesion of posterior T1 might obviate right hemisphere compensation and thus lead to a profound phonological deficit.

This anatomical relationship between phonemic (conduction) aphasia and phonemic jargon is also linguistically motivated. If phonemic jargon is conceived of as a failure of semantic content to achieve phonological realization, one might suggest that it reflects a phonological form which is independent of semantic information.

Thus, a unilateral left temporal lesion leads to phonemic errors in correct lexical targets, the symptom of phonemic aphasia. The limited nature of this disturbance

is explained by the persisting capacity in the intact left or in the right hemisphere. With bilateral lesions, the capacity to interpret the phonological code is severely reduced; the deficit erodes into the function words and the production of phonemes is no longer responsive to semantic-lexical intentions. The difference between unilateral and bilateral disruption at the phonological level is a difference between phonemic errors linked to lexical targets and phonemic errors independent of lexical control. This hypothesis predicts recovery of phonemic jargon into phonemic (Conduction) aphasia.

The Mechanism of Jargon Production

The traditional model of the aphasias originally proposed by Wernicke suggests that with a lesion of Wernicke's area, the regulatory function served by the sound image of words in Wernicke's area is lost. On this model, the mechanism of jargon is faulty monitoring of motor output; jargon production is attributed to the disinhibition of Broca's area by a lesion in Wernicke's area. While the model anticipates symptoms of semantic jargon when it permits the innervation of the motor speech center through associations with sensory modalities other than the auditory, i.e. tactile or visual images associated with words, it provides no explicit predictions regarding when semantic as opposed to neologistic jargon will be observed. Moreover, it does not predict the appearance of neologisms almost exclusively in grammatical slots corresponding to substantives.

In the case of phonemic jargon, where all classes of words are equally affected, a disinhibition explanation can not be ruled out. A more appealing model, however, is one proposed by Brown (1972, 1979), which addresses the psychological emergence of a language event and avoids casting language production (and disturbance) in the mechanistic terms of the classical model. Brown explains each form of jargon as a product of some distinct level of preliminary cognition in the emergence of a language event. The core concepts of the model, however, require further elucidation. For example, while the notion of "differentiation" of one level of language out of another is central to the model, Brown fails to make that notion explicit. Another central feature of the model which is not quite clear is the notion of an aphasia "displaying" an emergent level of cognition and language.

Let us adopt this view of language as an emergent event, defining a notion of differentiation in terms of the application of a system of linguistic codes which reflect the conceptual basis of a language event in order that it may be verbalized. A pre-linguistic mental event which has not been encoded semantically is one which cannot be linguistically expressed. For at the pre-linguistic level, representations are non-specific; specification of a mental event cannot be divorced from the linguistic formulation of that event.

To have intact language is to have the cognitive

capacity to use the linguistic code in the actualization of a pre-linguistic mental event as a linguistic event. The linguistic code is at least two-dimensional, consisting of a semantic aspect and a phonological aspect. In its semantic aspect, the code translates a pre-linguistic mental event into a set of specifications which can be interpreted by the phonological aspect. In its phonological aspect, the code translates those semantic specifications into a representation of a physical event. In spoken language that phonological code is an acoustic-articulatory code interpretable by the articulatory apparatus of the oral cavity. In language disturbance, that cognitive capacity is reduced in various ways. In jargonaphasia the aoustic signals may convey a meaning inappropriate to the context in which it occurs, as in semantic jargon, or they may fail to convey meaning at all, as in neologistic or phonemic jargon.

A language disturbance will consist in a disruption of the psycho-dynamic (or neurodynamic) processes normally engaged in the cognitive microgenesis of a linguistic event. The linguistic endstate represented in a jargon utterance will be thought of as a product of a disruption in this normal course of emergence of the linguistic act. Each processing level will correspond to an aspect of the linguistic code. A brain lesion will disrupt the unfolding of the cognitive event and prevent that event from differentiating appropriately into the subsequent representation.

Since a lexical memory consists of items which are linguistically encoded representations of mental events, it cannot exist independently of the linguistic formulations of those items. Therefore, the fact that KS can access and operate on lexical items suggests the preservation of at least some aspect of the capacity for linguistic formulation, that is, some aspect of the linguistic code.

It has been shown that KS's verbal formulations are generally uninterpretable in terms of the codes of any known language. Moreover, his comprehension deficit indicates an extreme difficulty on his part in interpreting the phonological code of English. KS's capacity to interpret the orthographic code, however, is apparently more intact. Since interpretation of orthography presumeably involves some form of phonological processing, one might suggest that KS finds it easier to access lexical meaning through the visual modality than through the auditory modality. In this regard, it may be important to point out that the processing time for visual stimuli is by nature longer than the time for processing fleeting auditory signals. Recall that in the longitudinal data on KS's jargon, it was found that conversational jargon appeared to become slightly more deviant from normal, while reading became less deviant. Suppose that KS's auditory capacity had diminished at Time 2 such that he could no longer recover enough information from the auditory signal to be able to access his lexical memory. In contrast, visual stimuli might still have been effective

at Time 2 in this respect, which may account for the discrepancy.

What conclusions can be drawn about language capacity in phonemic jargonaphasia? The fact that KS can distinguish between a grapheme string which corresponds to a semantically coherent lexical item and one which has no linguistic meaning as assigned by the semantic code, suggests the preservation of some capacity for linguistic formulation in the phonological aspect insofar as it is required in the interpretation of the orthographic code as well as some capacity in the semantic aspect of the linguistic code. The precise extent to which this code is available to him for the purpose of encoding mental events linguistically (in other words, whether there are semantic paraphasias underlying the phonemic distortions), is not clear.

Although phonemic jargon has been distinguished from other jargons by virtue of the fact that its constituent sequences are practically never identifiable as real words, the dynamic quality of the aphasia is evident in the occasional instances in which KS achieved normal linguistic realization, producing recognizable words. For the most part, these were rare single words. Yet, on one occasion, when I was leaving his apartment after several hours of testing, he requested, in perfectly understandable English: "Would you like..." The remainder of the request was in jargon. On another occasion, in response to several repetitions of the question "Did you go outside today?" he eventually said "I went for a..." the remainder again being jargon.

We must assume that apart from the partial preservation of automatic expressions such as "okay" and "you know", which might be accounted for by a theory which distinguishes voluntary from involuntary speech (Jackson, 1932), those intact sequences which have been observed do not result from the same mechanism which produces the deviant language, but rather reflect a residue of intact language capacity. How then are these phenomena to be explained? One possibility is that these utterances are evidence of a momentary integration of semantic representation and phonetic representation which results in appropriate language. Conversely, they may evidence momentary disinhibition (activation) of the normal processes of selection of linguistic segments. In either case, these normally realized utterances illustrate the transitory nature of aphasic symptoms. As such they offer support for a model of aphasia as a functional disturbance as opposed to a purely structural loss.

Within the framework presented above, symptoms of jargonaphasia may provide insight into the relationships among levels of representation of linguistic knowledge and particularly into the nature of the translation from a representation of meaning into a representation of sound. For, each of the forms of jargonaphasia is distinct with regard to the nature of the breakdown of the correspondence between sound and meaning. Each may thus call attention to a distinct facet of the translation process or to a distinct stage in the cognitive development of an utterance,

by indicating the level of representation which is translated into sound in that particular form of jargonaphasia.

In phonemic jargonaphasia, where sequences of sounds transmit no linguistic meaning, it is assumed that the cognitive differentiation of a representation of meaning into a representation of sound does not take place. Indeed, phonemic jargonaphasia points to the fundamental independence of phonological structure from semantic structure by revealing the phonological aspect of the linguistic act independently of the semantic aspect in which it is normally entrenched. Phonemic jargonaphasia may therefore indicate those properties of the phonological code which are fundamental to the sound structure of normal language.

Bilingualism and Phonemic Jargon

In conclusion, I would like to suggest that the rarity of the language disorder observed in KS together with the fact that KS was bilingual, offers an interesting speculation , in light of a comment by Leopold (1953) regarding the acquisition of language in a bilingual environment. Remarking on the influence which a bilingual environment may have had on the development of his child's language, he wrote:

> "The most striking effect of bilingualism was a noticeable looseness of the link between the phonetic word and its meaning...[the child] heard the same thing constantly designated by two different phonetic forms. This separation of word and meaning... favors content over form..."

Indeed, Leopold's observation is all the more striking in view of Schvachkin's (1948) suggestion that at an early stage of language acquisition in the monolingual child, the sounds of language serve to carry meaning directly, while only later does meaning become differentiated from sound as an entity independent of the sound configuration which conveys that meaning. In other words, whereas for the monolingual child the sound <u>is</u> the meaning of the word, for the bilingual child, and indeed, for the bilingual adult, the meaning of a word is less likely to be firmly associated with a particular sound configuration.

Thus, KS may have been more predisposed to the loss of the meaning-bearing function of sounds by virtue of his bilingualism insofar as bilingualism may foster an attitude toward language which puts greater emphasis on content over form. The hypothesis that phonemic jargon is more likely to be found in bilinguals may offer an interesting line of investigation.

APPENDIX 1

Relative Frequencies of Phonemes

*Key to Abbreviations

Eng N = English Norms

Ger N = German Norms

KSM1 = KS Monologue Time 1

KSD1 = KS Dialogue Time 1

KSD2 = KS Dialogue Time 2

CD = Control Dialogue

KSER1a = KS English Reading Time 1a

KSER1b = KS English Reading Time 1b

KSER2 = KS English Reading Time 2

CER = Control English Reading

KSSupER2 = KS Supplementary English Reading Time 2

KSGR1 = KS German Reading Time 1

KSGR2 = KS German Reading Time 2

CGR = Control German Reading

**Total for consonants and vowels combined

Relative Frequencies of Consonant Phonemes

	Eng N* n=66,534**	Ger N n=105,174**	KSM1 n=908	KSD1 n=1256	KSD2 n=879	CD n=983	KSER1a n=409	KSER1b n=369	KSER2 n=288	CER n=234	KS Sup ER2 n=537	KSGR1 n=641	KSGR2 n=588	CGR n=480
t	10.87	14.16	5.84	11.15	11.26	9.78	10.02	6.50	17.71	14.96	17.50	11.70	15.82	14.17
y	10.60	-	1.10	1.51	3.98	4.04	.99	1.63	.69	.43	.19	2.03	.34	.42
r	10.30	12.02	14.10	8.20	7.85	-	8.31	4.34	10.42	-	8.01	7.18	10.20	-
n	9.84	16.08	8.15	8.44	8.19	9.99	6.36	6.50	11.11	8.97	12.48	8.58	12.41	16.87
w	7.07	-	.22	1.59	2.84	4.57	.73	.54	1.74	2.99	1.67	.78	.51	.21
s	6.11	7.36	13.33	18.15	18.32	9.67	19.80	17.89	18.40	12.39	18.99	12.32	19.73	11.04
l	5.18	5.59	1.65	3.34	1.14	4.78	1.71	1.08	1.04	5.98	.19	2.03	1.02	6.67
d	4.76	6.58	3.41	4.22	5.57	8.82	8.56	10.30	9.03	11.54	6.70	7.64	8.67	7.29
h	4.11	1.80	.55	.56	1.02	3.08	1.47	.54	.35	6.84	4.28	.47	1.53	1.67
m	4.09	4.53	13.66	5.09	7.17	4.99	4.64	7.59	1.04	1.71	2.61	6.08	1.87	5.63
k	3.83	3.07	.66	1.03	1.48	5.63	1.47	1.08	-	3.85	.74	.31	1.19	4.17
ð	3.51	-	.66	.87	.57	1.17	.49	1.35	.35	1.71	.37	1.25	-	-
z	3.14	2.91	2.20	5.25	3.87	1.17	3.42	2.98	3.47	.43	3.91	12.01	5.10	1.25
v	2.94	3.34	4.07	4.70	2.84	3.51	6.11	6.50	3.82	3.42	1.86	3.90	1.70	3.12

Relative Frequencies of Consonant Phonemes

	Eng N* n=66,534**	Ger N n=105,174**	KSM1 n=908	KSD1 n=1256	KSD2 n=879	CD n=983	KSER1a n=409	KSER1b n=369	KSER2 n=288	CER n=234	KS Sup ER2 n=537	KSGR1 n=641	KSGR2 n=588	CGR n=480
f	2.66	3.91	6.50	1.91	2.96	4.89	4.64	5.69	5.55	3.42	3.91	4.99	4.08	2.50
b	2.55	2.79	13.88	10.59	11.94	3.72	6.11	5.96	9.72	1.71	3.35	3.43	5.78	2.29
p	2.52	1.64	6.50	5.49	3.30	2.97	1.22	2.44	2.08	2.14	3.16	1.87	2.89	.83
ŋ	1.44	1.09	-	.08	-	1.27	-	-	-	.85	-	-	-	.63
g	1.36	3.19	1.21	.80	1.59	2.66	-	-	1.74	.85	5.21	.62	4.76	3.46
s̬	1.12	2.76	.11	1.27	-	1.27	-	-	-	.85	-	-	.17	4.56
c̬	.72		.55	3.02	1.14	.53	.24	-	-	1.71	-	1.40	.17	.42
θ	.66		-	.32	.23	.21	.24	-	-	.85	-	.31	-	-
ʃ̬	.56		.11	.32	.11	.85	-	-	-	.43	-	.16	-	.21
z̬	.05	.02	-	.08	-	-	-	-	-	-	-	-	-	-
x		4.25	-	.08	-	-	.24	-	-	-	-	-	-	-
R			1.54	1.11	2.62	9.99	11.73	16.81	1.74	11.96	4.84	10.86	2.04	10.83
ʔ			-	.80	-	.42	1.47	.27	-	-	-	.16	-	-

Relative Frequencies of Vowel Phonemes

	Eng N* n=66,534**	Ger N n=105,174**	KSM1 n=803	KSD1 n=864	KSD2 n=617	CD n=713	KSER1a n=278	KSER1b n=266	KSER2 n=228	CER n=158	KS Sup ER2 n=377	KSGR1 n=414	KSGR2 n=413	CGR n=296
i	25.73	23.29	24.91	13.19	18.96	15.29	16.55	18.80	23.68	10.76	19.89	10.87	25.18	16.22
e	13.11	36.98	6.23	3.47	4.86	4.21	7.91	6.77	7.89	9.49	8.22	11.35	12.83	2.03
ɛ			9.09	12.49	12.64	11.50	19.78	17.67	14.03	8.22	16.71	21.98	11.62	19.26
ü		2.02	..12	.35	-	-	.36	1.13	-	.63	-	.72	.24	2.36
ɪ			4.48	7.05	6.97	13.74	14.03	13.16	5.26	10.13	3.98	13.28	4.84	11.82
ø		.89	2.24	.69	.16	2.66	.72	-	.44	-	-	.24	.24	-
æ	4.27		.37	.58	.52	2.52	-	-	-	5.06	-	-	.48	-
ə	32.73		12.83	12.37	9.89	12.76	3.96	6.77	12.28	16.45	9.81	6.28	13.32	11.49
a	12.83	20.52	19.43	19.65	21.88	11.42	18.34	21.05	23.25	6.96	21.72	16.42	18.16	19.26
u	5.28	9.83	5.98	8.67	2.43	8.55	4.68	2.63	.44	4.43	-	2.90	-	8.44
ʊ			.87	2.66	2.11	1.40	1.08	2.25	-	1.26	-	2.17	.24	-
o	4.26	6.47	6.35	6.13	11.83	4.77	4.32	3.76	8.77	6.96	13.79	6.76	7.99	4.05
ɔ	1.78		6.60	9.71	6.64	3.37	7.55	5.64	3.51	9.49	5.30	6.76	4.36	4.05
ʌ			.50	2.08	1.13	7.29	.72	.37	.44	10.13	.53	.24	.48	1.01

APPENDIX 2

Phonetic Transcriptions of Spontaneous Jargon

KS Monologue Time 1

[u ɛt vʊni æ piuvwɪvwɛnhi ɛspidə ɛtsəbafɔɹfɔɹ ɔɹlɪlik bɔts bimɛnzɪɔvəmitsʊhaɹa// aɹu aino pɔ ʌʔʌɹimɪpəɹ pɹits fɛɹ-ɛbɹisəmʊpɹi ɹɛdəmɔfipɹitsi avwɔmamibeɹ fatbamasbibɹɔsp-allə etəmezpɔmvɹemhia// bʌɹaimʊdɛvəbiastuduautəgeɹn ak-sɪdeɹvidautʃɛɹ// anɛpɛpɛpɛɹasɪpi adonɛnimimɛɔtbɪlʊz fɔ-pɹima mibi ʊ amasfə əmafɪbianəlidasbɛɹɛtsbiu// vwʊlbin ɛn ðeðeðebapfaɹbafəbiɛ demeəfəbasfəbispəɹetəɹɔfbəbia fɔ-mababispɹɪn// map maɹafəpɹanəɹi mʊabiɬøɛsənədə ɛbimivin-iviæɹspɪnifumiəobvimai ɛbidzɔmiɹʊsfɔmivwɔ bamɪɹɪbjɛspi-mes fɔaməbɹɛnibɹambos fənandi// mɪɹ as pəlemvasibenʊ ma-ɔsbəɹɛniasibimɹɛnzəs bəɹui fotəeɹofibi ameɹi veɹstiɔba-abmatəob [.....]*ɹuɹumatsəmɛəmɛəmɛəɹigoaɹɛgigapomi-paɹəpɹeni ainipimɪrus imɹɛtɔpimybibɪn fɔmai ɛspɹimɔsp-ɪnəɹe adɛpɹimɔsɪmi mɛɹibos mɛnivɹimvid idaras penəɹi ɛnfəɹi vispəɹiasəja ɔɹɪmɹɛsa bɛni amasibɛnmøv aməbɹis-unʌ no// kabidɹoseə ɛdɹinɔʃtɪstɹavats majubɹaspon// aimɔs tuɹiðɪstəɹadɪs djuju pɛmɹasbɛni japaispi (laughs) ebjɛɹsəbɪlibo apɹomas bəwima fiətsimoɹovgauzvɛɹsə lɛf-əbɪnɹifə emif apamɪsts ufbimɔfɹenatbrisko// nobibahɛs-jɛɹis mumɪs fɔɹupi biɛsmɪsge nopøsekɔntɛstajəbɹisbemø-pɹadvɛzə bɹomi [.....] madɹomo enenedebɛɹiɹi aɹo-bʊlzmifɔɹamaizəs mi ins [.....] baitabaibabjɔpɔndz-eədzeəbisbitat mastəɹobəɹizən nailə zofəmfəvəɹəstəɹən tɔimɔsbamɔvɪbɔmʊɔɹaspɔm// mabivɹisbiebmbɪs fɔfəmigobau-sbeəmas əmi bøɹimaspoəmibɹaspɹoninajənøfɹidɛsviginiɛsbə-ɹiniæs bəɹaðəɹɔ ɹobɛʁausmɛʁhebomiʁsafɛʁzibjɛtsmalju bɛɹmusbemaɹbɹuzdɪnbɹɪstʃ anɛfəfɔetsɪbɹizøf øf fɛʁtifɹɔm aitimuvəvɪʁs afənbɹidz mai mai mai ɔfɛd famɔsi bɹami ibəbetøŋ ebɹɛsbɔmøviasɪbɹɔmøsən miemɹʊs// tuðəbeʁzən ovɛʁsbimøsbenəɹofəbatsio opɹøməspɹu bat høɹbamisbɹans [.....] jubis deəfiɹɔpf maɹemjɛspəvø fɛʁbɹu nopits no [laughs] geəsɛndigamsiɔ apaɹa aɹɛvamøts bɔpəɹu bøfə-

ɹɪflə atɛsobəɹaspanɪjo dofɛɹə̃ baɹe mɪstɪ astʃulɪ naɪts// abɹansigoɹadɪ [.....] ɪmb apfəbetʃə ɪzɪbantʃəlɪbɪ en eəɹɪfɛns ɹɪbɛnsfomatbəɹɪ obəɹɔpabɪ ʒɪvəmatsəpɔvɹɔts [.....] jubaɪzmɪfɪbɹɪsmɪamofaɪ famɪøstuma apvɪbɔsə-ɹupɪnaso napmɪ noma [laughs] stɪkvo vwo obumastɪuɹɛbmɪ ɛəmuzflə]

*this indicates interruption by a second speaker

KS Dialogue Time 1

Therapist: May

KS: [ɛt man dʲa]

T: May, it's May 2nd, May 2nd

KS: [...adɪbe da ðadz ʲas]

T: nineteen seventy

KS: [...bɯɛts...]

T: seventy-seven. How are you Mr. S—? How are you?

KS: [lijə bɯo vwaʲɛ]

T: hm?

KS: [lɛvɪ vi faviə fawzɪs...]

T: Fine? You're fine? Are you fine? How are you feeling? Fine? Are you feeling fine? Mr. S— are you...

KS: [ʲa ija ijə]

T: Yes?

KS: [dedefotatəsists]

T: How was the weekend?

KS: [o sɛm nəɯists]

T: The same?

KS: [nɔnɛmabɪs nɔnɔnema [inaudible] nɔ// ad ɛɹɛbɪdɔ ɔtʃɛn daɹ aɹemɪz nɔdɔz]

T: You were writing?

KS: [ja]

T: and reading?

KS: [no ðɹi na nɹiɛvovomdʒivudʒɔmviðɔʃ// wɔɹiðu faɹɛpaɹɹiz fʌɹə tuɹə// nabɪsabibɔsɔbɹasəbwɔvə vɛɹvistəbɹusts]

T: Writing in the books. Good.

KS: [m hm]

T: Good. OK. Today we're just gonna do some simple words. I'm gonna show you the same ones again. Pencil, jacket, belt and check book.

KS: (grunting sounds as if his mind had wandered)

T: Mr. S—

KS: [balzɛ balze bʊlzɛn svɛʃtʃ]

T: Mr. S— point to the pencil, pencil.

KS: [vɛstə bɹiz mɔs tosts]

T: Point to the pencil.

KS: [bloblɛstsəbɹovɪts tsuɹblɪsts]

T: Right, um hm. Point to the belt. Mr. S—

KS: [bvɛ fas]

T: Mr. S— point to the belt

KS: [əbɛlɪzvwɛɪnsʋats]

T: Point to the suit jacket.

KS: [ʃutʃ]

T: Good

KS: [ja]

T: Suit

KS: [ja]

T: Point to the check book.

KS: [ʃɛtʃuləbuləbultubɹɛps]

T: Good. You're hearing better.

KS: [daə peʌpɹʊs]

T: Are you hearing me <u>better</u>?

KS: [ja baɹɛɹibus ...]

T: You're hearing it better. OK. Where's the pencil again, <u>pencil</u>.

KS: [atɪpɹɔs pɹinfwis]

T: Show me where is the check book (writing)

KS: [dɔmə tʃvumʃvɪts]

T: Show me

KS: [nɔ]

T: Show me where the check book is.

KS: [nɔbɔbɪtʃ]

T: What?

KS: [no]

T: Why?

KS: [ɹuvɹə gemə bitsutsus]

T: um hm

KS: [anubɹubɹɛtubɹɔsubɹɪstsudzaists]

T: You don't have a check book?

KS: [noɹɛnpəvɹɛm bɹivjɛtats]

T: Oh

KS: [noda? no a?a? dɛdzɛnɛbɛsvɔs// ɛndvɔɹabivɔɹabasbɹə// ɔlfəmisɪbasɪbisəbusts]

T: Here, match this.

KS: [nablsts abʊsts]

T: Match it

KS: [o mɛsmɪdzɔz ambɪzɛbɹasdzɛz [sing-song quality] bɪdʒɛsp ɔtʃɛsbvɛnsbɛdzasbeaɹɛsts// øɪnzos tʃatʃatʃɔtʃɪts sɪd ok tazekatsnɔts]

T: suit jacket

KS: [savɪk ɛta stɔtjɔʃtʃ vɪfʃtʃ]

T: suit jacket

KS: [øtʃətɛms atʃamtʃɪtɔdɪdz ɹɔfts]

T: Do you have a suit jacket?

KS: [θaɪsvɔts]

T: Hm. Do you have one?

KS: [ja wajɪʔɪʔɪnəkɔkləvɛnɪtspɪts vʊtsdwɪʃ// vyɹebusvɛt-bʊlsbɛsts]

T: check book

KS: [nɔ]

T: Check book. You don't have one?

KS: [nɔ]

T: OK, alright. Mr. S– I'm gonna say "two" and I want you to point to "two" alright?

KS: [əvwats]

T: Point to "two" OK? Listen and point to "two

KS: [bodotɹotɛnɛtʃɛnɛtʃɹotjuɪnst]

T: Point to the suit jacket and the pencil

KS: [ətsbɹɔnə əf hafdzʌns ʌtsdʌsəs]

T: First point to the suit jacket and then to the pencil. Where is the suit jacket?

KS: [səgasəbɪs]

T: Then the pencil

KS: [dɛtsəpɔləpɛzbʊs]

T: OK, I'm gonna point to, I want, I'm gonna say "two" and then you point. OK? Point to the belt.

KS: [æləpəlups]

T: "Two." Listen for the "two."

KS: [aməmɪdzʊɪs]

T: Yeah.

KS: [unintelligible]

T: I didn't say anything (KS continues talking) Listen, listen.

KS: [naw]

T: Point to the suit and the check book.

KS: [ʌbɹotʃatʃʊs]

T: Point to them

KS: [nosjɛts]

T: Why?

KS: [ʌbɹutəbɹɔktəɹa bɹutəbɹɛstsutvɛstʃ]

T: OK. Point to the belt and the pencil.

KS: [ðəfulba uŋklasebɹazunzɛtsats]

T: First point to the belt.

KS: [ɛətmadzvans]

T: and then the pencil

KS: [ɛtɹetsɛpts]

T: OK. Point to the check book and the pencil

KS: [ðæmətʃizətʃuʁəbɔʁɪʃtʃ]

T: and the pencil.

KS: [atsɪtsɪpɔʊztsɛms]

T: um hm. OK that's good.

[interruption]

KS: [...bumbobɔ mastəbɔzbɛs]

T: newspaper

KS: [astənyɪpatyɪpuʁpasists]

T: Do you read the newspaper?

KS: [noɻo]

T: Why not?

KS: [a a anaəlɛtəbizʊv duədəhe vwinəvwinəvwinə obaðəheɻo lobaɻəvatsəbɻuvɻɪʃt ənmɛɻɪ// aətpaðɛtə mɪgnɪʃ pandɔ-mi// migbɪspəpɻøzəbimitato nwʌvo]

T: Can you read...

KS: [nɛvəbɛsn̩ opɛʁɛpəbol??? e bɛ*renibusjə abɻɪs// atevønsʌs]

T: You don't want to read it?

KS: [nɪməɻɪmə]

T: You don't like what's happening

KS: [nomɔɻ*// naðivn* bʌt umɻiɻpubɔstsəbɻimʊθ iz nʊf wa [inaudible] ɪɪɪsɪbozdas]

T: OK. Mr. S—. Here's a wallet.

KS: [kaz]

T: You keep your money in your wallet

KS: [vəɹɪzmutasbus]

T: Wallet. Look, look.

KS: [adəwɪmətəbɹɛsbuzɛp]

T: Mr. S—, wallet.

KS: [...bɪzmɔnətsaɪəsfiʃtʃ]

T: Wallet

KS: [wewitʃɔstsəs]

T: Wallet

KS: [oɹ impɔɹ izpɹomitbɪʃtʃ]

T: Do you have a wallet. No you don't have a wallet.

KS: [o jaja alitəlvaz* jɛəs]

T: A little one. You have a little one.

KS: [nonoɹabɹon tʃɔstbɹonhabɹɪzɪðɪz stʌf]

T: OK. Here's a raincoat.

KS: [wində pɔlʒis tʃɛnsplusins]

T: Do you have a raincoat?

KS: [ʔθoma// nono θamaɪndaɹababusəbɹuzədɛsts//]

T: You don't have a raincoat?

KS: [nemagasts]

T: You don't want... you have an umbrella

KS: [vwait vwait [excited tone]]

T: You have two umbrellas (laughing). Well. Do you have these? Galoshes.

KS: [mɛvɛnɛpɹɪzpɔthapts]

T: Do you have galoshes?

KS: [...tʃøstʃinuz sɔts...]

T: Mr. S—

KS: [ʃʌz]

T: Do you have galoshes

KS: [adɹistəpovɹits]

T: Do you have galoshes?

KS: [jɛs busɛts]

T: You have galoshes?

KS: [ja m̩hm̩]

T: When do you wear them?

KS: [ɔma ɔ wɔməɹeɹepaɹus foɹemigasʃiubɹis patelebɛntswɔntʃ-istʃɛntʃəlɔs]

T: Do you wear them in the rain?

KS: [jadz vɛɹ i nʊfsɛsəvjɛt]

T: You don't wear them very much.

KS: [no bikʌz* ɛ ɛ ɛ [stumbling over sounds]...mizʌ wɛnebi audɛʁ aj baidɪ ibɹutabɔlsʊ obotamazəbiɹuda fɔbɔtsəmi-zdu// bɹɔbɔmisuʒ]

T: It stops raining

KS: [ap fɪfɪmiljə ajə e bɪs ɪna bebehɔstɪbɪmustɪtuvo bɹɔsəs]

T: It stops raining huh? OK. Where's the wallet, where's the wallet?

KS: [ja ðə bɹiz aps]

T: Where's the galoshes? g-a-l-o-sh-es.

KS: [pasɪpinabɹiʃɔʃtʃ]

T: Show me, point to the galoshes

KS: [xɛpɹɛzo ban i ɛʃtɔnʁiʃtotʃɪps]

T: Point to them

KS: [natabizsufs]

T: Point to the galoshes

KS: [natafamɪtbɛs]

T: Where's the newspaper?

KS: [napaɹɪsplɔpnɛpavuz sɛt nus]

T: Raincoat.

KS: [ɻɛmakɛdɔm sɔʁsɪns]

T: Now I'm gonna say "2" and I want you to point to "2", OK listen. The wallet and the galoshes.

KS: [ɛɛ vwɔs puɹəm vwɔs pɛnsən]

T: Good. The raincoat.

KS: [suʁsʌn]

T: Raincoat and the newspaper.

KS: [jænkuzpʌtʌ puɛztəplʌnʒpɪs]

T: Good. Very good. OK. The wallet and the raincoat, the wallet and the raincoat.

KS: [ɻadbuspuspjɛstʃjə]

T: No the wallet and the raincoat, wallet and raincoat.

KS: [ʁegnuzəbɪədzuzʊts]

T: First the wallet

KS: [ʁatsuts]

T: then the raincoat

KS: [hegɹɔs dups]

T: OK, good. Newspaper and galoshes.

KS: [tapəbɹz zɪs patɪɹubjɛʃjə]

T: Good, very good, very good. Now I'm gonna try '3'. See if you can remember '3' '3'

KS: [atɹusɔt bɹɪθ]

T: Wait, and then I'm going to say '3' OK? Wait, then I will say '3'. The wallet

KS: [batɹumats]

T: the newspaper, no wait. Wait until I finish

KS: [nizəs [inaudible]]

T: Wait. OK. I'm gonna say '3'

KS: [ɹɪstɛɹgəaspas]

T: and wallet

KS: [gɹɪdɛs]

T: Good. You're listening very well. Are you reading my lips?

KS: [ja]

T: It's easier for you when you read lips. You're very good at it.

KS: [əpadajʊlz ɹists]

T: But you can't hear the words very well can you

KS: [njapɔpɹins]

T: Can you? You can?

KS: [kvad]

T: You can't hear the words very well

KS: [pabiɹubɛstəbwelubwistupɛsups]

T: You can?

KS: [o aj mʊtəmeətspɔzpʊs fʊsmaɹɪs kamalisɔm]

T: um hm. OK. Now I'm going to say '3'

KS: [m̥]

T: Wait until I'm finished and then point to them. The galoshes, the newspaper and the raincoat. Very good, very good. OK. The wallet, the raincoat and galoshes.

KS: [naitsutadaleədʒətɔnpɔvɔtəpidzəbɔtʃ]

T: Good, very good, very good. You're doing very well.

KS Dialogue Time 2

EP: Your name is K— S—

KS: [ɟɛs]

EP: So tell me your name.

KS: [ad wad hʌŋ mabisəbo]

EP: Tell me your name, your name. No tell me, tell me your name.

KS: [ʌ ɐʁgigoskɛtɻodɛstistɛtistiɻst ɐɻkopist ɐɻstistiɻs ɐɻ-ɛsbɔgɪsbadizpəfo wɔs wɔs]

EP: No, no, no, just sit and tell me some — no sit down, sit down, sit down (taps seat) it's ok. Um (to J) should

KS: [ɻaindɯɻbaɟist beʁtist eʁtmistɪʁstɔmʁiəsdiʊsts]

EP: um hm

KS: [ɟa]

EP: um hm. What else.

KS: [somɛd nobʁɛm datistɛʁdistodɛgɟɛsɟɛs]

EP: um hm. What did you do today. Tell me what you did today.

KS: [batmɔ]

EP: Did you go outside today?

KS: [ɛʔ]

EP: Did you go outside today.

KS: [abɹufədu]

EP: You went outside.

KS: [ɹa]

EP: It's a pretty day? Did you think it was a nice day today?

KS: [ɬuðe*]

EP: Today, right.

KS: [aɪ* vɛnɬ* foɹ* a* vəlɔwzpoldʒizəzɛzɹəɬsɹɛ]

EP: Oh

KS: [ɹa]

EP: Oh. Do you take walks around the building (making a circle with hand)

KS: [ɹa fɔn ɬoham ɹɛ]

EP: Oh I see, back and forth.

KS: [aɪ dɪdajaɪbɪsɬ// aɪ bɹofɪs [inaudible]...[holds up four fingers]]

EP: Sit. No why don't you sit down.

* indicates recognizable word

KS: [inaudible]

EP: Sit. Why don't you sit down, sit.

KS: [inaudible]

EP: What's the matter are you worried about the time?

KS: [dɔzənmæɹə*mizʊm]

EP: Doesn't matter. Ok, ok. What time do you eat dinner usually?

KS: [o ʌvəɹɛnzəðidədidədistʃ vɛnivɛhomʌbijɛstɛs// ɹɛ]

EP: Maybe we will

KS: [kɛmɪbajɪʌsəs]

EP: Yeah

KS: [oke]

EP: OK

KS: [abɹustfiap e ɪnusʁais[inaudible]]

EP: Yes, both of us.

KS: [ɹa bo*]

EP: Um hm. We'll have dinner with you.

KS: [ɹa]

EP: OK good. Do you want to read. Do you want to read. (to J) Should we read some things or I'm gonna ask you to read some things. OK?

KS: [ɹumɪdnadɪs vwaɬ]

[ks reads ɬext]

EP: OK. What's the matter?

KS: [numa aɪ bɛd hɪə]

EP: Oh you want to eat now. Can we wait a little while.

KS: [əm fɔm]

EP: Can we wait a little while. In a little while

KS: [naw naw naw]

EP: Now?

KS: [əbɪbɪbɛpfɪlðɛdəɹdɛstəvɪfə abɹuz fɔɬ mɛnɪg aɪbobaɪsɪsə]

EP: Can you sit down just for a second. Sit down for a minute. Can you sit. Five minutes. A little while.

KS: [ɹa ɹa ɹa ɹa ɹa]

EP: OK?

KS: [ɹa]

EP: OK. Can you tell me what this word is? What is this word?

KS: [gopnajʊz jɛ ðis bopɛtanist fɛstɛnθos]

EP: OK can we try another one or? Can you read this one. Follow along with your finger like this.

[ks reads text]

EP: OK finished good. OK now there's going to be one more.

JB: Ask him what this was about?

EP: OK. Can you tell me what this was about?

KS: [æʔ]

EP: Can you tell me the story again.

[ks picks up page of text]

EP: Don't read it, just tell me about it. Tell me who was in the story. Who?

KS: [mə ba vəm]

EP: No just tell me. Sit, sit please. Mr.S— please sit. Sit down.

[ks goes to bookcase]

EP: What are you getting. Are you looking for a book. Are you looking for a particular book.

KS: [inaudible]

EP: OK what is this. What is this? What is this?

KS: [bɛs fa va fɹom ðɪsɛθfɹɔd bɛn// bɛsbi ɹ is biəs]

EP: Is this the same kind of story? Did you read this? Have you read this book? Have you read this?

KS: [continues reading]

EP: Why are you reading me this? Is this the same as this.

KS: [sib// abɹisɪsem vaɹahæm// nasʊbad emsamtova//[gets up]]

JB: Do you have anything else?

EP: Yes I do. Mr. S—, I'm going to ask you to do something else OK? I want you to read some words. Remember last time I was here we read some words.

KS: [apɹospas fɛʁmamis pɹɹod vanimiswibɹub// obaigos pɔt kɛm-ɹɛʔ benimiəsəpəbəw// o amaɹizibɹɔsəsi ɹuno*]

JB: the eyes

KS: [nɔ naw ɹaidɹɛmɪziz]

EP: Why don't you sit here and show me. Show me. Sit here and show me. What's the problem. Is there a problem with your eyes.

KS: [nɔ nɔ nɔ naɹbəɹimɛngɹozdiz]

EP: Good.

KS: [no no]

EP: Try, go ahead.

KS: [aib aibɹoste fo eʁb pɹʊmə ɛst nobɹiz kɔm ɹizdis tʃɛʁ// dos dis tʃis ɹuno*]

EP: uh hum

KS: [epɹɛsbɹos baim eəs mɛni bwiʁ ist wistʃɪs// aibɹɔz vɔs]

EP: OK, I, can we go to these now.

KS: [ɹa]

EP: Yes. What was it about?

KS: [ɹa fɔl gɹoma// ɛt a fɔɹb ist bɹod ist pɛɹd ies diest]

EP: umhm

KS: [gɹop ɹane bof// ɹo bo pat// bid eɹs bes vies]

[ks reads text]

EP: Good. What was this about.

KS: [kɔt ɔt vɔt mɔz mɪzmɛzivi [pointing to neck]]

EP: Tell me what this was about. What was this about.

KS: [ɹɛ no bat a vat]

EP: What did he write about.

KS: [ai ino bɛs ɛs ɛ [begins to read text again]]

EP: Tell me just tell me in your own words. Tel me. What is this about.

KS: [ʌm no no not nɔt həbɪlə ɛs pad bɪs [points to his temple or eye] obɹabɛsɛ bjɛbɹofɛɹmaws eɪs ɔn bot bɪstan estə baɹ iə [gets book from bookshelf and reads] si ɛf ai sɛn os// si ib abɹofa amtbasɛbɹosɪbimz ɹɛ [reads] ol vais best inbus gɹos ginz fot ain ist god ɛn iɹ// os vai// o eɹb ai bot ɛn ist]

EP: Is this the same?

KS: [hʌ]

EP: Do you want to read the words? I'll show you a card and you'll read the word.

KS: [ɹa]

EP: OK. What is this word?

KS: [gɹaidz ɔd ɪɣsts ai pɹobaistʃ]

EP: OK. How 'bout this one. What is this word.

KS: [χŋ kauz dist// aiz gɹozd ɪst θas tsaɹomizdɹɛsdɹɪs bis]

EP: Is that English.

KS: [ɔ gɹainz dɛs tan iəst]

EP: Is that English.

KS: [hm]

EP: Is that English?

KS: [no no tam a bainɪstɛtɹɛs]

EP: Deutsch?

KS: [a baiməis baivwa// obɹ if kɔməbabəiwistʃʊɣbiʒi]

EP: Is this German?

KS: [ɹa]

EP: German

KS: [ɹa]

EP: Is this English?

KS: [beʊd iʁsk]
EP: Is this English?
KS: [bap an ɪst]
EP: Is this German?
KS: [beɹn beɹn isɹə dɛʁ misa]
EP: Is this German?
KS: [abɹainpaist isøɪt isəstʃamiskosdiʁ nobɹomɹistɔbɔ bɛnəni bɹɛst]

EP: Haben Sie Angst?

KS: [bat ɹas bɹæsʊ//[outlining letters of word with fingers] ɛm sef kɪm ɹɛm]

EP: um hum

KS: [ʌm]
EP: OK. How'bout this one, can you read this.
KS: [o bɹai dzʌd ɪsts ɪs ad ɛs panə ɪz tsɔzɔ]

EP: Is this a word?

KS: [o fə? nɔzətəmes baizə mazəbis no tɛnɹɪs nɹʊz]

EP: No you can't tell what it is.

KS: [aɹ bips no a na vwɔts]

EP: You don't know what it is. Is this English? Is this German?

KS: [aɪf əmtetʃʌsjʊs aɪ no wʌ hɪsɪs wʌɹəmɛn]

EP: No you don't know what it is. OK, let's go to another one. Can you read this word?

KS: [gɹed awt enz dzɔlɪs bɛnɪzmɪ· belibaillizbisbisvɪədə]

EP: What is, what is

KS: [ko vait est hɛʁn ɪstʃɪətstʃjɪəts]

EP: Can you show me what this would look, how bit is this. This thing (pointing to word on card). How big is that? Is it big like this.

KS: [ɔpɹaim]

EP: (to JB) It's a snail. How big is it, how big. Big like this or is it little like this? Little?

KS: [mumbles,then gets up]

EP: No sit down, sit down. OK, is this English?

KS: [nɹau]

EP: OK. What's this?

KS: [aut ot ɪsts// set ɔn ɪst]

EP: What language is this?

KS: [o bɹabɹɪspɪstsəm]

EP: Is this English?

KS: [ja tsʊamɛnjɪs pad ɪst pɔd ɪɹɪs vi.ɹts]

EP: It's English? English?

KS: [no]

JB: Ask him what the letters are.

EP: What is this litter. This, what is this letter. No, no just this first.

KS: [ap ai bis ɛs tʃɛʁm ɪs bis iəʁsts bɹot bat bis pot ɛn ies diəsts]

EP: What is this letter?

KS: [ɔ]

EP: Letter, what letter is this? 'T' 'T' 'T'

KS: [vɪts]

EP: Is this a 'T'

KS: [paitʊu]

EP: 'T'?

KS: [no]

EP: 'T'

KS: [jɛs]

APPENDIX 3

Single Word Reading Tasks

Appendix 3a

Reading Task 1: Order of Presentation of Target Words, Numbers and Letters

1.	start	24.	ask	47.	deer
2.	serve	25.	sense	48.	ball
3.	slab	26.	guard	49.	lake
4.	lark	27.	dart	50.	catch
5.	skirt	28.	whisper	51.	jab
6.	tower	29.	pluck	52.	gin
7.	dip	30.	bank	53.	shirt
8.	bag	31.	crab	54.	miss
9.	melt	32.	fence	55.	zip
10.	try	33.	nerve	56.	bathe
11.	flea	34.	card	57.	gather
12.	blow	35.	snail	58.	thank
13.	arm	36.	drum	59.	give
14.	belt	37.	truck	60.	laugh
15.	glue	38.	farm	61.	avoid
16.	throw	39.	lamp	62.	suffer
17.	survey	40.	buck	63.	feed
18.	fry	41.	cry	64.	zeal
19.	task	42.	sew	65.	lathe
20.	cow	43.	wake	66.	thing
21.	frenzy	44.	hear	67.	graph
22.	snake	45.	fall	68.	fate
23.	sulfer	46.	live	69.	sing

70. beg
71. linger
72. go
73. kiss
74. heed
75. week
76. hate
77. do
78. take
79. come
80. make
81. buy
82. pick
83. leg
84. back
85. finger
86. pickel
87. car
88. bed
89. cat
90. nail
91. gum
92. cab
93. man
94. pie
95. weak
96. observe
97. embark
98. rag
99. flee
100. convey
101. jersey
102. whimper
103. cart
104. camp
105. latch
106. chin
107. sip
108. void
109. seal
110. lather
111. need
112. pan
113. tail
114. cap

115. 2
116. 7
117. 4
118. 9
119. 5
120. 8
121. 3

122. 1
123. 6

124. M
125. S
126. U
127. H
128. W
129. F
130. P
131. Z
132. A
133. C
134. E
135. J
136. R
137. N
138. K
139. Q
140. Y
141. X
142. T
143. L
144. B
145. O
146. D
147. I
148. G
149. V

Appendix 3b

Reading Task 1: Single Words, Numbers and Letters

Target Items and Corresponding Jargon Responses

Item # by Ord. of Presntn.	Target	Ref. No.*	Phonetic Transcription of Jargon Response
13	arm	38	[o ɹaigiɹniɹts]
24	ask	19	[axbɹajɪsdzjəʃtʃ]
61	avoid	108	[obɹɛzɛnzdzɛɹist sogɹanestainɪɹs]
84	back	8	[obainesθiɹs ogɹanesdiɹs]
8	bag	84, 98	[vɔʔfɪns vɔd zijés]
48	ball	45	[hobɹausesbəsɔsbəsdiəs obɹaudzisbandzospazbɪ]
30	bank	58	[omaɹ imðadediɹsts ɑɹaitanstsɛstsiɹs]
56	bathe	65	[odaidɛsdzɛniɹsts odɹataniɹst]
88	bed	70	[otainiɹst otavlistvazdʒiʃ]
70	beg	83	[egɹaniɹsksotabɹamiɹz]
14	belt	9	[dejɪtait itsk samasjɛ]
12	blow	72	[ɹɑɹaid iɹs]
40	brick	82	[élæbotaindɛsdiɹs ogəɹaɹdensdasdiɹs]
81	buy	94	[obɹainizbɛts baspøbisbis]
92	cab	3.51,89,114	[ofbainiɹs fɔtabizbɔdɛɹz]
104	camp	39	[obɹanisbaniɹsotangɹenstɛljiɹssɔmiɹ]
87	can	93	[apfainiɹst sotainiɹst sotanijəsts]

*Reference number of related items refers to item number in list by order or presentation given in appendix 1a

114	cap	89,92	[ʇsopainəmiɹzəbaizəvɛ]
34	card	26,103	[ʟopadɹʊmpfansdiɹsbasdijəzbølvi-jəiziɹvəlpa]
103	cart	1,27,34	[sobɹaniɹstsobɹaniɹsts]
89	cat	92,114	[ʟofatiniɹstsotainiɹsbɪdə iɹs]
50	catch	105	[ʟotautestsanists otaidɔspaizdɹs-ʇzospɛɹʲɪ]
106	chin	52	[ɛtainebiɹs ostanestainiɹs estan-besətsan]
79	come	91	[ʟopainesdiɹtsobɹaidɛnsbɛɹəbɛɹəs-bisbɛseɹ]
100	convey	17	[aɯabanɛsdiɹse?anbɛsbaniəs]
20	cow	6	[ʟowaugam iəzkɛɹs iɹtʃ]
31	crab	51,92	[ʟowəgɹaivbisvəsbʌsvijəs]
41	cry	18	[ʇsejɪst aits dijɪsts]
27	dart	1	[ʇapiɹðɛɹst ɪsts]
47	deer	44	[ʏdanesdiɹs ɔgɹandests]
7	dip	55,107	[sibəl aid ists]
77	do	15	[ʟodais kodiʃ]
36	drum	79,91	[ʟɹatanistɔdiɹsviɹsfɔɹaitamzɪst-iɹsts]
97	embark	4	[ʟofɹadenstsɛniəs sopanɔispanɛsb-ɛɹəiɹzeə]
45	fall	48	[ʟobɹaɯdinz ɛsdiɹsts fɔɹbɹauzɛsts]
38	farm	13	[ʟobɹainstɛspainiɹsdzɛsiɹs ovbɹau-dzainzdzijəsts vosasdinsdasdɛɹs]
68	fate	76	[ʟodɹaineistainiɹs sɔtatɔnaidiɹ-ɪst]
63	feed	74	[apidenijəs otaindɛskaniɹstsus iɹdə]

32	fence	25	[ɯopɛdɛnstsɛɯizsopaidzɛstsɛʁsva-dɪspiəspɪbɛsbə diəzɪ]
85	finger	71	[ovaigɛstaniəst sotaindɛnɪbiʁs]
11	flea	99	[wɔtanɛʁvɔ ɹobaitinzsviʁs tsɛʁs paspimispiʁts]
99	flee	11	[tɯubainiʁsbainaɯiz sebaunɛsdiʁs sopaniʁ ɪst]
21	frenzy	101	[obɯamis pizəsopəspanəspisdʒɛns-ɪʁsts]
18	fry	41,81,94	[fawavɯainists fotaɯijəsbɛsbists]
57	gather	110	[ofɯɔdainiʁs otanɛdiʁs totanɛd-ɪʁs ostandɛstsaɯiʁs]
52	gin	51,106	[ejɪdin ists sɛijəns]
59	give	46	[kipadinzdziɯiɯz sobɯaidɛniʁst sobɯamespandɛspɛzbijə]
15	glue	77	[fɯibɯoteəsbɛtsvɛsbɪsʊsvɛʁtsvɛ-nsviɯtsivə]
72	go	12,16,42	[ogɯɛmpf[whisper]...ists]
67	graph	60	[obɯabɛnsainiʁs odʁabɛnsbiʁists]
26	guard	34	[ogadanθazdijəθiʁsts sobɯanbɯas-ijəsus]
91	gum	79	[ɔmɛɯis fobadibaniʁs]
76	hate	68	[obajədɛsdɛɯists odɯaigɛtainiʁzt otanistɔdbiʁz]
44	hear	47	[napədɛdziʁsts..]
74	heed	111	[ogɯainijəsts otanists otaniʁs]
51	jab	31,52,92	[ɛtanijəziʁsts otʁaidɛnzists∫]
101	jersey	21	[tsɔibɛniʁzaniɛz tɛbanɛsvaniəs]

73	kiss	54	[sobɹɛnzijəsdiɹs...]
49	lake	22,43,78,80	[bɹaudɪstsɛɹiʃ otautɛstsaniɹ]
39	lamp	104	[ɹobadenɛdiɹsbɪts]
4	lark	97	[ɒ gaidiɹiz...]
105	latch	50	[sa tɹanɛsbaniɹs ɔstandɪskaniɹs sapanisvadə]
65	lathe	56	[bdɹaidesdzainijəs ɔsdɹangɛdiɹs obɹandɛs]
110	lather	57	[tsolstanɪsbanədiɹsɔstaindɪspaniɹst]
60	laugh	67	[samodɛspanədizbɛ tsopanzdɛzbɛdzdiɹdzbə tsopadzpɛspɛpɛɹəbizəzbɛ]
83	leg	70	[bɹainists ˍvbɹainisboniəsbɪtspə]
71	linger	85	[ɒ dainɛsdzɛniɹs sotaidɛstaniəs sopaikɛstsadiɛs...]
46	live	59	[bdɹaunsɛspajɪsdiɹspiɹzbɪs]
80	make	22,43,49,78	[bɑiðɛsdainəiɹs dʌn...pɪdiɹz]
93	man	87,112	[bwainiɹsfotainiɹs]
9	melt	14	[mɔdɹɪntsejəsts]
54	miss	73	[napɔtiɹzvijəs]
90	nail	113	[bɹainesdiɹs]
111	need	74	[bwgɹanustsɔgɹaniziɹs sostaniɹist]
33	nerve	2	[bɹaidansdɛsdists...]
96	observe	2	[tɔpvɔdɛnɔniɹs sofbanɛfbaniɹs]
112	pan	87,93	[bɑainiɹsgɛsbainiɹst]
82	pick	40,86	[bɹajesbanəvizfə opanezpɪzviɹzbɪdiɹ]

86	pickel	82	[seems to him the short-short-long stress pattern]
94	pie	81	[taibiɤ is tsaib ɛniɤzists]
29	pluck	137	[ɹotaitsdɛtsdɛɹ iəsdjɛtsəs obɹat-amdɪtsəsfɔɹ]
98	rag	8	[ɑɹaidiɤts seganɔs sambanəliɤse-zəm]
109	seal	64	[bi?ɛɤiɤsbajəbizbə sopazdisbɛðə-dilbe]
25	sense	32	[ɑɹabɹəmsʌnsɔɪsiʌsʊəsvɔvjə]
2	serve	17,33,96	[fo veɤzi]
42	sew	12,16,72	[e gɤaɤzdejɪsdiɤs dotandɛniɤ..]
53	shirt	5	[odɤanzdɛstain ijəztsets ɔdais-dziztaizdijəztjɛzts]
69	sing	66	[i ɛnediɤs odanediɤs]
107	sip	7,55	[sepamiɤs sopaniɤsviɤs sopain-iɤst sopɛbiɤsɛ]
5	skirt	53	[wʌzɪs fɔθɛnɹainzists ɔdɹedzvists]
3	slab	92	[amjɛ fɛɹewinuf]
35	snail	90	[natɔtsdɛɤtsdijətsts opasɪspɹɔs]
22	snake	43,49,78,80	[ɑɹaiganijəstsɛɤtsvidə ogɹaidanɛ-diɤs ogɹaidɛsts iɹəɪsts]
1	start	27	[fataɹə tsaistsitsʌstsɔʃitʃt]
62	suffer	23	[sopadɛniɤstsopanɛspaniɤsps]
23	sulfer	62	[ɑɹabanɛziɤzdzɪsəsas...]

17	survey	2,100	[o ɹaikanizdjɛzijəsts soðɛtansɛ-stsosbistʃəs]
113	tail	90	[ogainiɹstainɐuizodɹainestiɹsts ostainiɹstaniɹs]
78	take	43,49,80	[obanis topaidɛnsbɛsbiɹspɛsɪbiɹs]
19	task	24	[ob aiz dainzdis vusdɛɹsts]
58	thank	30	[oawamaidɛziɹz sopaiðɛspaniəzp-ɛspazəspiəzə]
66	thing	69	[ibanɪsvaniəs obanɪsbandists]
16	throw	12,42,72	[dɹebotain ditsøststʃ]
6	tower	20	[ɪɔbadbeziɹtsɛɹmsɪms]
37	truck	29	[ɔɹadawsdɛnsdiɹst odɹadauskaniɹs oskandʌspəsvists]
10	try	18,81,94	[klopainəmiɹzajəstsastʃam]
108	void	61	[owainiɹsostanɪstainiɹs]
43	wake	49,78,80	[obɹaðɛstsaiðiɹsts ogɹadøstsaniɹ...]
95	weak	75	[baibɛɹsts sepaniɹsp saipɛniɹəs]
75	week	95	[op opɹai obɹaigesiəs ɔfainsdɛs-ban[groping]... ijəsɛsaspoisvɛf]
102	whimper	28	[ɔbɹimgɛtstaniəs sɛtanɪsbaniɹbəs]
28	whisper	102	[gɹobalð insdazdijəztsiəzviɹa obaðisvɛdzɛnɛɹists]

64	zeal	109	[obɹezbainiɹzbizeʁ obanzdɛniɹs]
55	zip	7,107	[segaʁdiɹzdiɹzts sódaitanijɪsts]
122	'1'		[tobainiɹsts]
115	'2'		[kɔpuis]
121	'3'		[obɹainiɹst sopaniɹspəs]
117	'4'		[ofɹafdzinɐɹtsitsiɹts]
119	'5'		[opainiɹsts]
123	'6'		[fopainiɹsts sopaddajɪs]
116	'7'		[waiɹts ʈsapiɹɛsts ofbɹanztsanziɹst]
120	'8'		[ʈsapiɹɛsts ofbɹanztsanziɹst]
118	'9'		[odanotainist sotɛʁniɹspʌmiɹs]
132	A		[apiniɹs]
144	B		[obitsomɪʁpofɔmiɹzbaziɹz]
133	C		[dɔɹist sɔpainiɹst]
146	D		[op govɛtsanspɛɹəijəspɛsəvjɛʁs spɪdɛʁ]
134	E		[ɔpainispaniɹst]
129	F		[gʁobajəmiəzbosbiɹsbiʁ]
148	G		[sebɛɹɛmɛɹ sogɹɛns somaʁis somɛʁ-baas kɔmɐɹazə]
127	H		[mɔɹeʌns ɛsbaniɹz]
147	I		[iʁdotsiʁbɹos fiʁbozəhɛʁzə]
135	J		[ʈsamist sobistwidz]
138	K		[gejəijəs sopainisbʌniɹs]

143	L	[æʉvif aʉzɪs bɛʁzə]
124	M	[afʉes apʉonɪʁs domats]
137	N	[tsøbainiʁis sødainiʁsts]
145	O	[somaʉaɪda oʉadbimiʁdiʁs]
130	P	[ɔdainiʁsk ɔdainisbadiʁs]
139	Q	[ɔfa ɔfba [groping]..]
136	R	[sapɔniʁsps sobɛniʁs]
125	S	[sɛfælidz sepaʁanʌstists sɔpani-spadiʁs sɔpaniʁspasɔʁbɛniʁəs]
142	T	[op bedists sobʉaif]
126	U	[abists obainistiʁsts sob sobʁ-aimijəs...]
149	V	[asɔbai sbɔsbaimiəs biʁzbabizəbʁøz]
128	W	[tabeɪs bozdɪnsbʌʉəbiʉsbiʉs]
141	X	[ipɛʁɛsvøs søsɔsɔsəs]
140	Y	[amadadzpadizpɔzdaʉhigeʉzɛvə]
131	Z	[kuvəməjɛha sopaimesiʁiʁz kopaniʁst]

Appendix 3c

Target Items Used In

Word-Nonword Reading Task 2

1. bag
2. Angst
3. חגך
4. snail
5. wort
6. קלא
7. rasdin
8. tail
9. sglulk
10. Buch
11. dsin
12. bed

APPENDIX 4

Connected Prose Reading : Texts and Transcriptions* of Jargon Reading

*Please note that for reasons of clarity of representation in the transcriptions, the following equivalences obtain between phonetic symbols used in the text and graphs and those used in the transcriptions :

R= ʁ	y= ɹ
r= ɹ	ž= ʒ
š= ʃ	ǰ= dʒ
č= tʃ	ü= y

English Reading

The Hare and the Tortoise:
A hare made fun of a tortoise because it was so slow. Then the tortoise said to the hare: "I will challenge you to a race." The hare thought this was a silly idea but agreed to the competition. They started off but the hare ran so quickly that soon he was far ahead. Then he thought: "I'll take a nap until that stupid tortoise catches up with me." The tortoise crawled along very, very slowly, passed the hare who was fast asleep and had nearly reached the finishing line when the hare woke up. The hare ran as fast as he could but he didn't manage to get there first. The tortoise had won the race.

KS English Reading Time 1a*

[[1]**ɹeʁt ʔaɹɛ Ʊʔ ðeʁ tsɛtɛʁɪstsətɛɫe// [2] oɹalə waits fɔɹoɹa sɛn-
dɛʁɪtsalɹɪzy betanɪʁfɛʁɪʁi ʌdvaitsfɔʁ vwaits// [3] ðeʁ ðɛʁs tʊ-
dʁɪdɪstɔlwis dan dudɛʁ hais// awvaifs kɔbʁɛmiʁvɛdzəs tuʁ-
ɟə awaitzɛʁbɹubɹɪsɪə// de hɛɹɪxɛbɹaɟdɛɹpvisvaidvɛɹsafɛɹɪsu
ldaʁet kuʁts eɪʁan umumɪts// dutzeɪsub hɛɹbɛʔbɛʔbɫiʃɪtɪtɛɹ-
tsɛmɪmɪ ainɛ bɔlsʌnɹɪdsɪzibaiaitzvwɔtsdɪtsføts// nɪdɪɹɛɹsɔn-
iblə fɔɹs ains tiɟəbɔs fɔɹtɛm iɹɪsfoz dɛɹ ɹos hɛs bɛs bɛnɪ-
tsɛɹi// ɛdvwais kamalɛv ai rap ɪmvirfts deɹs soveʁaʁs dib-
ɛʁthabɔmɛɹvɪzəs sɛksɛʁbatsɛnɛs ɔpfs vatiʁmɛdɪsvɔzə//
[inaudible] [8]aɹɛstsɪs banɪviɹ fanzƱ̃ns sʊʁsɔʁvwiʁ// fɪʁdʔaɹɪs
pʁobmabɪstsameʁ sivɛʁobmãn emɛni Ʊnsfan ønsɪs feʁzɪn// deʁ
aʁmɬ zdets eʁ enənθ deɹaiz vwiɹvaif ɔpzimɪs dzɛʁ omɪʁdze//
oʁsvaif oʁfiʁ kɔmeʁs badeɟa ʁɛsdɛʁnis vwɔnɛbaʔfaʁais deʁ ais
vwɛʁtɛɫɛ foɫɛs dɛʁ ʁɛsɛtzeʁnɔstsizukstsats vwɔstsɪn ɹiɛmu//
ɹɔbɔs//]

*First of two readings on same day

**Numbers refer to lines of text being read, when this was determinable from watching KS's finger guide his reading.

KS English Reading Time 1b

[1 deʁ heɹa ũnt dɛʁ həɹɪtɛɹstʊdɹaitsisʊs// 2 awɔits vwaits dɛʁs of a dɛnsdɛʁajɪ steʁzəs piʁasɔlʁɪvyɪnais ɔɹvaiɹt 3 dɪʁdiʁuf dɛʁʔbainɬiɛsʊsəs ødedeɹaibɪʊɹəfjɛ// abaɪf vɹɪdɪmiɹspʊɹɪs tu dɪʁs 4 avwasɛvɛ// ðɛʁ amɛ batpiʁi stɛdvaisɛʁvwaisfyzən apɛʁ-vyvɪtɛs 5 eʁtgamibiɬis ði eʁs obadambeʁdɪstkʌməʁɪs mans ɛntɛ-nəvɛʁsofɛʁajɪsiʁs 6 fɛʁain bɛvɛʁs pfɛʁisɪpʊs dzɛʁ aivaivwɔs-des emɔsbɛzə// dzɔmdzɛʁɪnɪdzani 7 of adθeʁjɪsovwajɪts ɔmɪmɪ-fɔʁ oːdhaɪmɪtzɔnɪmɛnɪtzeʁtzatzamabiv// 8 nuʁbaisbɔbʁiz// ðɛʁ gamnɛsɛʁsf fɔmais fɹɔmasfɔɹɪbɔɹavipandɹ iməmzɪʁs 9 baɹofdɛʁ vaɪnɪʁsvɛi iʁso asbeʁji ũnz ɛs svandafabʁɛɪndzəm// 10 ðɛʁ vʊ-ʁsɔənsteʁmɔʁəspisasfɛʁai viəmɛʁtzɪpif// 11 a aibɛsɛsdɛʁ kameʁm aʁfdeʁ fɔfts ʁəmemi beʁəʁə indeʁ menjə// fiʁt 12 ðɛʁ kamdɛʁ tsinɛʁɪts tsinɛʁɪts fainɛdi vaitsdɛʁ ʁubɛʁ kamisbos//]

KS English Reading Time 2

[[1]gaɪf// owaizɔnðɛstaniəs//[2] o// ai gest vai ɔɹɛstanɛstaniɹ// estaniəst ɔt bai bevɛtis//[3] djæ dɛts bɹot hɛn iəs// fɔtɛndiəs// etvɛnbɛstistɛniəst//[4] o bɹav fʌlain egeniəst// fɛs an ɪstaniə est an ba?ɛtɛniəs//[5] do azbɛniəsts// døɪspɛniəspɛnsdajɪs//[6] a bɹof ɛ an iəzd// et iɹst// ɛstan iə// ɪf vwaz// fot an// et ɛnodiəz// fo? bateɪstiəst//[7] if gɹeb eəns// of ait iəs eəs tɛns// badɛnɛt ɛnztɛd iə// bɛdistadeəs//[8]ed awd iə iod ɹawd an iəz// odladviztadiə ebaib bat ɔkɪnbɔs tanɪstadiəv//[9]ɹopai bod iɹ baz bɔə vaist iəst ɛt ai// un iɹb ɛst iəs pɛsdai//[10]ovɹaɹb ɔm iəɹev vwat ot eɪs bɛs pan iə ob aif// [11]a aidbiɹ bɛdiəs fot biə bɛst ims fot ais pɪs baif//[12]gofait anzt is// fot maindɛsɪs//]

German Reading

Vorwort.

Seit beinahe einem Jahrhundert sind Mathematiker und Logiker mit Erfolg Bemuht, aus der Logik eine strenge Wissenschaft zu machen. Dieses Ziel ist in einem gewissen Sinn erreicht worden: man hat gelernt, in der Logistik mit Symbolen und Formeln ähnlich denen der Mathematik in strenger Weise zu operieren. Aber ein logisches Buch muss ausser den Formeln auch Zwischentext enthalten, der mit Hilfe der gewöhnlichen Wortsprache uber die Formeln spricht un ihren Zusammenhang klar macht. Dieser Zwischentext lässt oft an Klarheit und Exaktheit manches zu wünschen übrig. In den letzten Jahren nun hat sich bei den Logikern verschiedener Richtungen immer mehr die Einsicht entwickelt, dass dieser Zwischentext das Wesentliche an der Logik ist und dass as darauf ankommt, für diese Sätze über Sätze eine exakte Methode zu entwickeln. Dieses Buch will die systematische Darstellung einer solchen Methode, der "logischen Syntax", geben (nähere Erlauterungen in der Einleitung, **1,2).

KS German Reading Time 1

[faɪtf// anɛmyɛ ɪɹgadzʁoldzɛnɛtzɛtzɛ ɛns// fɔtɛʁastɔʁadjɛd-ɛʁdyɬɪjtʃɛdzɪs ʊns// fɔtsetʃ eɪtʃɔ weobʁɪsvɪdz bɪʁɔtsests ajə ɛʁ fɔts de enɔtsɛmɛmɛs// alsɛʁstøf ʁeganəlfeʁ sɔbətsɔn-əm of ai enəmʌf// bʁemaf// oɹjɛbɹomasəs// vwɛɹ widʊs wɛɹ halsvɛɹdɹa auf ɪndɛʁ ɹɪɹiðɪstsuzʊts nɛts si wiaɹt badɛʁbʊs-uo ɔns fɛʁaptsɔlməls ɔnʁɛnɪts ðain ɛts fɔɹatsamatsiʁɛpɔvɛb-ɪts in hʊəmɪtsamɪms vwain eɪts oʁɪʁɛʁs onʁɪstʃjəhi apjɛʁf// aɛts ains ɹibɪʁɪstsɪsjoɹp bʊlts vatʃ dɛʁs fɔnveɹtsɛɹvɪs aits fɔɹɪspesɹɪsamɪɹs fɔtɪmɛʁɪspɔʁzʊs θevais ɹomadeʁ deʁop vɛts fɔʁɛmɪmɪs bɔs[inaudible] mama eɪs dɛʁ fomama fɔvɛʁts ðɔl ɛʁ fɔʁɪnʁɪnzɪmɪʁmɪʁdzən ðeʁ ʁʊmʊdz// [interruption] anviʁtsaits fɛɹtsɛʁ ɛs un ɛʁtsɛs sun ðɛtsɛtsɛ dɛɹvis vai vwɔts// deʁts-ɛts vai beʁʔbɬasplan eəʁzɛs// vaj eɹ auf aletsaneʁʊns fɔɹi-stsiʁtsəs// eɹ asʌintseinsɟətuə vwɪnstɛmɪs atsbavus// in-dɛʁvatsɛnvɛsɪs øns dɛʁ as ol dɛʁ aɹeiɹɛbeɹdəs ɹowɛdkɛdɹemet-ʊjəɹdzə fosjətɛnɹənzɪnəns eɹmos vwai deʁ onʁɛtʃ otsdamɛpɛtʃ dɛʁ ainitzaitz fyʁɪtsɛnʁɪtsɛnʁɪtsəs// ɛʁvwanʁɛtsɛtsɛdz ain-dɛtsɹumɛmɛ o enðeiʁts ðf demɛɹɛs ɛmgɹomɪbɪs// dɪʁ ʁijə auf ŧʃɛtʃeja ainə ðsəʁtsani esseɹə pambjə ansulji bɛɹɪ ŧjɛɹibe-zɪs ðɛʁ ais fwoʁ ðisə fɔθenafemɪsəs fodɛtadaɹintzemɪs ɔnjə etɛnz vɛstɛʁbɹɔtɛts ɹopɛm ɛdzɹɪs fɛɹamɪz fɔɹap dʁe mɪbɪs// eʁbobɹingɛkɪnɪtzeɹjəz ɪndɛʁs// iʁdɛʁtsastsuɪz aits ŧsvɛs//]

KS German Reading Time 2

[ɪʁd ɹaɪs et anə ɪʁ ezə et an ɪʁeəz// otɛdzkɔtɪt ɔd ɪəs// fetɪɹs// eskamɪstatestɔdɪəs // af dɛɹs gɛst han ɪes// ɛgɛs ɹɛganɪəs gɹɛsɪd bat ɔd ens// bɔt han mozpasə// tɹaɪz ɔt ɛd eɪs ɪɹ aɪn gwɪʁd ez ɪəz ɪgʁɛsdanɪɹz hʌɹɪgɹʌnɪʁz// eskatosɪs ɪtanɪəs fɔt ad bevd ɪʁz ɔdɛnɪəz edanɛstɪs fɔt ɛmɪstaz// ɔts // fotɛm bɹɔtɛnɪəs egɹɛnɪəs gɹøsbɛdɛnzdɪstɹɛtbvadəɪə odbad-ɪʁezdɪʁd ʁegamɹaw// abeɹostɛɹdanɪɹeəz// ænd ebəanz eskʌod est ɪst// fɪst anɹɪ// ɪtausɪəst got aɪt ɪst ɪəs// anɪst ɪəsts// apf gʁan ʃesden oəst ɪst bot an ɪəst// fest ɪəns ɛst laun ɪst// glɛst ɹaun ɪst an ɹɪə ep gɹan est an ɪəs// ogɹɛbest han ɪəɹ// dop aɪ ɪəɹes// glɛst glɛst han ɪstan ɪəɹ// ɪf gɹaun ɪəst// efgɪɹs// gɹɪgɹamotɛnɪɹ// ɛpɪəs ɔnɪɹ mɛdɪnsdɛsɪəs// dəɹabulɪst// gobɪst fotanestanɪɹs ogɹɪst ot aɪ besthanɪɹz// ɪst poteəs ebgɹam ɪəs// fɔtɛnɪstɛdɪɹ et an ɪʁdɪʁ// egemɹɛsthanz gɹɛsthamɪə vadvɔn ɪɹ ˈvwɛmdɪəs// bɹɔtpɛn ɪspɛdɪəz bopɹænbɹɪspanɪəɹ// bɹɪspanɪspadɪəv opavɪɹ-zɪnzeəsɛnɪpaneəɹɪndɪsts// ogɹaɪb eskanɪəzd ɛst ʊnbɛzdɪɹz fɔtbaɪdɪəs ogɹeb ʌn ɪəst fotaɪnetɪəz hyztɛnɪəs// aɪbɹofɪəz ɛbɹo ɪɛst ofbɹɛmɪəs fosdɛnɪstadeəs fotaɪnja fɔɹbɹɪntɛstɪstʃ-adɪəs fotan bɛdɪəst// op aɪ edɪəs bod ens fɛs kotens pɛz-ɪsts fɛstɛnənbevəl vatanəzənɪsfɔt dɛt ɪzdzɛbɪspɪsus//]

Supplementary English Reading

Why look into language? If I do not deal with all of the answers to the question, I do not intend to challenge the legitimacy of those of which I do not take account. One can engage oneself with the elements of language and look at their ordering, how they are used in thought and in conversation. One can take language in the traditional way. I do not contend that the notions developed in normal language reveal patterns of thought. Of greater intrigue are the principles that govern language. A human language is quite complex. To come to know a human language would constitute a great intellectual feat for a creature not actually designed to have language. A normal child acquires this knowledge with little exposure and without specific training. He can then, with little effort, use an intricate structure along with guiding principles to convey his thoughts and feelings to others. For the conscious mind, not actually designed for the purpose, the goal is to understand what the child can do intuitively and with little effort. Language is then a mirror of the mind, a product of human intelligence, created anew in each individual in ways that lie beyond consciousness.

KS Supplementary English Reading Time 2

[wai o gɹist in ot i got ɛn iəs// ai eɹ is dot ɛns fet ɛns est an iɹ// a bɔt ɛn izdeəzd fot ɛn bɛzd es tot ɛns// obenɛz pfɛd iəs// fos ɛn iəst// ɔfopɛestɔd iəs// of ɛn iəɹ os an iəs// ot bai eəs// fɛt ʊɹ// ek an ɛt iəzd// ow ɛngɛst ɛns ɛt an ist// fot ɪɹs// dɛs ɛs kan ɪst han iə// ɔs ɔgɪstan iə un ɹai iəb ɛs fiɹts bɛsdinstad ɪn iɹ ei// of gɹei// vwɔs bainz iəz ɛstan iɹ ün iɹ eg ɛn stɔt ɛstad iəz// o aɹb eɪs// gɹɛst ab aun iɹz// iɹ ðɛst an ɪst hot ɛnst ad ɛn ɛɹ ɹa vwai bʌɹ iəz// ɔb iɹ naiz// op hanіə// gop vai eɪs tan iɹs gɹɛs kɔp ɛ̈s tɔm iəɹ iən o? iəz o bɹeg ist hɔm iɹ// ob ai iɹst// fot hain iəzd// ap gɹaub ist// o ai dist ho? iəz// ɛs tu gɛɐ tan iə// op iɹ// ɛf bɹɛn ɪstop ɛstadiə abɔl aif// ʌp ai ist// [interruption] majə bid ai ɔm gɹɪs an ɛs deɪs ɔɹ aid iəst ɹest han iəst dot ain bɛɹsdis// op aim gɹesk hən iəs gɹɛstun iɹz ɔf gɹɛtɛnz ɪst// ob if dɛn ais tɛɹdz ist føip// fop aib iɹb ast fotsp ain iəs gɹop ainsfɔdiɹz ɪs tan eɪs diəs ɔbɹof gɹezd hausdiəs ɹes pan iə ɪst han iəs bɹaust dɛst iəst gɹost han iə// ob ab ist// fɔt iz fɔt in est// op ai ɔb est ist fot ai gɛn ɪst han ɛst had eə oɹɛst hanɪst an iɹ o ɹaiv gɹov pan ai ob ɛv pan iɹ ob ais kɛstestɛɹ i// ov ob ɛns vov gɹɛst ham iəɹ onz bɛstɔn ai iə// dɹɛs tɔn ɛst hap iɹst// av dɛɹ skɹʌn os tan iɹs o aiz dɹe pam iəz// gɹɛst hɔn iə// vos pad a?// go wa meas// e am ɹest//

baɪd daʈ hɛʁ ɪst// af dɛst ɛn ɛstɔd ɪtab eɪs// ɔn wiɻ taɻad// ap aɪn ɪɻəɻaɪzd// agɻɛst hamɻɪ// ɔɻ ðɛs ɔɻ ɪəs gʁɛst han ɪəʁ// ef pam ɪəʁ af bɻam bɻɛst ham ɪɻsts gɻɛst ham ɪʁ est ham ɪʁ// ɔm ʊʁ ɛs ʈɪnz ʈʌd ɪəd eɪs// ob aɪ hɛb// baɪ ogɻaɪn gɻɛst han ɪst han ɪʁd aʁ e//]

APPENDIX 5

Frequencies of Occurrence of Consonant and Vowel dyads

Consonant and Vowel Dyads:

Eng Reading Time 1

1st \ 2nd	C	V	Ø	Σ
C	126	222	77	425
V	227	23	22	272
Ø	57	27	13	97
Σ	410	272	112	794

Consonant and Vowel Dyads:

Dialogue Time 1

1st \ 2nd	C	V	Ø	Σ
C	366	740	170	1276
V	699	44	91	834
Ø	182	72	16	270
Σ	1247	856	277	2380

Consonant Dyads: Place Features*

Eng Reading Time 1

1st \ 2nd	F	C	B	Σ
F	5	8	2	15
C	21	53	2	76
B	7	16	-	23
Σ	33	77	4	114

Consonant Dyads: Place Features*

Dialogue Time 1

1st \ 2nd	F	C	B	Σ
F	8	76	1	85
C	52	174	5	231
B	3	9	1	13
Σ	63	259	7	329

*excluding h,w,y; F=Front, C=Central, B=Back

Consonant Dyads: Manner Features

Eng Reading Time 1

1st \ 2nd	Stop	Fric	Liq	Nasal	Gli	Aff	Σ
Stop	1	40	7	2	2	-	52
Fric	15	8	-	-	7	-	30
Liq	12	17	-	4	2	-	35
Nasal	-	7	1	-	-	-	8
Gli	-	1	-	-	-	-	1
Aff	-	-	-	-	-	-	-
Σ	28	73	8	6	11	-	126

Consonant Dyads: Manner Features

Dialogue Time 1

1st \ 2nd	Stop	Fric	Liq	Nasal	Gli	Aff	Σ
Stop	9	88	61	3	10	-	171
Fric	71	11	4	8	12	5	111
Liq	6	8	-	-	1	1	16
Nasal	10	17	2	1	4	5	39
Gli	5	3	-	-	-	-	8
Aff	3	2	1	-	1	8	15
Σ	104	129	68	12	28	19	360

Consonant Dyads: Voice Features

Eng Reading Time 1

		2nd Voiced		Voiceless		
		Stop	Fric	Stop	Fric	Σ
1st Voiced	Stop	-	6	-	2	8
	Fric	-	2	-	-	2
Voiceless	Stop	-	6	1	24	31
	Fric	6	2	8	4	20
	Σ	6	16	9	30	61

Consonant Dyads: Voice Features

Dialogue Time 1

		2nd Voiced		Voiceless		
		Stop	Fric	Stop	Fric	Σ
1st Voiced	Stop	2	15	-	1	18
	Fric	4	2	9	2	17
Voiceless	Stop	3	-	3	70	76
	Fric	15	5	49	-	69
	Σ	24	22	61	73	180

Vowel Dyads: Place Features

Eng Reading Time 1

1st \ 2nd	Front	Central	Back	Σ
Front	1	2	-	3
Central	1	-	-	1
Back	19	-	-	19
Σ	21	2	-	23

Vowel Dyads: Place Features

Dialoque Time 1

1st \ 2nd	Front	Central	Back	Σ
Front	3	9	3	15
Central	-	-	2	2
Back	13	7	6	26
Σ	16	16	11	43

Vowel Dyads: Height Features

Eng Reading Time 1

1st \ 2nd	High	Mid	Low	Σ
High	1	3	-	4
Mid	1	-	-	1
Low	18	-	-	18
Σ	20	3	-	23

Vowel Dyads: Height Features

Dialogue Time 1

1st \ 2nd	High	Mid	Low	Σ
High	3	6	2	11
Mid	2	8	2	12
Low	15	3	2	20
Σ	20	17	6	43

Consonant/Vowel Dyads: Place Features

Eng Reading Time 1

C \ V	F	C	B	Σ
F	36	8	31	75
C	58	28	40	126
B	6	4	10	20
Σ	100	40	81	221

Consonant/Vowel Dyads: Place Features

Dialogue Time 1

C \ V	F	C	B	Σ
F	78	32	122	232
C	119	95	197	411
B	9	4	13	26
Σ	206	131	332	669

Vowel/Consonant Dyads: Place Features

Eng Reading Time 1

V \ C	F	C	B	Σ
F	17	63	28	108
C	4	32	6	42
B	19	49	12	80
Σ	40	143	47	230

Vowel/Consonant Dyads: Place Features

Dialogue Time 1

V \ C	F	C	B	Σ
F	50	153	10	213
C	64	75	3	142
B	100	223	12	335
Σ	214	451	25	690

FIGURES

Figure 1

CT Scan Demonstrating KS's Lesions

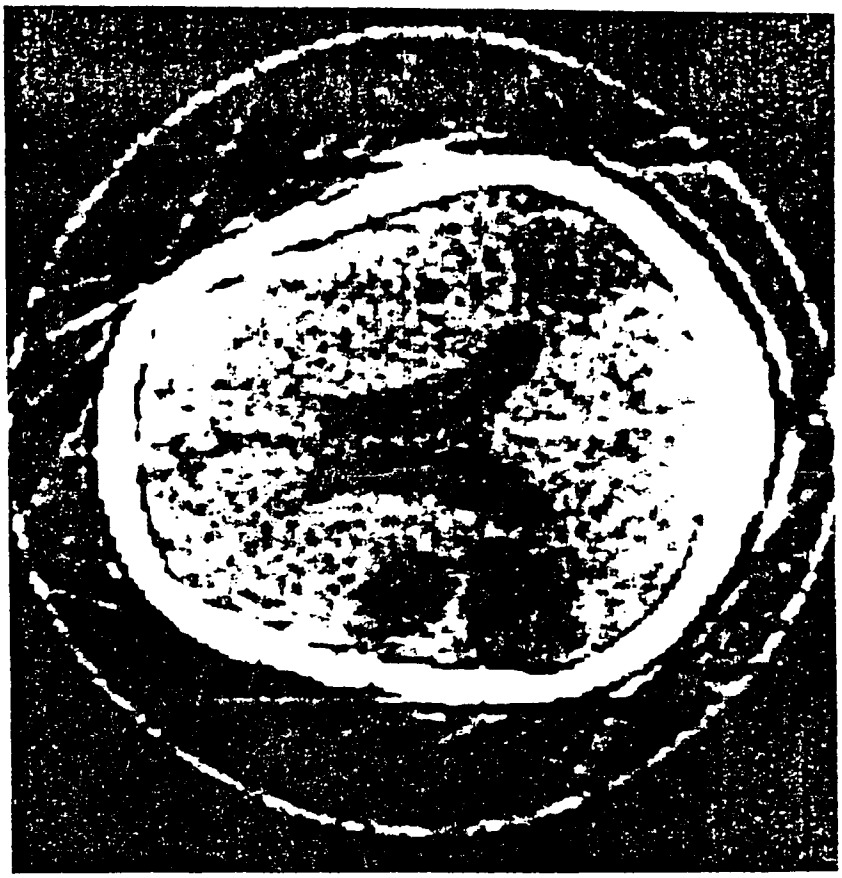


Figure 2

Comparison* of Relative Frequency Distributions of Consonants in KS Monologue 1 and Normal English

* All graphs show difference between two distributions.

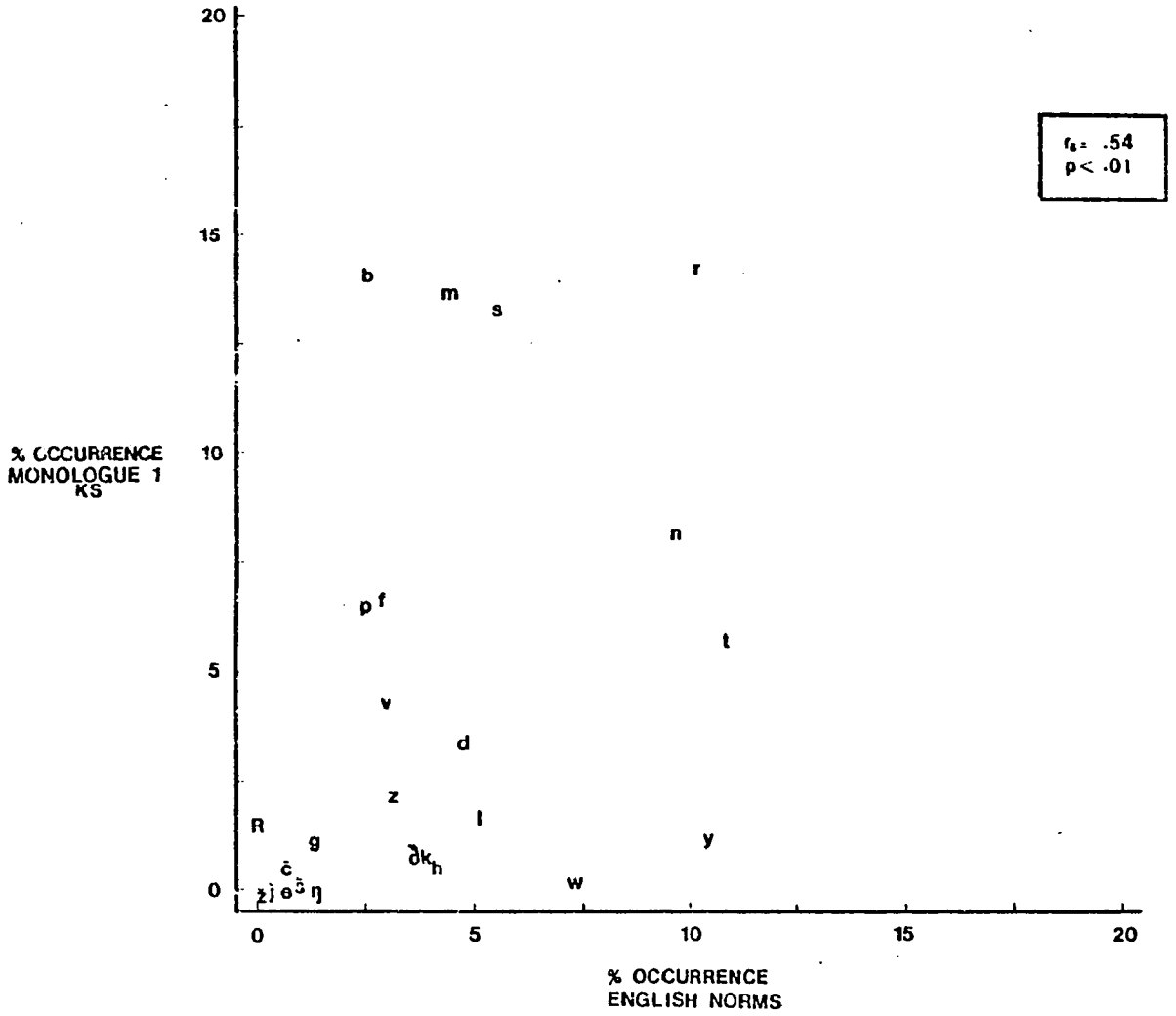

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE
MONOLOGUE 1
KS
% OCCURRENCE
ENGLISH NORMS
r_s = .54
p< .01
b
m
s
r
n
p
f
t
v
d
z
l
R
g
y
w
η

Figure 3

Comparison of Relative Frequency Distributions of Consonants in KS Monologue 1 and Normal German

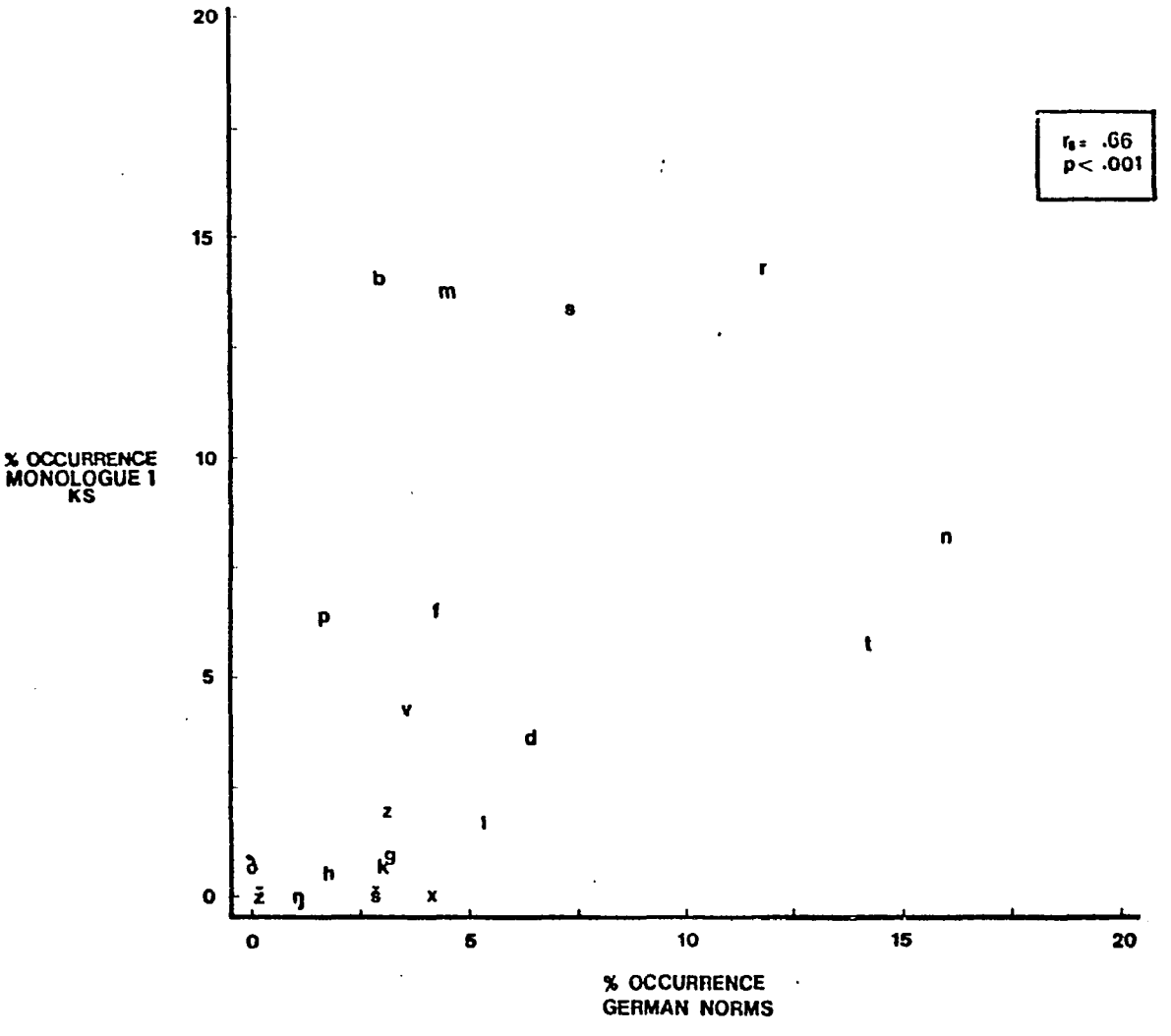

20
15
10
5
0
% OCCURRENCE
MONOLOGUE 1
KS
r_s = .66
p < .001
b
m
s
r
n
p
f
t
v
d
z
l
ə
h
k
ž
ŋ
š
x
0
5
10
15
20
% OCCURRENCE
GERMAN NORMS

Figure 4

Comparison of Relative Frequency Distributions of Vowels in KS Monologue 1 and Normal English

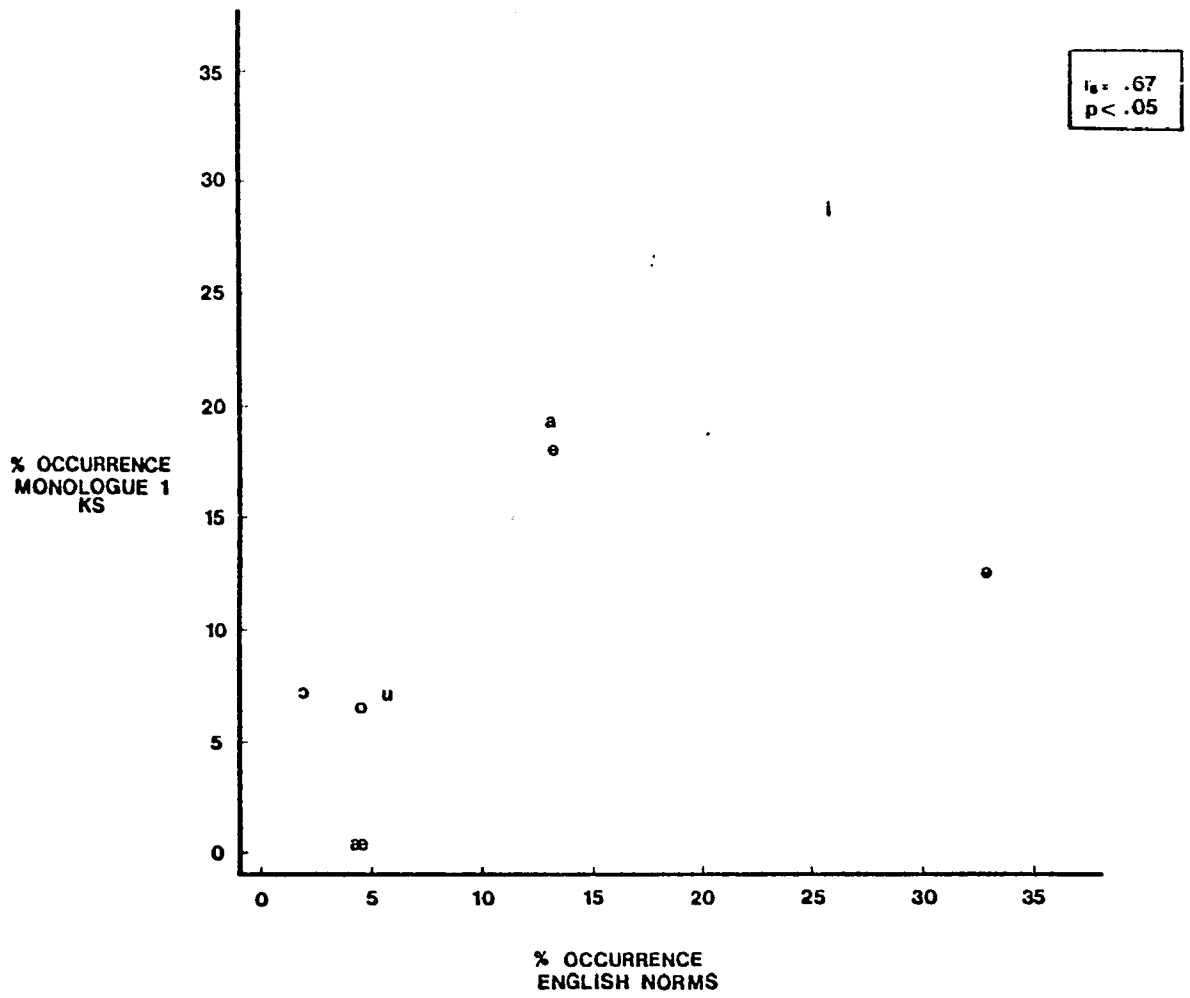

r_s = .67
p < .05
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE ENGLISH NORMS
0
5
10
15
20
25
30
35
ɪ
a
e
ɘ
ɔ
o
u
æ

Figure 5

Comparison of Relative Frequency Distributions of Vowels in KS Monologue 1 and Normal German

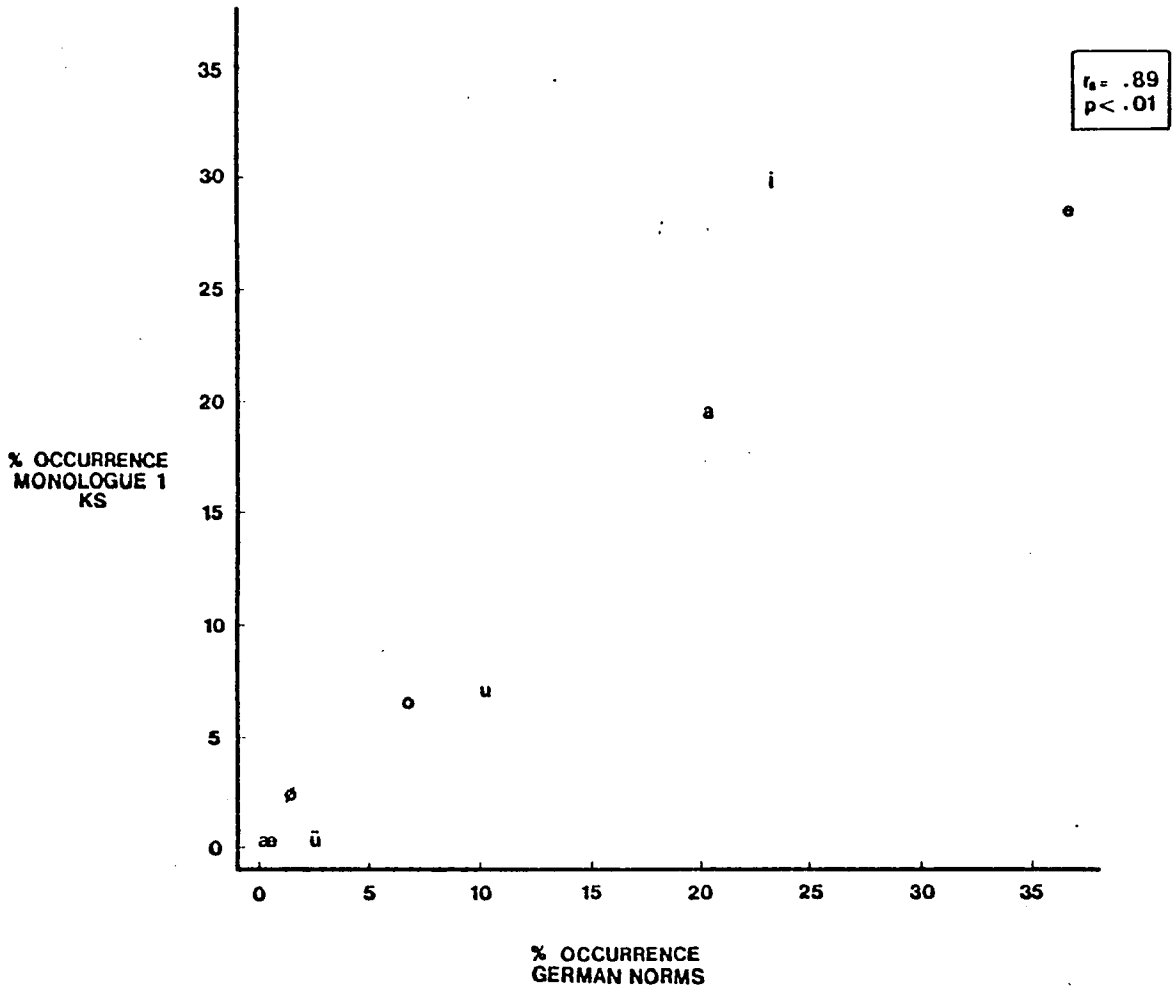

r_s = .89
p < .01
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE GERMAN NORMS
0
5
10
15
20
25
30
35
i
e
a
o
u
ø
æ
ü

Figure 6

Comparison of Relative Frequency Distributions of Consonants in KS Monologue 1 and KS Dialogue 1

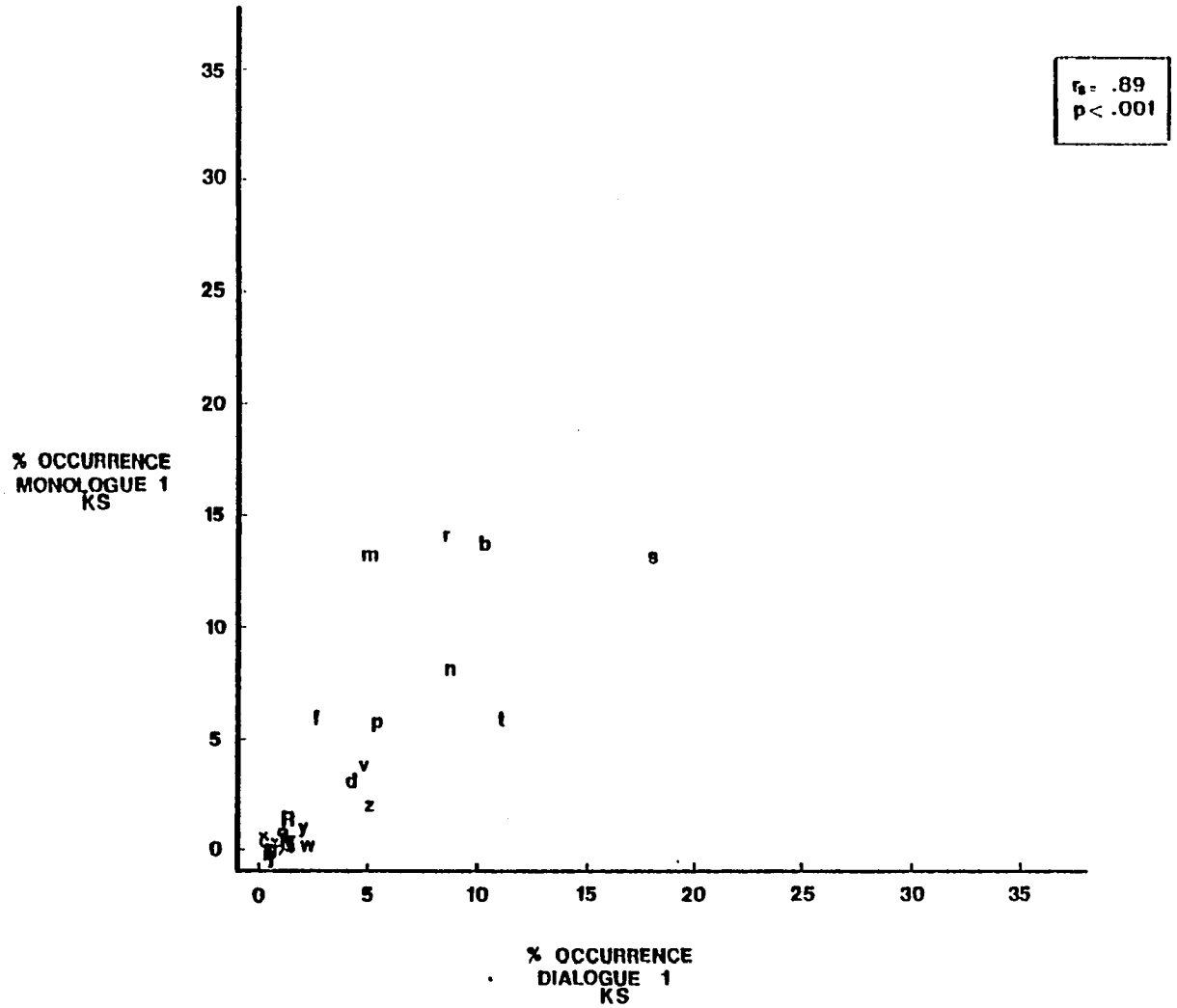

r_s = .89
p < .001
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE DIALOGUE 1 KS
0
5
10
15
20
25
30
35
r
b
s
m
n
f
p
t
v
d
z
R
y
w

Figure 7

Comparison of Relative Frequency Distributions of Vowels in KS Monologue 1 and KS Dialogue 1

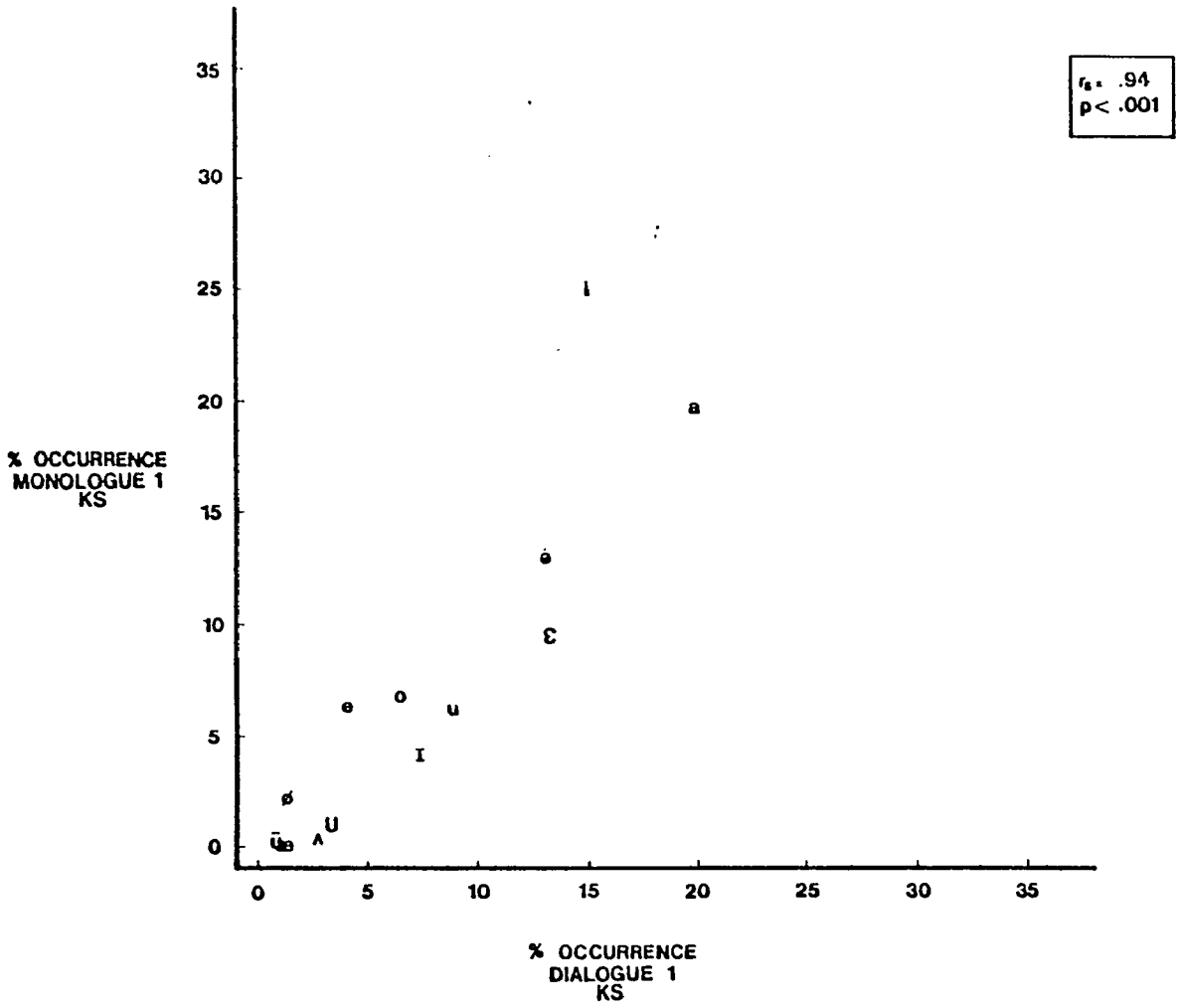

r_s = .94
p < .001
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE DIALOGUE 1 KS
0
5
10
15
20
25
30
35
i
a
e
ɛ
o
u
I
ø
U
ʌ

Figure 8

Comparison of Relative Frequency Distributions of Consonants in KS English Reading 1a and KS English Reading 1b

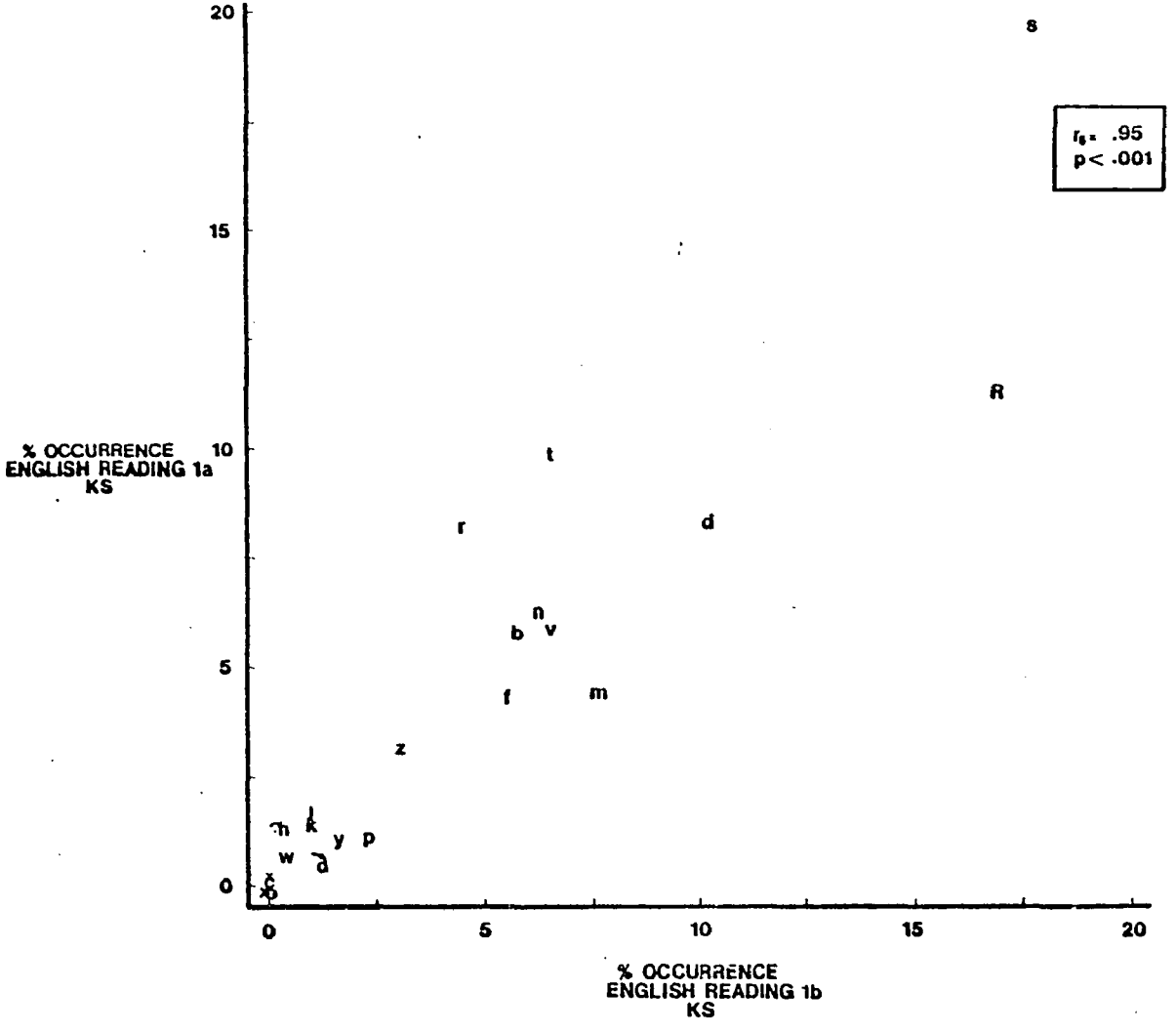

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE
ENGLISH READING 1a
KS
% OCCURRENCE
ENGLISH READING 1b
KS
r_s = .95
p< .001
s
R
t
d
r
n
v
b
f
m
z
h
k
y
p
w
ə
ɛ
ɔ

Figure 9

Comparison of Relative Frequency Distributions of Consonants in KS English Reading 1 and KS German Reading 1

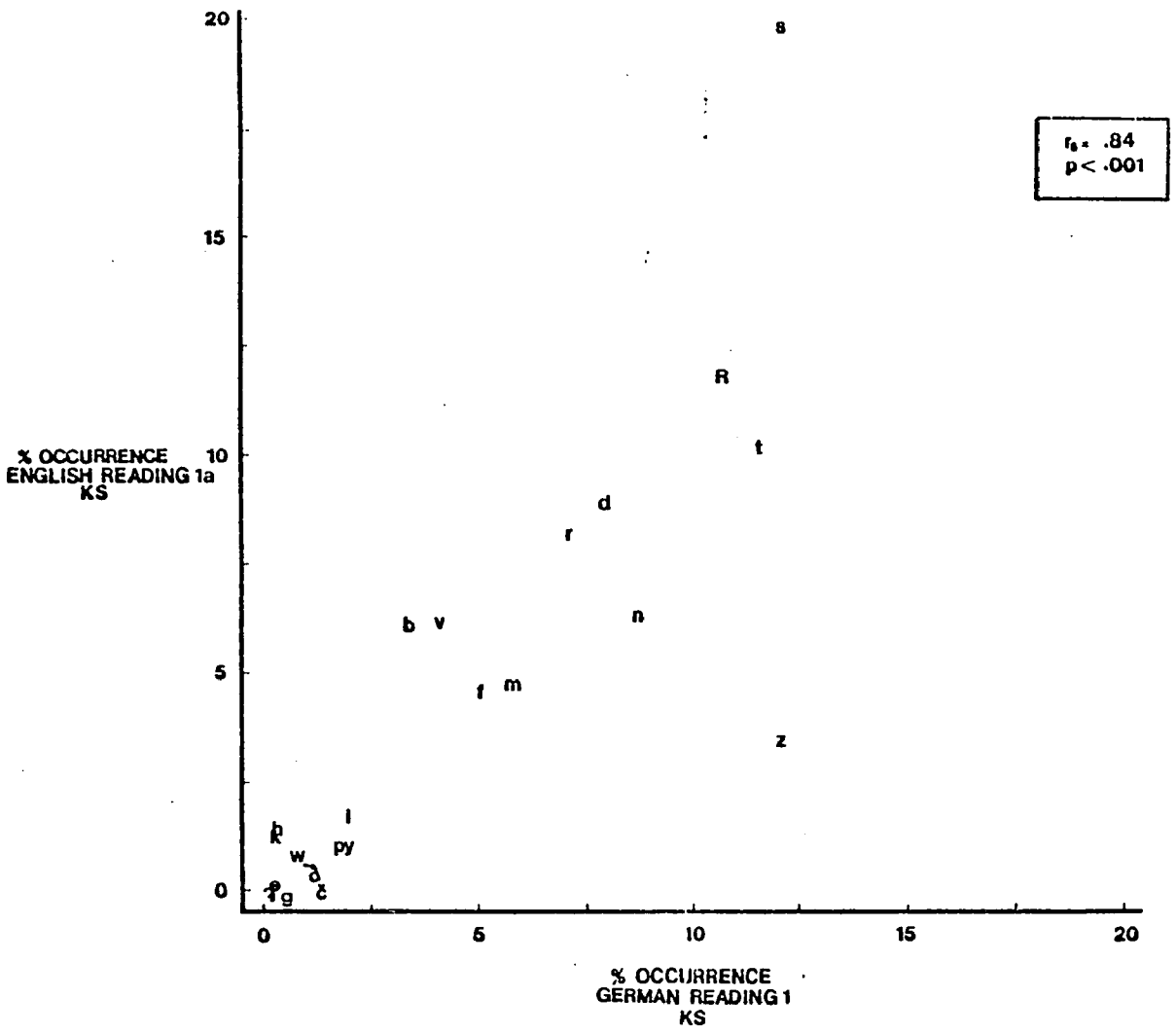

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE GERMAN READING 1 KS
r_s = .84
p < .001
s
R
t
d
r
n
b
v
m
f
z
l
py
w
h
g

Figure 10

Comparison of Relative Frequency Distributions of Vowels in KS English Reading 1a and KS English Reading 1b

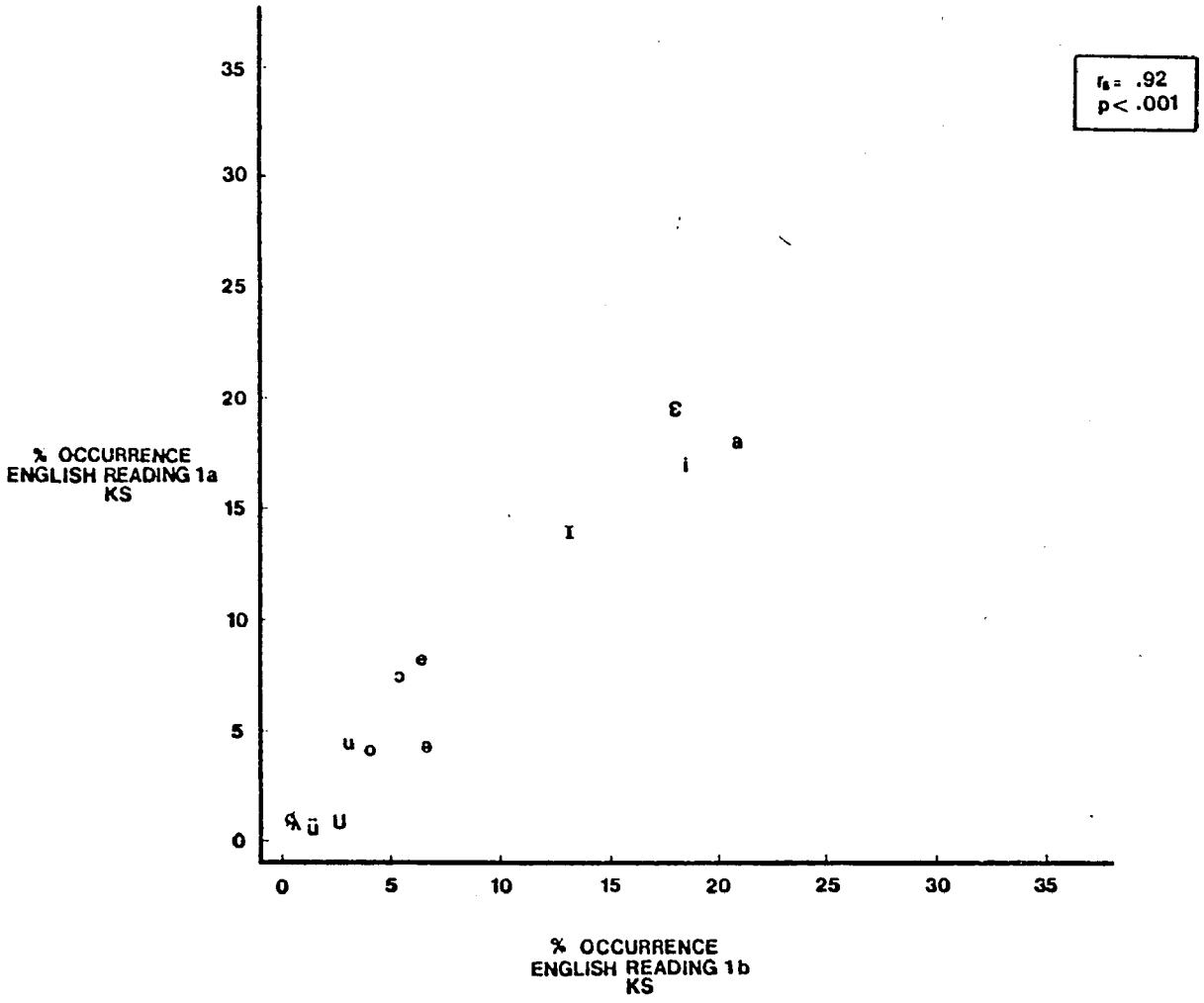

r_s = .92
p < .001
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE ENGLISH READING 1b KS
0
5
10
15
20
25
30
35
ɛ
a
i
I
e
ɔ
u
o
ə
ɑ
ʊ
U

Figure 11

Comparison of Relative Frequency Distributions of

Vowels in KS English Reading 1

and KS German Reading 1

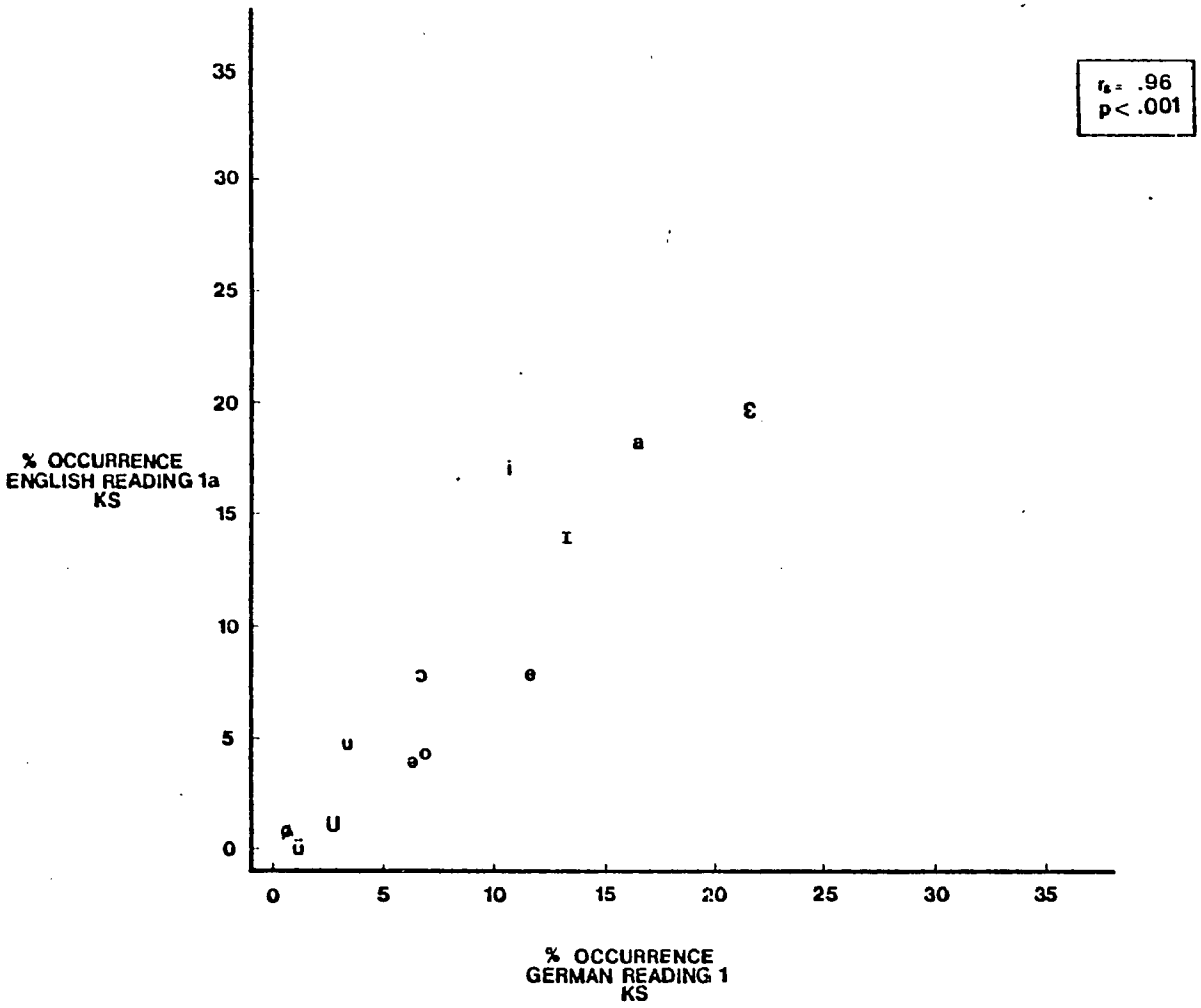

r_s = .96
p < .001
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE GERMAN READING 1 KS
0
5
10
15
20
25
30
35
ɛ
a
i
ɪ
ɔ
e
u
ø
ʊ
ʏ
ʌ

Figure 12

Comparison of Relative Frequency Distributions of Consonants in KS English Reading 1 and Normal Control English Reading

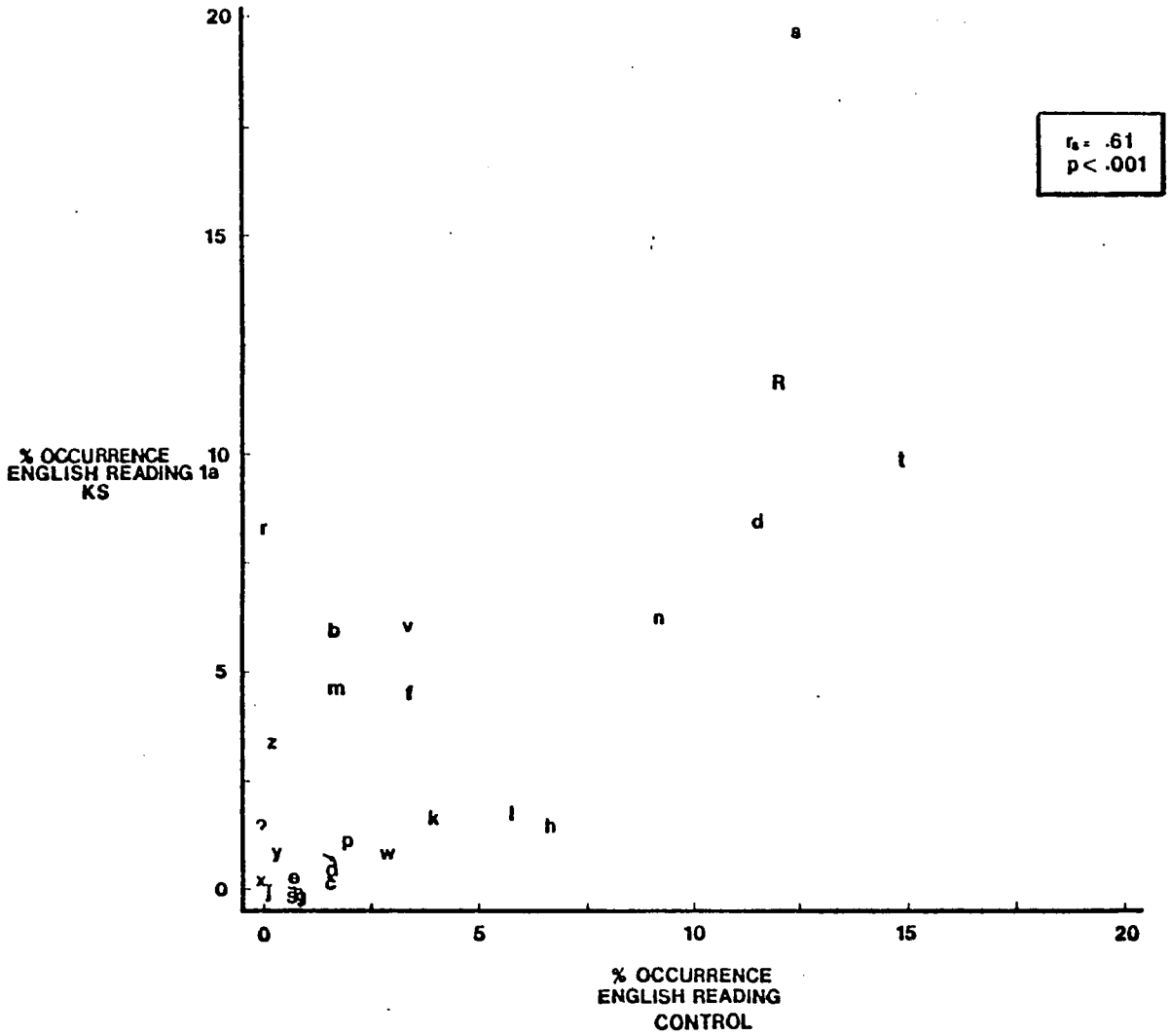

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE ENGLISH READING CONTROL
r_s = .61
p < .001
s
R
t
d
r
n
b
v
m
f
z
k
l
h
p
w
y
?

Figure 13

Comparison of Relative Frequency Distributions of Consonants in KS German Reading 1 and Normal Control German Reading

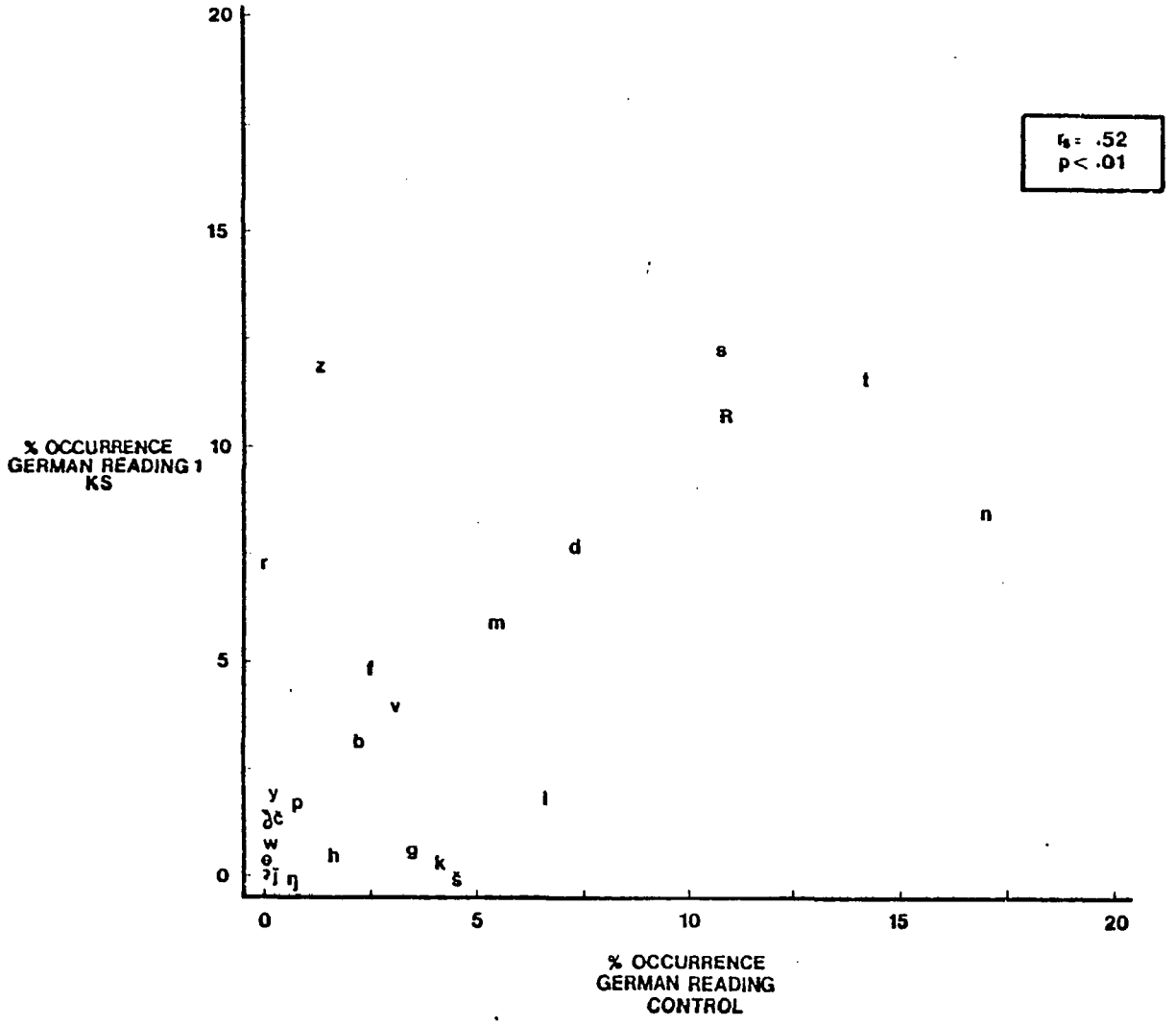

20
15
10
5
0
% OCCURRENCE GERMAN READING 1 KS
0
5
10
15
20
% OCCURRENCE GERMAN READING CONTROL
r_s = .52
p < .01
z
s
t
R
n
d
r
m
f
v
b
l
y
p
h
g
k
w
ŋ

Figure 14

Comparison of Relative Frequency Distributions of Vowels in KS English Reading 1 and Normal Control English Reading

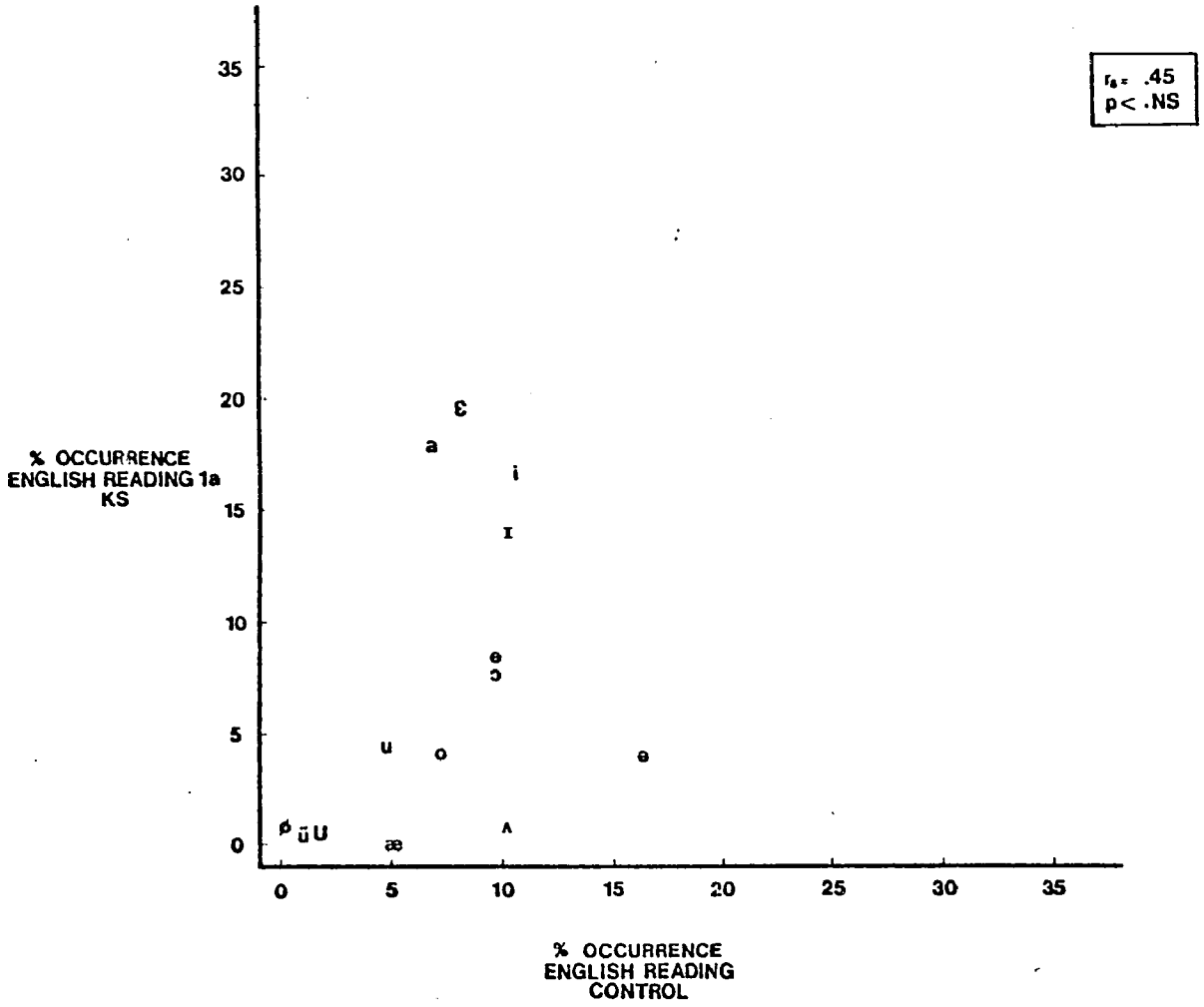

r_s = .45
p < .NS
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE ENGLISH READING CONTROL
0
5
10
15
20
25
30
35
ɛ
a
i
ɪ
e
ɔ
u
o
e
ø
ü
U
æ
ʌ

Figure 15

Comparison of Relative Frequency Distributions of Vowels in KS German Reading 1 and Normal Control German Reading

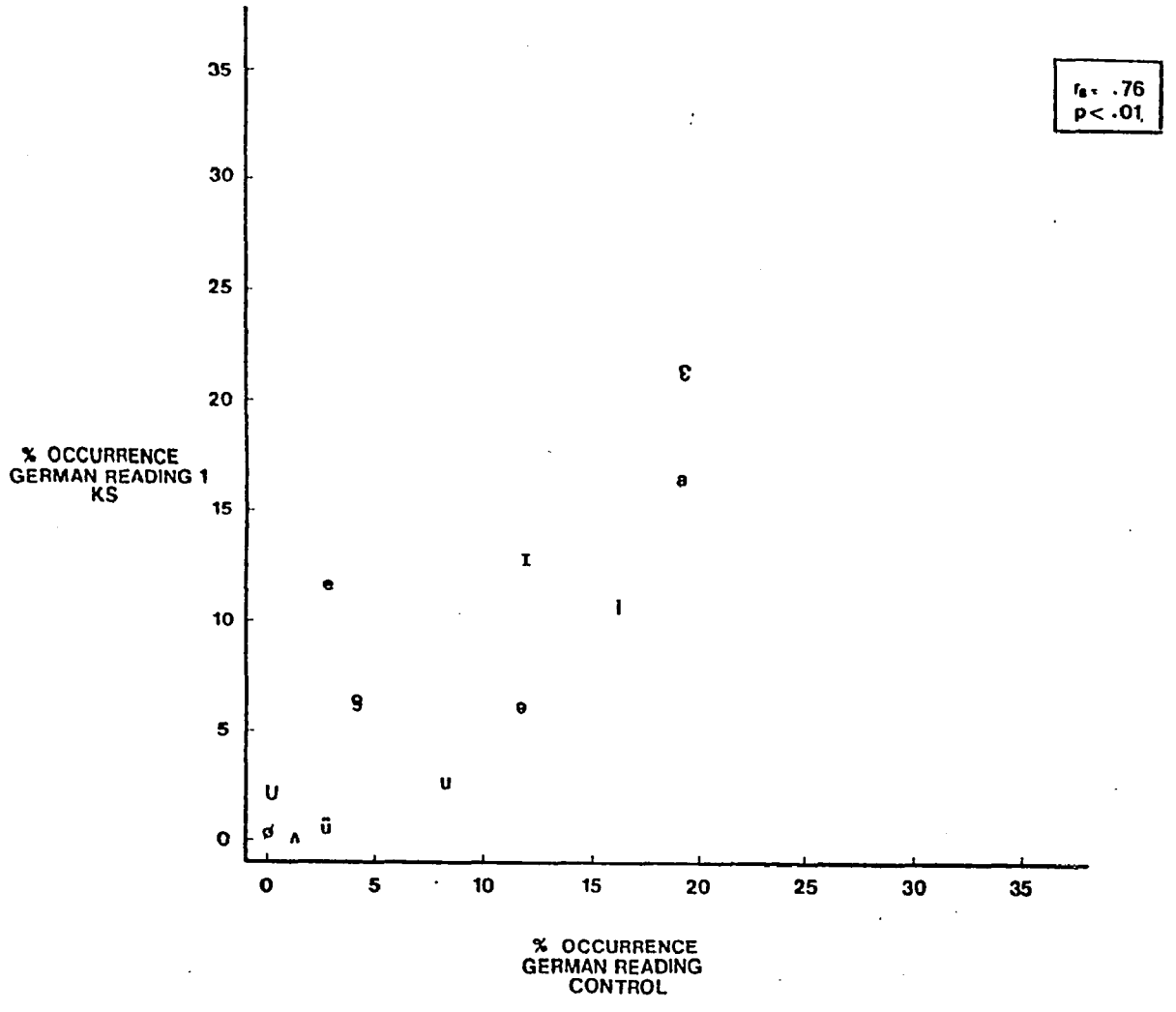

r_s = .76
p < .01
% OCCURRENCE GERMAN READING 1 KS
% OCCURRENCE GERMAN READING CONTROL
0
5
10
15
20
25
30
35
U
ø
ʌ
ü
9
e
u
I
ɐ
ɛ
a
I

Figure 16

Comparison of Relative Frequency Distributions of Consonants in KS Dialogue 1 and Normal Control Dialogue

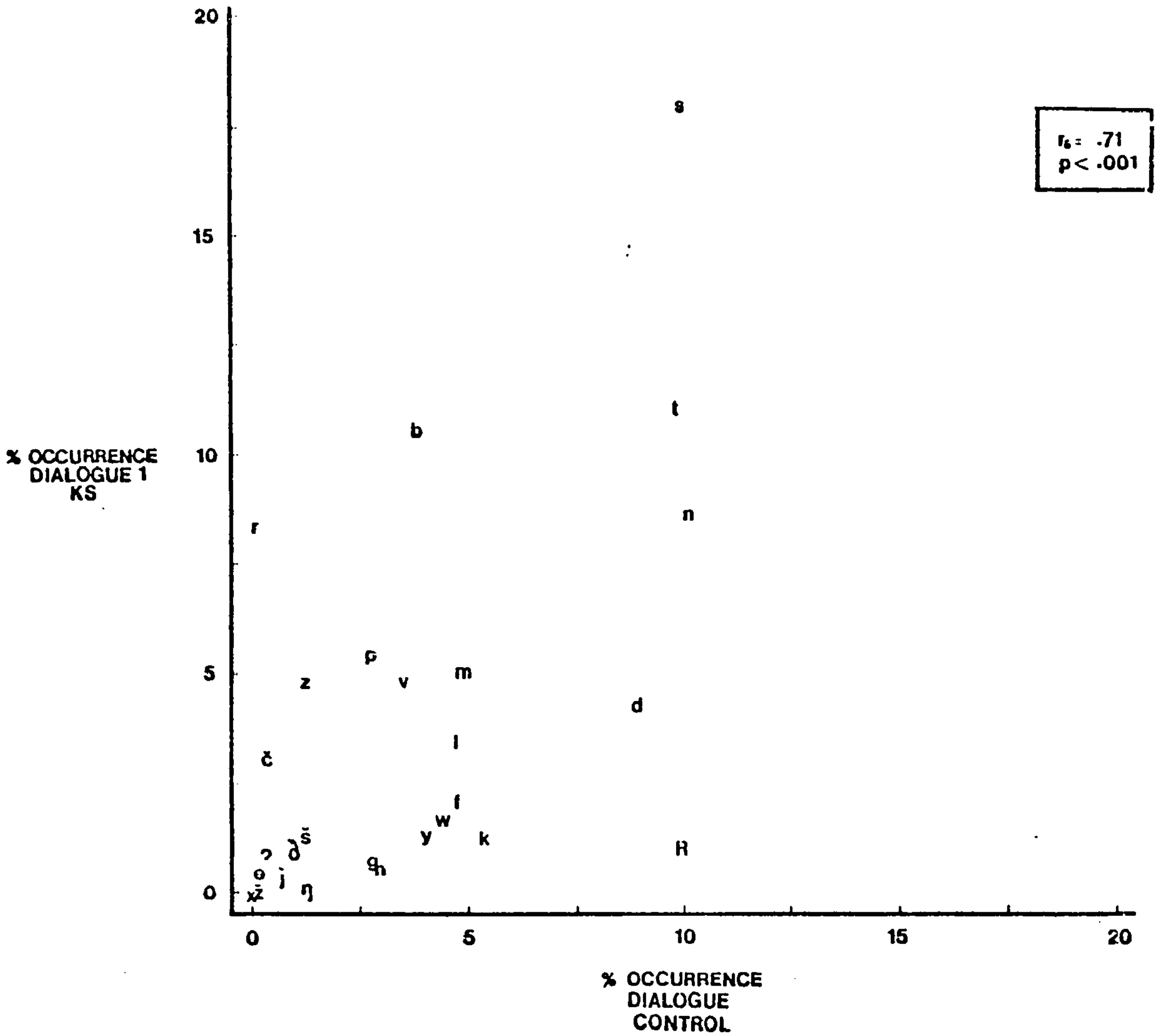

% OCCURRENCE
DIALOGUE 1
KS
% OCCURRENCE
DIALOGUE
CONTROL
r_s = .71
p < .001
0
5
10
15
20
0
5
10
15
20
s
t
b
n
r
p
v
m
z
d
l
č
f
w
y
k
š
ð
?
R
q
h
o
j
ŋ
x
ž

Figure 17

Comparison of Relative Frequency Distributions of Consonants in KS Monologue 1 and Normal Control Dialogue

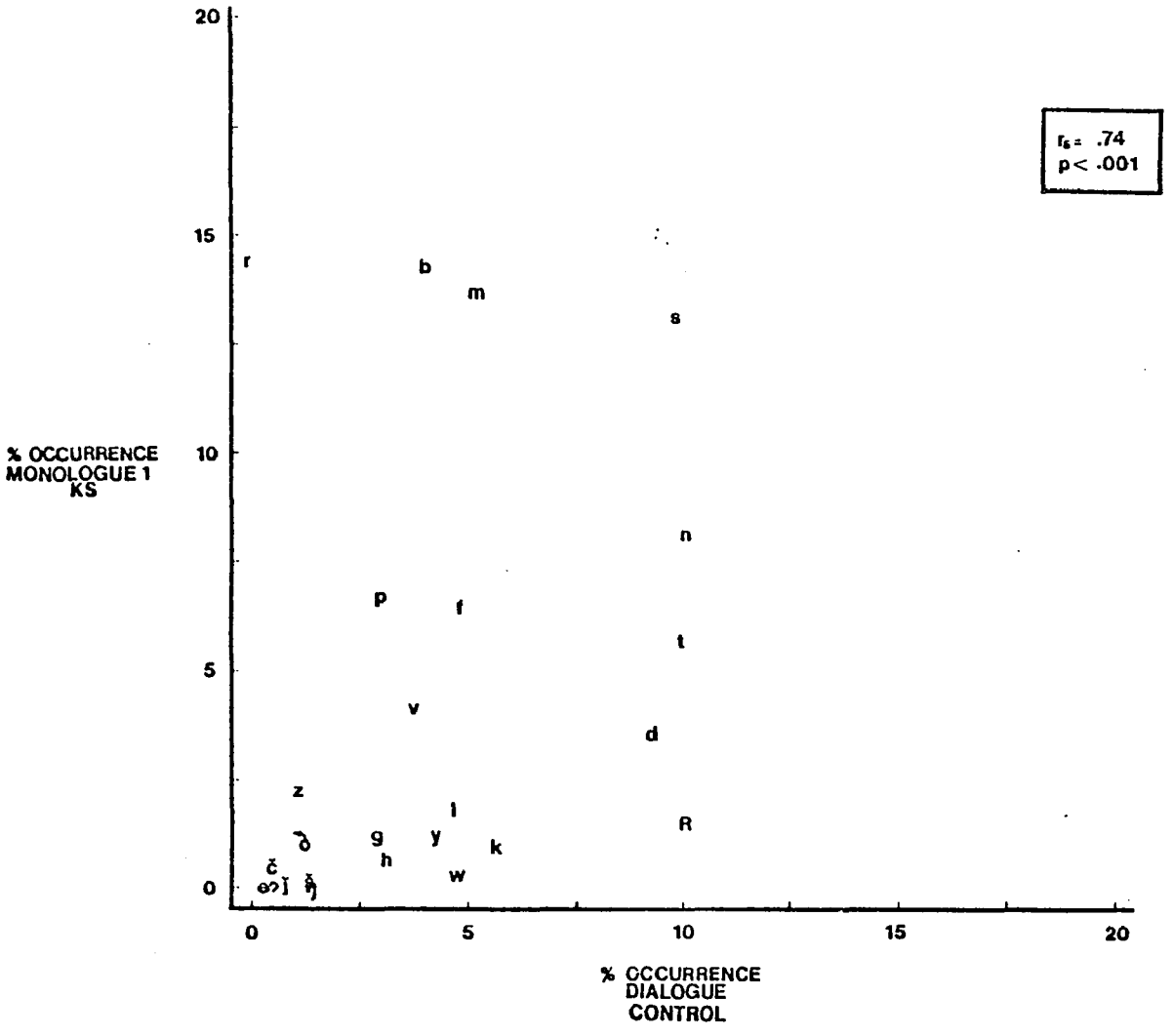

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE DIALOGUE CONTROL
r_s = .74
p < .001
r
b
m
s
n
p
f
t
v
d
z
l
R
g
y
k
h
w
č
ǰ
ǯ
ǯ

Figure 18

Comparison of Relative Frequency Distributions of Vowels in KS Dialogue 1 and Normal Control Dialogue

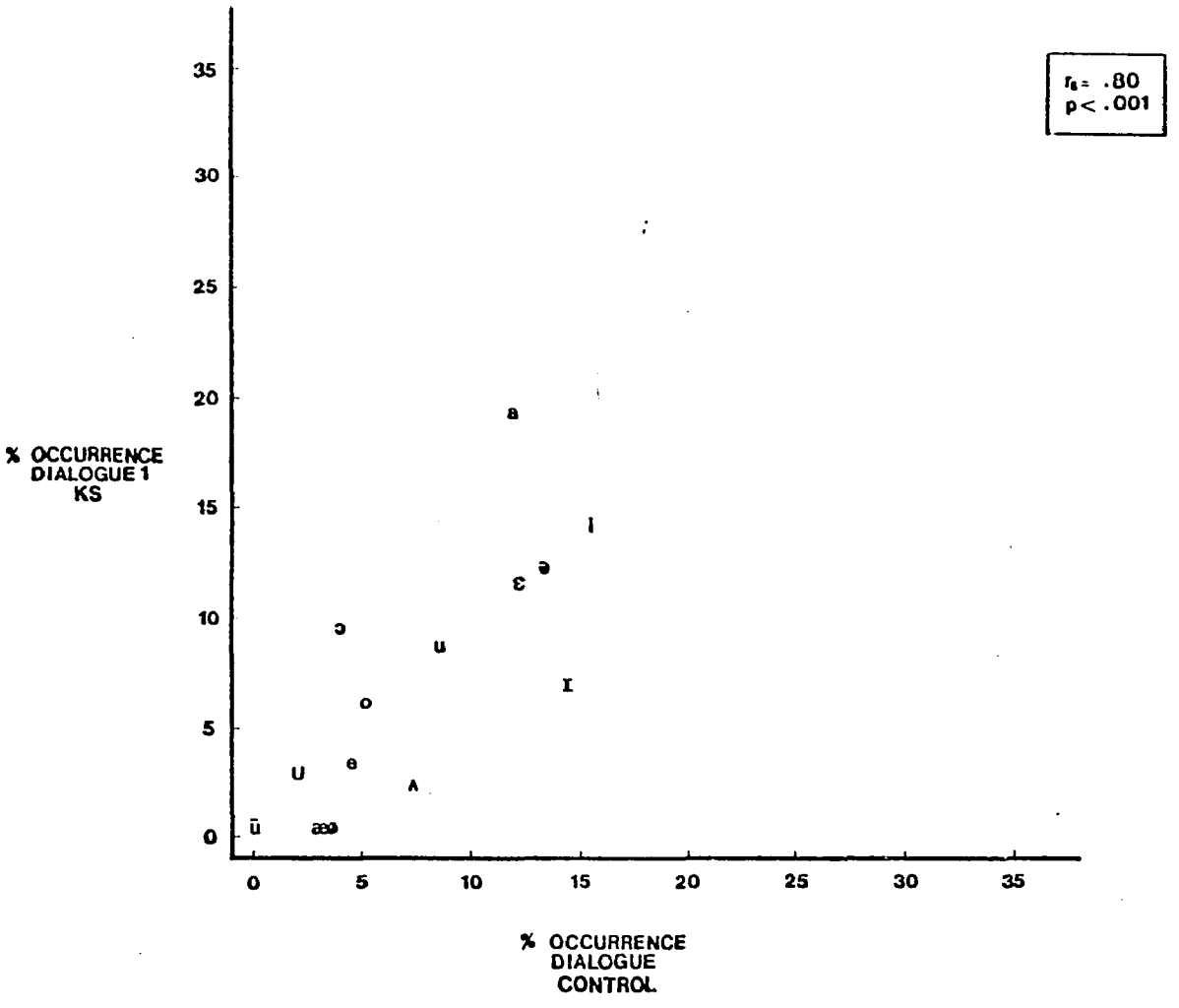

$r_s = .80$
$p < .001$
% OCCURRENCE DIALOGUE 1 KS
% OCCURRENCE DIALOGUE CONTROL
0
5
10
15
20
25
30
35
ɑ
ɪ
ɛ
ə
ɔ
ʊ
ɪ
o
ʊ
e
ʌ
ɑ
æ
ə

Figure 19

Comparison of Relative Frequency Distributions of Consonants in KS Dialogue 1 and KS Dialogue 2

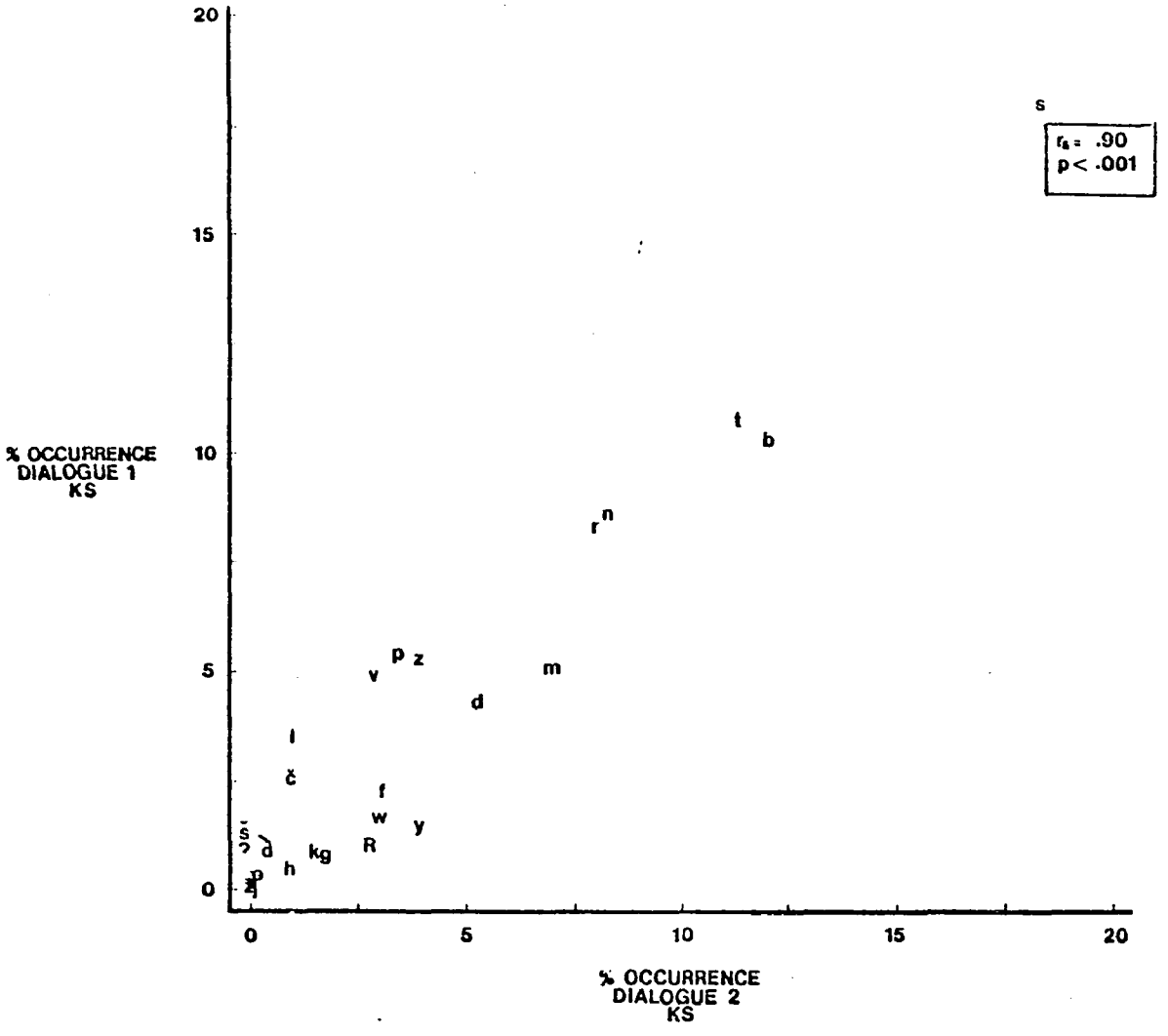

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE
DIALOGUE 1
KS
% OCCURRENCE
DIALOGUE 2
KS
s
r_s = .90
p < .001
t
b
r
n
p
z
v
m
d
l
č
f
w
y
R
kg
h

Figure 20

Comparison of Relative Frequency Distributions of Consonants in KS Monologue 1 and KS Dialogue 2

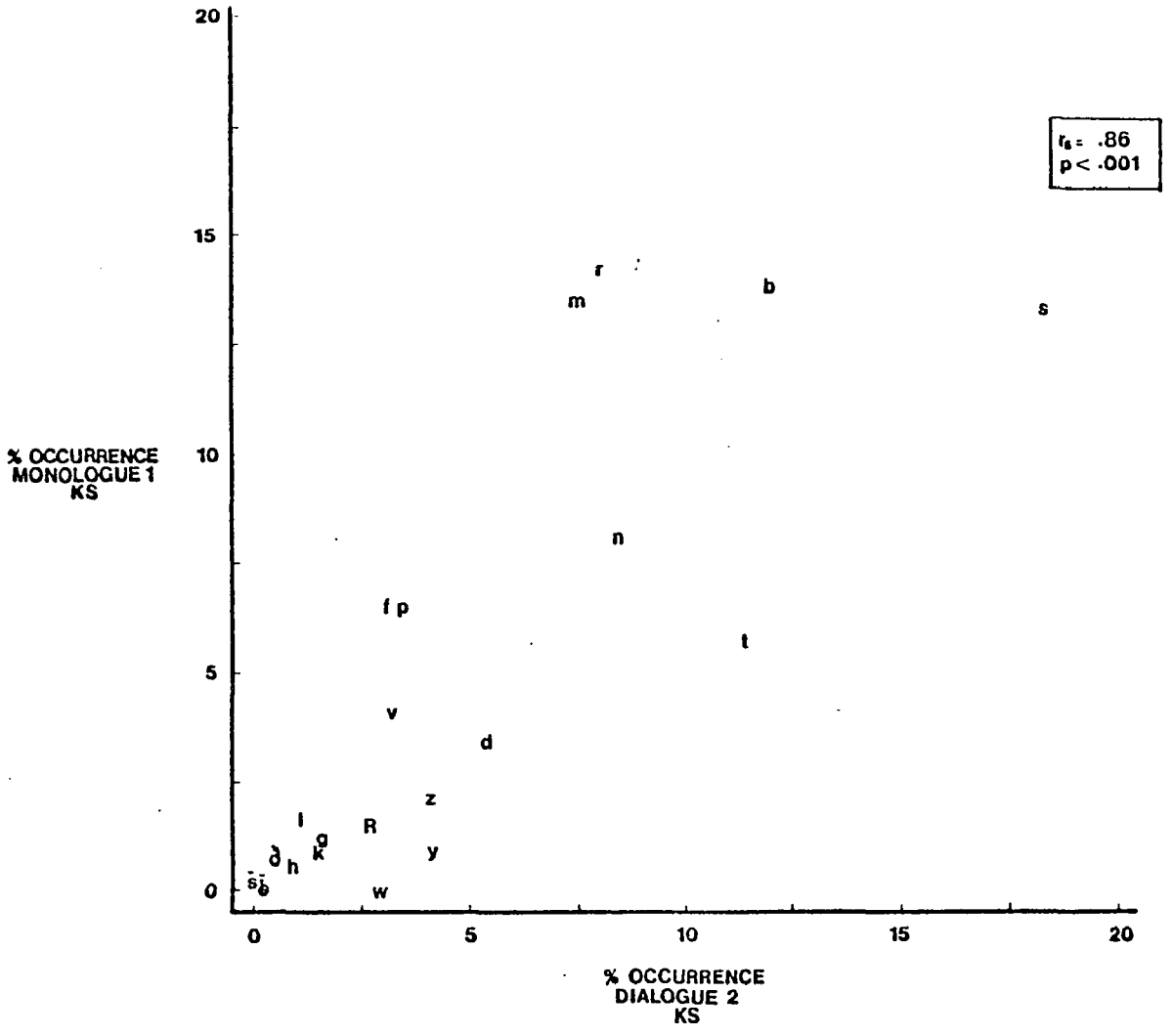

r_s = .86
p < .001
% OCCURRENCE MONOLOGUE 1 KS
% OCCURRENCE DIALOGUE 2 KS
0
5
10
15
20
r
m
b
s
n
f p
t
v
d
z
l
R
g
k
y
ð
h
s
θ
w

Figure 21

Comparison of Relative Frequency Distributions of Consonants in KS English Reading 1 and KS English Reading 2

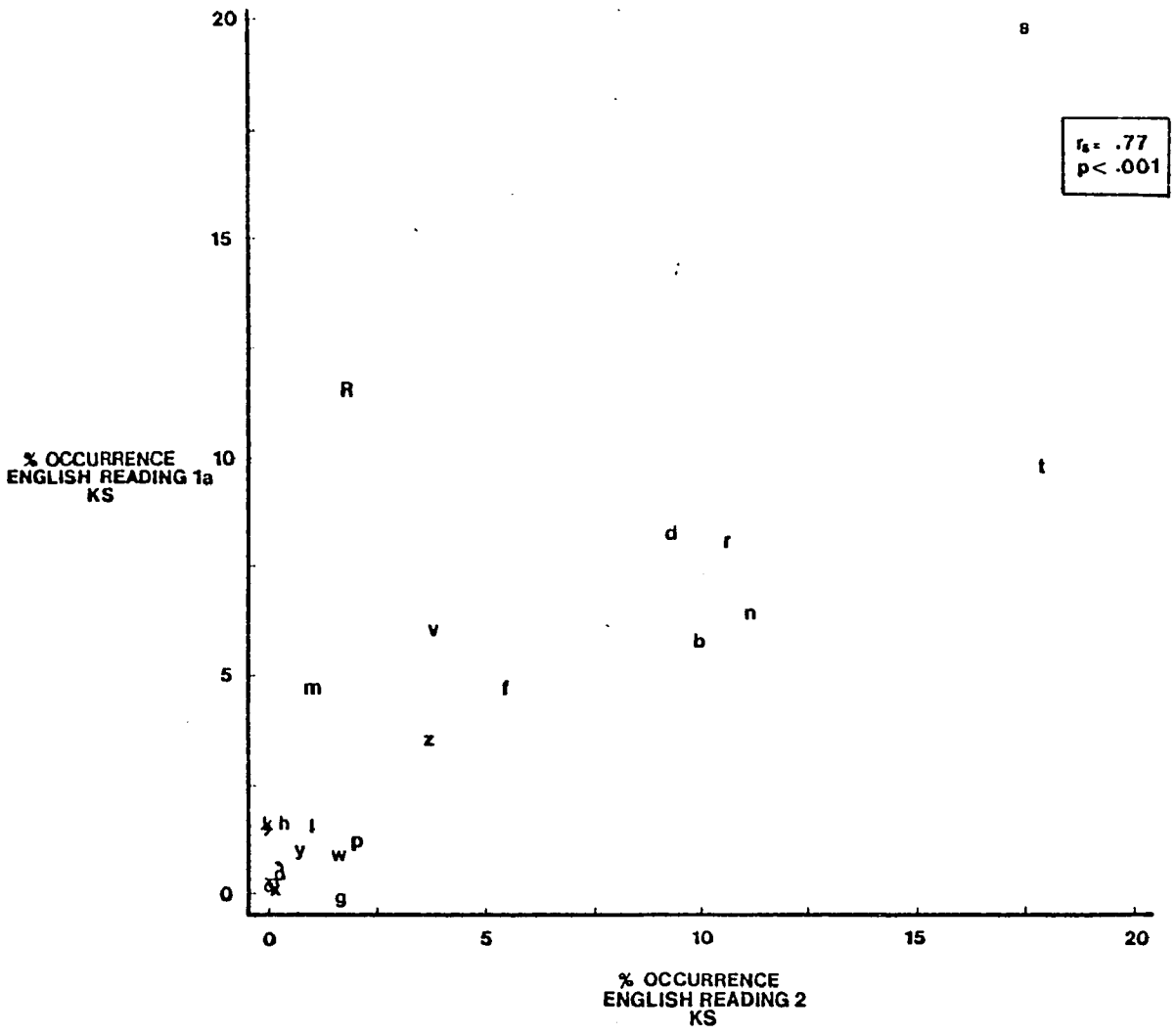

20
15
10
5
0
0
5
10
15
20
% OCCURRENCE ENGLISH READING 1a KS
% OCCURRENCE ENGLISH READING 2 KS
r_s = .77
p< .001
s
R
t
d
r
n
b
v
m
f
z
h
l
y
w
p
g

Figure 22

Comparison of Relative Frequency Distributions of Consonants in KS German Reading 1 and KS German Reading 2

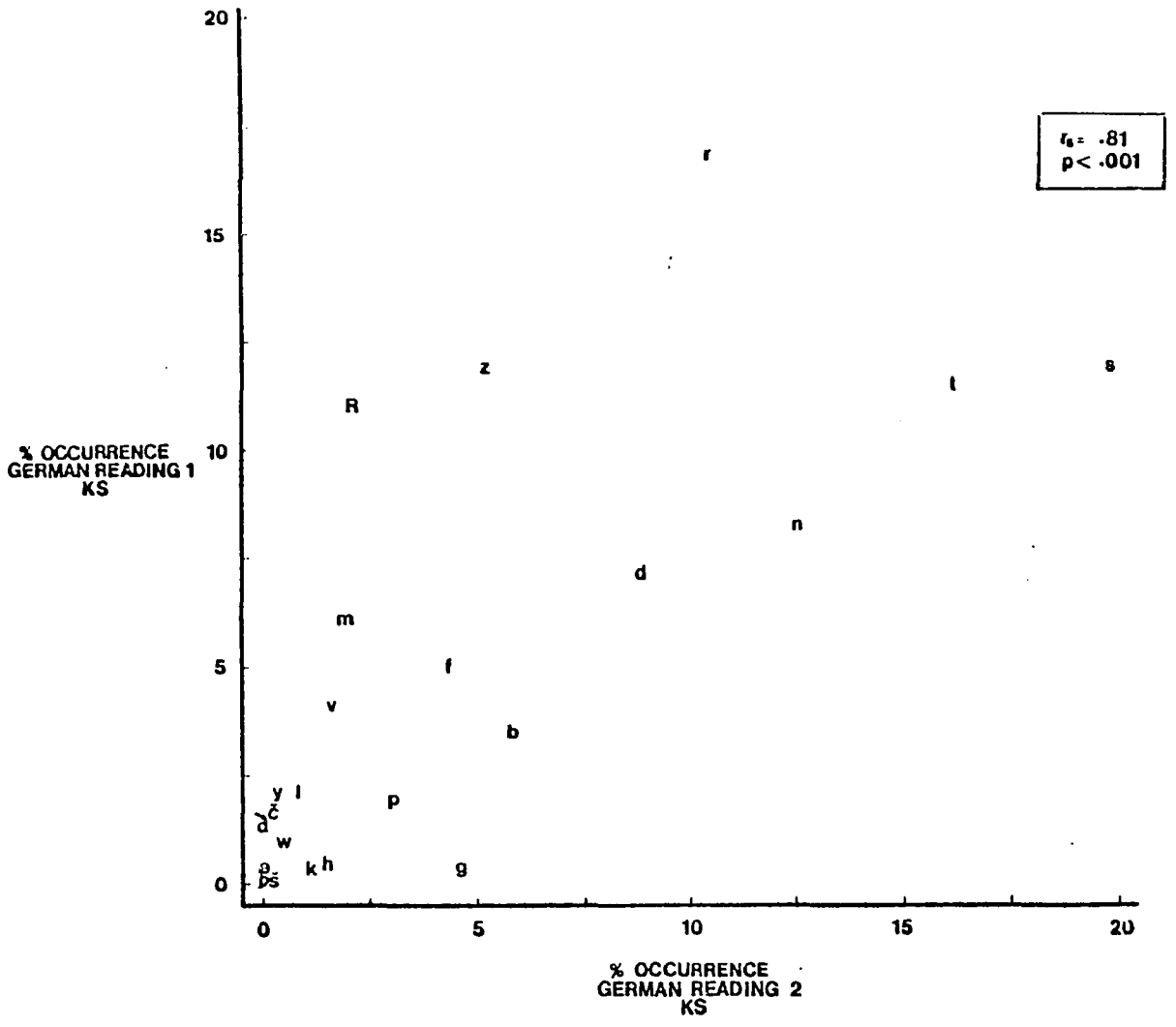

r_s = .81
p < .001
% OCCURRENCE GERMAN READING 1 KS
% OCCURRENCE GERMAN READING 2 KS
0
5
10
15
20
r
z
s
t
R
n
d
m
f
v
b
y
l
p
č
w
k
h
g

Figure 23

Comparison of Relative Frequency Distributions of Vowels in KS English Reading 1 and KS English Reading 2

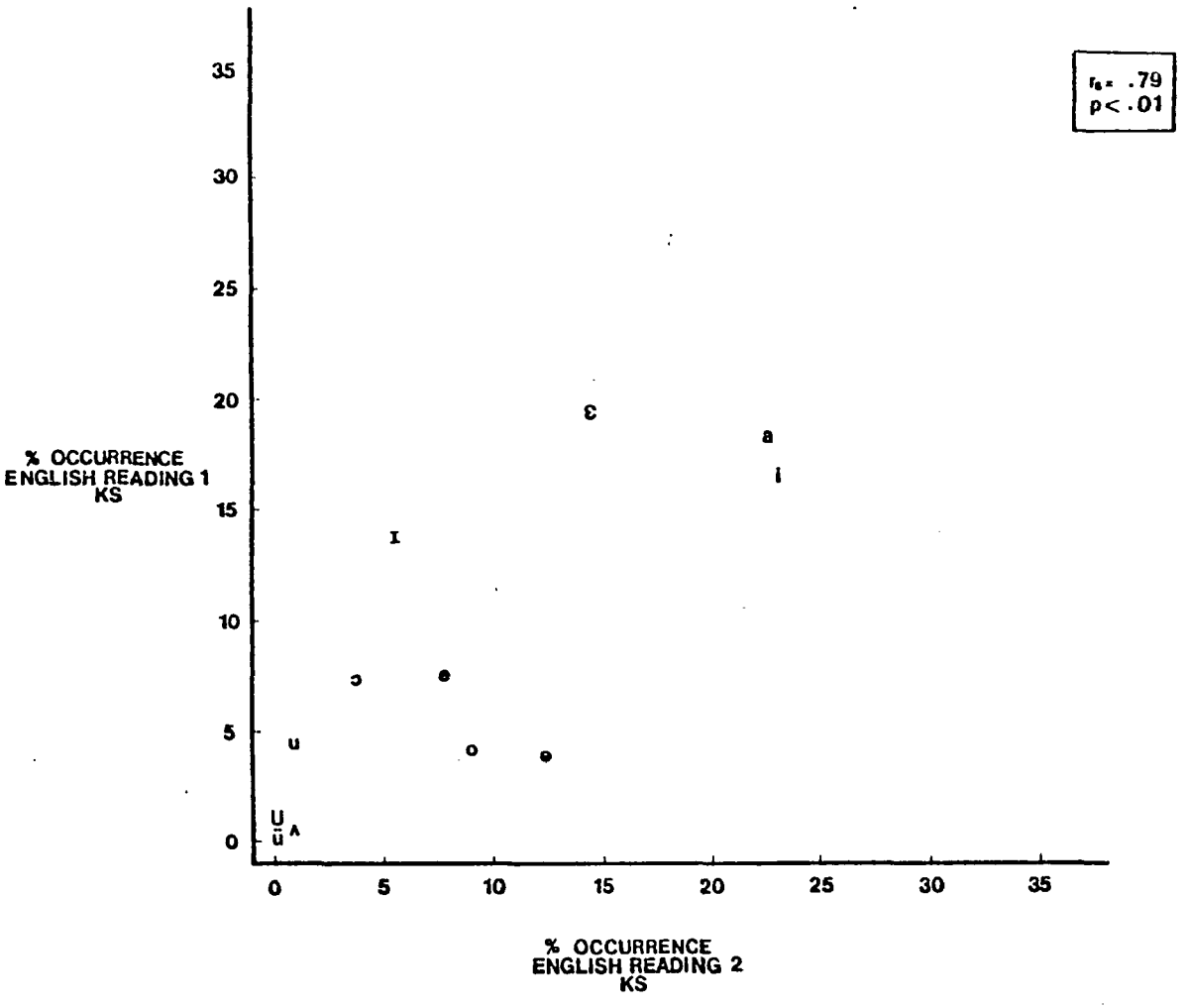

r_s = .79
p < .01
% OCCURRENCE ENGLISH READING 1 KS
% OCCURRENCE ENGLISH READING 2 KS
0
5
10
15
20
25
30
35
ɛ
a
i
ɪ
ɔ
e
o
ɐ
u
ʊ
ʌ

Figure 24

Comparison of Relative Frequency Distributions of

Vowels in KS German Reading 1

and KS German Reading 2

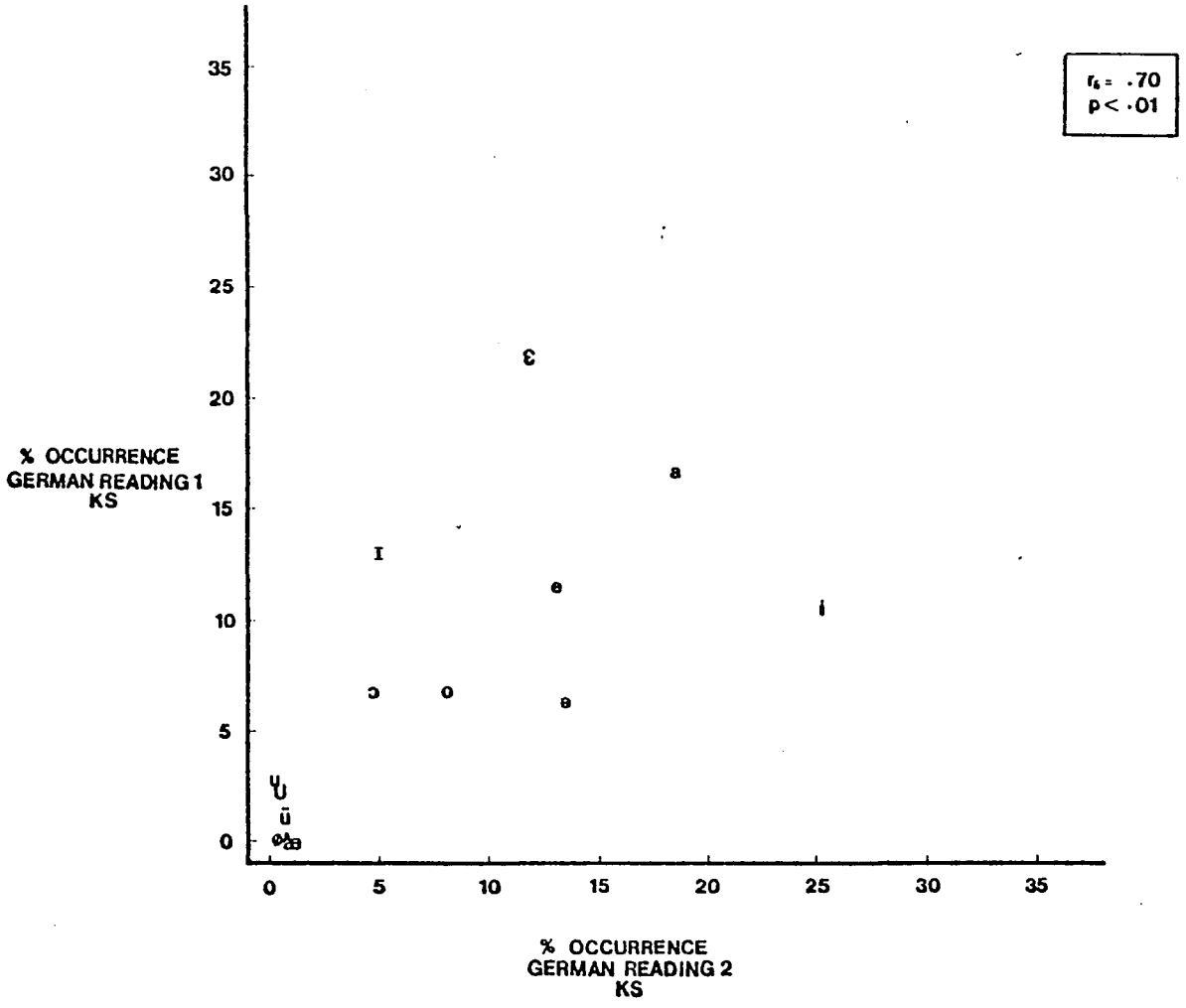
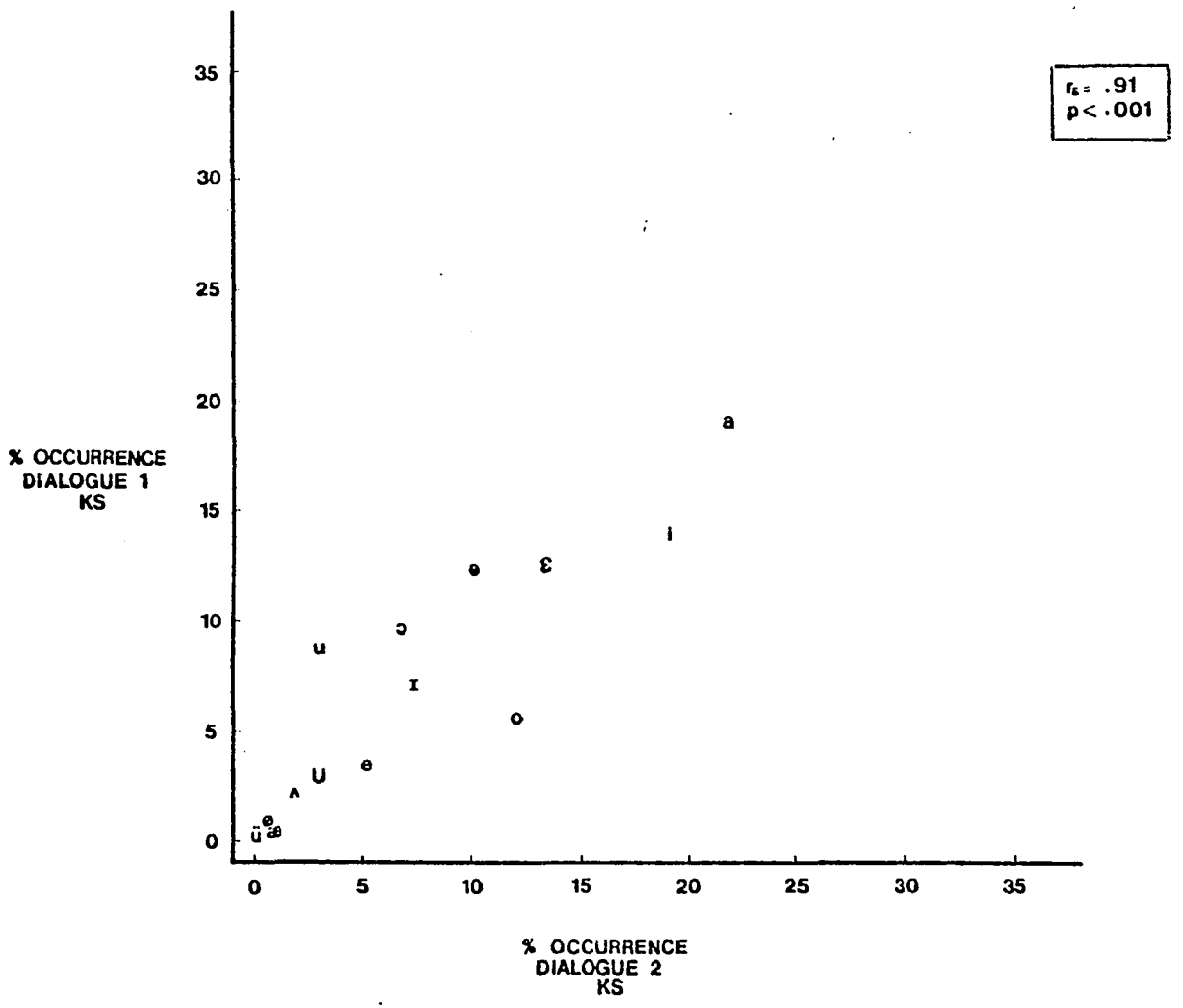

r_s = .70
p < .01
% OCCURRENCE GERMAN READING 1 KS
% OCCURRENCE GERMAN READING 2 KS
0
5
10
15
20
25
30
35
ɛ
a
I
e
i
ɔ
o
ə
ʏ
ʊ
ü
ø
ä

Figure 25

Comparison of Relative Frequency Distributions of Vowels in KS Dialogue 1 and KS Dialogue 2


$r_s = .91$
$p < .001$
% OCCURRENCE DIALOGUE 1 KS
% OCCURRENCE DIALOGUE 2 KS
0
5
10
15
20
25
30
35
a
ɪ
ɛ
ɔ
ʊ
ɐ

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