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ABSTRACT

This paper examines the perceptual processes that underlie normal language acquisition with relation to perceptual dysfunctions in the aphasic child. Experiments are cited which seem to indicate that auditory dyfunctions may underlie language impairment. Experimental studies of the linguistic systems of the aphasic child seem to support the theory that the deficiency is quantitative (or one of delay in learning) rather than qualitative (or one of manner of learning), and that this deficiency is one of a semantic, rather than syntactic or morphological, nature. (AM)

CHILDHOOD APHASIA - AN UPDATED CONCEPT BASED ON RECENT RESEARCH

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INTRODUCTION

Our concept of childhood or developmental aphasia is based on the assumption that the child's inability to process and produce language has its etiology in auditory perceptual dysfunction. As Myklebust indicates (1971, p.1186), "Children having this disability demonstrate a discrepancy between expected and actual achievement in one or more of the following functions: auditory perception, auditory memory, integration, comprehension, expression". Further, as Myklebust observes, "The deficits referred to are not a result of sensory, motor, intellectual or emotional impairment, nor the lack of opportunity to learn. They are assumed to derive from dysfunctions in the brain ..." Most aphasiologists would agree that often the evidence for the dysfunctioning is arrived at by behavioral observation and assessment rather than as a result of the findings ordinarily provided in the usual examination conducted by a neurologist. In practice, if we consider the findings of the psychologist relative to perceptual functioning to be an extension of the neurological, then we have considerably more evidence to support the impression that a developmentally aphasic child is impaired in the capacities necessary for the reception, integration and perception of the sequential auditory events that constitute spoken language.

Most of this paper will be devoted to considerations of the perceptual processes that we believe underlie normal language acquisition, and the evidence that indicates, directly or indirectly, what aspects of perception are impaired or deviant in the developmentally aphasic child. First, however, we shall present operational definitions of the terms perception and developmental aphasia.

Perception is a process by which a responding individual organizes sensory data on the basis of past experience. Perception implies co-related acts of discrimination, identification, categorization, and assignment of meaning. Overtly, perception results in behavior appropriate to the assumed attributes and potentials of the event to which the individual is responding. As Richard Gregory indicated in a recent lecture at Stanford University (Lecture to Psychology Seminar, October, 1971), perception is a probability phenomenon. In the perceptual process the mind assumes what an object or other stimulus event should or might be, and the individual acts according to his assumptions.

The congenitally aphasic child is one who is seriously retarded in language acquisition. These retardations are manifest in his delayed development of his phonemic, lexical, and syntactical systems. Basic to these retardations are perceptual dysfunctions in one or more modalities; the most obvious difficulties are for the auditory events that constitute spoken language.

PERCEPTUAL FUNCTIONS NECESSARY FOR NORMAL LANGUAGE ACQUISITION

In order for a child to acquire an oral language code, he must have the following capacities:

1. He must be able to receive stimuli that occur in a sequence or order.

2. He must be able to hold the sequence in mind, to hold the sequential impression, so that its components may be integrated in an identifiable, differential pattern. This may be achieved either by memory or by the application of a rule plus memory.

3. He must be able to scan the pattern from within so that it may be compared with other stored patterns or other remembered impressions.

4. He must be able to respond differentially, to assign meaning on some level, to the identified pattern or impression.

5. In order to speak he must have an oral-articulatory system, or an equivalent manual system if he is deaf, to produce a flow or sequence of movements that constitute an utterance, audible and/or visible.

SENSORY AND MOTOR INVOLVEMENTS AND PERCEPTION

As a general observation we believe that limitations for the reception of sensory stimuli do not in themselves interfere with perception, providing the stimuli are received. Thus, a peripheral hearing loss, or a visual refractory defect, does not impair perception once the stimuli have been received so that they can be processed by the central nervous system. To be sure, unless the limitations are corrected either by an adjustment to the loss - getting closer to the source of sound, or having an aid to amplify sounds, or making distance adjustments to the visual stimuli, or having properly fitted glasses - intake will be difficult and there may be problems related to such difficulty.

We believe that the combination of peripheral <u>and</u> central impairment certainly aggravates the problem. This we sometimes find in developmentally aphasic children who present evidence of mild to moderate peripheral hearing loss. We also suspect that this may be an underlying problem for non-verbal infantile (primary) autistic children.

PERCEPTUAL DISFUNCTIONS

In determining possible perceptual disfunctions in children who cannot report verbally whether or how they have received or organized stimuli presented for input (intake), we must resort either to conjecture or to the interpretation of experimental investigations. The first approach, conjecture, assumes that we know as "fact" what we accept in theory. What we know as "fact" in regard to the brain damaged comes for the most part from acquired impairments in adults. As a result of fairly recent investigations, we have gathered a considerable amount of information about breakdown in auditory perceptual functioning in adults. For the most part, the observed data are well reconciled with theory. We even know something about distorted perception in adult schizophrenics. By analogy we make assumptions for children. However, analogies may often be misleading. We need to be mindful of the differential effects of the time of onset of pathology on developmental processes. Thus, Eisenberg observes that injury before speech acquisition "is even more devastating than similar injury in the adult". An early injury to the brain, pre- or post-natal, might impair "an elementary psychological function, the lack of which could then distort subsequent development. Thus, complex functions, the anatomical equipment for which might otherwise be intact, could have failed to evolve. Whenever the injury is such as to impair the development of the capacity to symbolize (language) all subordinate functions which are ordered by language will develop less optimally and all patterns of social interaction will be grossly impaired" (Eisenberg, 1964, pp.68-69).

If we resort to experimental investigations, we necessarily work on the assumption that the individual understands the task and the required response he is expected to make. We can, of course, train the child to make the responses, and so reduce the margin of error in our interpretation of what the child actually does. However, we can by no means be certain that the child does indeed understand, and so the possibility for error must always be entertained. Dyspraxic or dysarthric involvements may make it difficult for a child, or for an adult for that matter, to express his intake in the form expected for a normal, perceptual-motor activity. Thus, as Birch and Lefford (1964, p.46) report, some brain damaged (cerebral palsied) children who make erroneous block design reproductions are able nevertheless to choose a correct reproduction over their own product when directed to identify the one which most closely resembles the model. We have made a similar observation on aphasic children in regard to Bender-Gestalt figures.

Despite all of these precautions, we believe that there are some perceptual disfunctions which underly the impairment for language acquisition in the developmentally aphasic child. For the present, let us consider the developmentally aphasic child as brain different and so perceptually different. As a general and introductory observation we will state that perceptual disfunctions as far as language acquisition is concerned, may occur as a result of an impairment of any of the input processes considered in our summary statement above. Broadly stated, a perceptual disturbance for spoken language may be present because of the child's inability to organize sensory auditory events even though "received", to hold the events in mind, and to scan them and compare them with others stored by the central nervous system. Perceptual disfunctions may also be a manifestation of categorical impairment. This may be on the basis of an absence or of an inadequate number of basic or innate categories from which further categories may be developed. Categorical development for phonemes (the sound system of a language) may also be impaired if the child does not modify his primary categories to permit the development of useful discriminations. If, for example, the primary category for sibilant sounds is so broad as to include all s, sh, th, and f sounds, he will be unable to make the necessary discriminations for what he hears to respond differentially to speech that includes these sounds. Similarily, if the stop sounds t, p, and k are perceived as one, or the nasals n, m and ng perceived undifferentially, the child will not derive much meaning from a spoken utterance. At the other extreme is the possibility that the child's categories are too narrow, too restricted, and too rigidly set. Thus the child may have too many categories for functional sound discrimination. The s in words such as see, sue, its, pest are somewhat different in duration and somewhat different in lip position, each determined by its context within the verbal utterance. Even more so are t's in too, let Tom, get that, and letter. However different allophonically, by the age of two almost all children "perceive" the /s/ sounds and the /t/ sounds as categories that encompasses each of the varieties. If a child's categories are discrete, he necessarily has to overload his storage system with more individual sounds than he can readily recall and match as he is exposed to speech. If we bear in mind that no two persons articulate the same content in precisely the same manner, or that no person articulates precisely the same way twice even for the same content, we can appreciate the impairing implications of a precocious rigidity of sound categories. A child with such categorical involvement will be limited in his perceptual development for speech. He would, we conjecture, be considerably more impaired than would a child who can read only if the print type and size are the same as the first printed words to which he was exposed.

AUDITORY DISCRIMINATION FOR SEQUENTIAL CONTENT

Spoken utterance, as we indicated earlier, consists of sequences of sounds. The order in which they occur are in part determined by the phonemic "rules" of the given linguistic system. However unwittingly applied, unless we followed such "rules" which permit us to anticipate and to make correct guesses as to what we are hearing, it is extremely unlikely that any human being could literally hear (listen) and separately to identify each sound in a flow of utterance. Nevertheless, it is necessary to be a fast listener to keep up even with a slow talker.*

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* In an article by Liberman, A.M., Cooper, F.S., Shankweiler, D.P., and Studdert-Kennedy, M., "Perception of the speech code", Psychological Review, 74, 6, 1967, 431-461, the authors point out that "Speech can be followed, though with difficulty, at rates as high as 400 words per minute. If we assume an average of four to five phonemes for each English word, this rate yields about 30 phonemes per second ... Even 15 phonemes per second, which is not unusual in conversation, would seem more than the ear could cope with if phonemes were a string of discrete sounds" (p.432).

In essence, what the Liberman, et al, article points out is that the ear can actually perceive more than it can possibly hear. This apparent inconsistency is related to the perceptual processing of speech sounds as part of a sound decoding system which, as we indicated earlier, permits us to anticipate what we should be hearing, and in effect responding as if we did. For an expanded explanation, we recommend reading the provocative article by Liberman and his associates.

How fast must a child be able to listen, to resolve what sounds he is hearing and to keep the order of sounds in mind in order to perceive the flow of sounds as speech? Unfortunately, we cannot answer this question directly. We can, however, present some evidence on aphasic adults, as well as on aphasic children, which indicates that auditory discrimination for sequential events is impaired, and that there may be a generalized impairment for dealing with sequential events. We can also present some experimental evidence of how little time it takes for a normal perceiver to determine whether he is listening to two like events, or two different events, and if it is the latter, the order of presentation (reception and perception) of the events.

A rather common subjective response on first exposure to foreign language speakers is that they seem to talk much more rapidly than we do. However, after increased opportunity for hearing the foreign speakers, even though we may not understand them, they seem to be speaking more slowly. This, of course, is not what takes place. It is much more likely that with added exposure, we begin to "tune in" and, in effect, become "faster" listeners. Recent experimental evidence supports our subjective impression about the effect of experience on our auditory perception. Broadbent and Ladefoged (1959) report an experiment in which they were themselves involved as subjects. They report that the time required for them to discriminate pipp-hiss from hiss-pipp was reduced from 150 milliseconds (msec.) to 30 msec. after repeated trials of the task. Hirsh and Sherrick (1961) report that an experienced subject required an interval of 20 msec. to report correctly (75% of the time) the presented order when two events, a light and a sound signal, are presented repeatedly in the same order. In a later experiment Hirsh and Fraisse (1965) report that naive subjects required about 60 msec. for the same percentage of accuracy of performance when the discriminating decision had to be made on the basis of a single exposure of a light and a sound signal.

We have relatively few investigations on the ability of persons with verified brain damage in discriminating-sequencing tasks. The evidence, however, clearly indicates that cerebral pathology markedly impairs this ability. Efron (1963) compared a group of aphasic adults who had incurred left temporal lobe lesions with neurologically normal adults in their ability to make correct judgments as to the order of two 10 msec. sound pulses which were markedly different in frequency. Efron found that the neurologically normal subjects required approximately 50-60 msec. to make correct judgments as to the presented order of the sound pulses. In marked contrast, most of the aphasic patients required significantly more time, a few as much as a full second interval between sound pulses, before they could make correct judgments.

Lowe and Campbell (1965) performed an experiment with children much along the lines of Efron. The subjects ranged in age from 7 to 14 years, eight with aphasic (aphasoid) involvements and eight normals. The experimental serial order task required that the subjects indicate the order of two 15 msec. pulses, one at 2200 cps and one at 400 cps. The time interval between pulses was varied in order for the investigator to determine the minimum time separation necessary for the subjects to indicate the correct order of the sound pulses. "Correctness" was assumed when the subjects reached a level of 75% accuracy. The range of interval time for the normal subjects was from 15 to 80 msec., with a mean of 36.1 msec. The range for the aphasoid children was from 55 to 700 msec. with a mean of 357 msec. The time interval difference between the groups was significant at the .005 level.

We need to be cautious about generalizing and applying the results of the studies we have just reported to aphasic children. On the face of it, signals such as discrete sound pulses and light flashes would seem to present a much simpler task for discrimination and sequencing (time-order determination) than would speech signals. However, signals of this sort do not permit of anticipation and "decoding" as spoken utterance might. The impairment for discrimination-sequencing, however, especially the appreciably longer time interval needed between signals for aphasic adults and children to make correct responses, is in keeping with clinical impressions. Aphasic children, as well as adults, seem to improve in comprehension of speech when the speaker reduces his rate of utterance. It is possible that this improvement is related to a reduction in quantity (bits of language to be processed) per unit of time. Investigations involving speech signals and spoken utterance are needed to give us the understanding we need about the perceptual functioning and impairments of the brain damaged for speech.

DISCRIMINATION OF SPEECH SOUNDS: ISOLATED SOUNDS VS SOUNDS IN CONTEXT

McReynolds (1966) utilized operant conditioning to investigate the ability of aphasic and non-aphasic children for speech sound discrimination. She selected three pairs of sounds, /m/ and zh/ʒ /, /s/ and sh/ʃ /, and /v/ and /z/ on the basis of distinctive feature theory (Jakobson, Fant, and Halle) according to which differences between phonemes can be expressed by the number of units or features of difference between two sounds. Subjects were trained to the task and were given up to 300 trials to make ten consecutive correct discriminations. Only those subjects who succeeded were continued in the experiment proper. This required that the subject pull a lever to indicate which sound he was hearing. A correct choice was followed by a reinforcer, a bit of candy. An incorrect choice was left unrewarded. The experimental task was considered completed when the subject made a minimum of 16 correct responses out of 20 trials (80 percent correct), or completed 200 trials regardless of the number of correct responses.

In another phase of the McReynolds investigation, the subjects were limited to five presentations of the sound-lever association task for each sound, and provided with a total of 100 trials to reach criterion on each task. The results indicated that the aphasic children made 70 percent correct discrimination for sounds in isolation compared with 75 percent for the normal children. However, one aphasic child failed to reach criterion in 300 trials and was excluded from the experiment. The aphasic group as a whole required 1,640 trials compared with 1,040 for the normal children.

When the key sounds were embedded in context; e.g., hamak [hamak] vs hashak [haʃak], or havak [havak] vs hazak [hazak], the aphasic children had increased difficulty in their initial efforts compared with the normal children. However, with repeated trials, discrimination and association improved. Ultimately, the aphasic children made 61 percent correct responses based on 2,820 trials compared with 71 percent correct on 1,860 trials for the normal children. McReynolds notes that "Normal children not only perform more accurately within a fewer number of trials, but improve their performance more rapidly and more often than aphasic children". As a general observation, McReynolds notes " ... the aphasic child requires more time (more trials) to respond reliably to a discrimination between speech sounds. Consequently, if he is given an insufficient amount of time, he will in all likelihood respond erroneously with the result that he would appear to be impaired in auditory discrimination ability".

Rosenthal (1970) investigated aphasic children and normal controls in experiments designed to study aspects of auditory temporal perception. Specifically, the experimental tasks required the subjects to make decisions on temporal order for speech and non-speech signals. The subjects were eight aphasic and eight normal children, ranging in age from six to ten years. They were directed, after training, to indicate which member of a pair of auditory stimuli came first when the order of occurrences was randomly varied. Six different stimulus pairs were used: pure tone-noise; high tone-low tone; vowel "ah"-affricative "ch"; vowel "ah"-vowel "ee"; fricative "s"-fricative "sh"; and fricative "sh"-affricate "ch". These stimuli were selected in order to contrast certain characteristics of auditory signals - speech versus non-speech and frequency versus temporal coding of information.

Rosenthal found significant differences in performance between normal and aphasic children as well as between different stimulus pairs. Under all stimulus conditions the normal children exhibited superior performance as measured by the minimum stimulus interval needed to resolve temporal order; that is, to make correct decisions as to which member of a stimulus pair came first. The normal children also had a higher percentage of correct responses at various interstimulus interval durations. In general, the pattern of response was similar for both groups, with errors increasing as the interstimulus interval decreased. The errors were not related with stimulus conditions based on a speech-nonspeech dimension. Interestingly, the easiest pair for the aphasic children was the vowel affricate sequence; the most difficult pair was the fricative-affricate sequence. The respective mean minimum interstimulus interval was 64 milliseconds for the vowel-affricate (ah-ch) and 650 milliseconds for the fricative-affricate (s-sh).

When analogous speech and nonspeech pairs were compared (vowel-affricate versus pure tone-noise and vowel "ah"-vowel "ee" versus high tone-low tone), the temporal order of the speech pair members was more accurately determined than nonspeech at shorter interstimulus intervals. Peak differences between these analogous pairs occurred at interstimulus intervals below 200 milliseconds for the aphasic group and below 100 milliseconds for the normal group. Comparisons of the fricative "s"-fricative "sh" and fricative "s"-affricate "ch" conditions indicated that the former pair, the members of which are distinguished on the basis of spectral energy, was more easily processed by aphasic children. This trend was reversed for normal children, who more easily processed the fricative "s"-affricate "ch" pair, in which the members are identical in spectral or frequency composition but differ along a temporal dimension. This reversal was the only major difference in the pattern of responses between the groups.

The findings in Rosenthal's study indicate that aphasic children, even those who though linguistically retarded are not nonverbal, require more time than normal children to resolve temporal order for auditory stimuli. However, Rosenthal notes that "It is significant that 7 of the 8 aphasic subjects were able to resolve the temporal order of at least one stimulus pair when the interstimulus interval was less than 100 milliseconds. This suggests that in those children tested, the auditory system is capable of processing most of the acoustic segments which comprise the speech signal ... It seems likely that the auditory temporal disorder which is presumed to underlie childhood or developmental aphasia serves to retard language development, but not to prevent its emergence completely. However, in older aphasic children, it is evident only under experimental conditions which test the limits of the auditory system".

Restated in non-laboratory terms, we may observe that aphasic children are less efficient in auditory processing than normal children and continue, even after functional language is established, to be somewhat slower and less efficient listeners than normal children.

PERCEPTION AND INTER-SENSORY STIMULATION

Perceptual development of the infant changes from initial dependence on distance receptors. Birch and Lefford (1964, p.48) observe along this line:

> "In infants and young children, sensations deriving from the viscera and from stimuli applied to the skin surfaces appear to be predominant in directing behavior, whereas at these ages information presented visually or auditorily is relatively ineffective. As the child matures, the telo-receptive modalities assume an even more prominent position in the sensory hierarchy until, by school age, vision and audition appear to become the most important sensory modalities for directing behavior. Such hierarchial shifts are orderly and seem to be accompanied by increased inter-sensory liason in normal children."

Our emphasis for the present part of our discussion is on the development of intersensory reactions and perception in brain damaged children. Birch and Lefford (1964, pp.48-58) report the results of an intersensory study on a group of neurologically damaged (cerebral palsied) children. The sensory systems studied were vision, kinesthesis, and haptic (touch and active exploratory movement of the hand). The stimulus items were blocks cut out as geometric forms. The subjects were directed to judge whether simultaneously presented stimuli in pairs were the same or different. The same blocks were used as the visual and haptic stimuli. The findings for the brain damaged children were compared with those for normal children. Birch and Lefford note that for normal children, errors decrease with age for all conditions of intersensory interaction. For the brain damaged subjects, despite considerable variability, the overall finding was that "At the very least, the emergence of such relationships appears to be delayed in the 'brain damaged' children, a factor which may seriously limit possibilities for the normal utilization and integration of environmental information".

We cannot assume that developmentally aphasic children who do not show the hard-sign evidence of the cerebral palsied are equally impaired in their sensory-integrative functioning. The clinical evidence we do have suggests that some aphasic children tend to ignore auditory signals, but respond relatively well to visual signals. Almost all aphasic children perform much better on visual association tasks of the Illinois Test of Psycholinguistic Abilities (ITPA), (Kirk and McCarthy, 1968), than they do on auditory association. This, of course, is not an unexpected finding. If a child can perform up to or close to age expectation on the auditory tasks of the ITPA, he would not be aphasic. In clinical training which emphasizes visual perception in the early stages, aphasic children at the Stanford University Institute for Childhood Aphasia seem better able to accept and integrate visual plus auditory input than training approaches which begin with auditory discrimination. May (1967) utilized nonsense word discrimination; e.g., hathak vs hatak, and six-point random "nonsense" geometric forms, in an experimental investigation of auditory, visual, and combined discriminatory functioning. He found that auditory discrimination did not improve over 300 trials but remained approximately at 65 percent correct discrimination. In contrast, visual discrimination improved from initial chance discrimination (50 percent) to 80 percent after 300 trials. This improvement was found to be significant at the .10 level of confidence. Combined auditory plus visual discrimination (simultaneous presentation of forms and nonsense words) was at 78 percent after the first hundred trials and remained at this level after 200 trials. After 300 trials the combined modality discrimination improved to 85 percent correct performance. The May study was an experimental investigation which involved paired associate learning for two sets of artificial stimuli. It is different therefore from a "natural" situation in which a stimulus event may be recognized by its form as well as by its sound; e.g., a bell.

Wilson, Doehring, and Hirsh (1960) compared the performance of a group of 14 aphasic children who were classified as sensory aphasics with a group of non-aphasic children in an associative learning task. Specifically, the children were taught to associate four auditory stimuli which differed in quality and duration (a long tone, a short tone, a long noise, and short noise) with four visually presented letters of the alphabet. Eight of the aphasic children learned the task in about the same number of trials (fewer than 80) as the non-aphasic children. Six of the aphasic children failed to learn the task at the end of 80 trials. "The difference in learning ability within the aphasic group was unrelated to age, IQ, or amount of hearing loss." The investigator also notes that "Informal observation on further training of the children who had failed to learn the task indicated that they were able to make the required discriminations among auditory stimuli, and that their poor performance was the result of a specific difficulty in learning to associate four visual stimuli with four auditory stimuli".

Berry (1969, p.124) presents a possible explanation for some of the experimental findings and for the clinical observation that some neurologically handicapped children show impaired rather than enhanced perceptual functioning with multi-modality stimulation. "We know that neural assemblies in several receptor systems may use the same route; a child with CNS injury or deficit may be able to accommodate only impulses from one modality in a unit of time. In the normal child, on the other hand, the same neurones can participate in countless specific patterns of activity."

To summarize, aphasic children do not seem to show the severe degree of impairment for intersensory perception as do frankly cerebrally palsied children. Neither do they seem to do as well as normal children for integrating and perceiving multisensory events, and particularly for associating auditory and visual events. They seem to be more dependent and more proficient with visual input than with auditory input. Based on our clinical observation, aphasic children seem also to be able to accept auditory input when it is associated with the visual as the initially trained modality more readily than when training begins with the auditory.

LINGUISTIC PARAMETERS OF CHILDHOOD APHASIA

We have limited this paper so far to considerations of difference in perceptual processing which underlie and impair the acquisition of spoken language. We would like to turn now to an examination of the resulting linguistic systems of aphasic children. Specifically, we will discuss syntactic, morphological, and semantic aspects in the light of recent research.

The nature of the aphasic child's linguistic system has important theoretical implications. The question can be presented as follows: "Does the aphasic child follow the same development patterns in learning language as does the normal child?" If yes, we can say that the difference between the aphasic child and his normal counterpart is one of delay; i.e., that there is a quantitative difference. If, on the other hand, we claim that the aphasic child develops language in a different manner than does the normal child, then the difference is more than delay. Rather, it would be necessary to posit a different linguistic competence for the aphasic child, and argue for a qualitative difference.

There are several consequences in following one or the other of these positions. One concerns the preparation of materials for language training (therapy) with aphasic children. If it can be shown that the aphasic child follows a delayed version of normal language development, then language programs can be based by and large on what we know from normal language acquisition. If, however, the aphasic child uses unique linguistic formulations, our research will need to concentrate on these peculiarities and determine which route can be used so that ultimately he will arrive at the adult system.

Another important consequence concerns the issue of linguistic universals. Jakobson (1941) has emphasized the relationship between the dissolution of language in adult aphasia and the acquisition of language by children. The adult aphasic is assumed by Jakobson to lose features of his language in the reverse order that he acquired them as a child. Presumably, the universal aspects of language will be much more resistant to loss than the more idiosyncratic ones. This position extends itself without difficulty to childhood aphasia if we take the position that aphasia in children essentially represents a delay in language acquisition. It is not clear, however, what happens to the notion of linguistic universals when one assumes that there are qualitative differences. This position - the assumption of qualitative differences - implies that there are two kinds of language universals, those for normal people and adult aphasics, and those for aphasic children.

For the remainder of this paper, we will present research that has compared the linguistic systems of aphasic and normal children to answer the question "Do aphasic children develop language in the same stages as normal children?" Our position will be that present research indicates that the linguistic systems of aphasic children show linguistic delay rather than uniqueness, that the differences are quantitative rather than qualitative.

SYNTAX

The qualitative position can be contributed to Menyuk (1964) who was one of the first to compare the syntax of "linguistically deviant" children with normal children. Using 10 children in each population, she wrote transformational grammars for each child and compared the rules that each group used. From the comparison, she concluded that there was a qualitative difference:

> "From the results obtained the term infantile seems to be a misnomer since at no age level did the grammatical production of a child with deviant speech match or closely match the grammatical production of a child with normal speech from two years on ... Formally the grammatical usage of the two groups differed in that the children with normal speech used more transformations and the children with deviant speech used more restricted forms and used them much more frequently." (p.179-120).

She later updated her position (Menyuk, 1969) by using the Chomskyan distinction of competence (the internal rule system, the knowledge an individual has about his language), and performance (the use of the rules to speak, or understand what he hears). Menyuk argued that aphasic children manifested a different kind of linguistic competence than do normal speaking children.

Morehead and Ingram, in a paper which has not yet been published, are challenging Menyuk's position. In a similar study which they conducted, Morehead and Ingram compared the grammars written for 15 normal and 15 aphasic children. Rather than matching the groups on age however, as Menyuk did, they matched the groups on the linguistic measure of <u>mean length of utterance</u> (MLU). The subjects were placed in five arbitrary levels of increasing MLU to approximate increasing levels of sophistication. Morehead and Ingram found that at each level the aphasics demonstrated the same linguistic rules as the normal subjects. They conclude:

> "The major differences between normal and linguistically deviant children of comparable linguistic level were not in the organization or occurrence of specific subcomponents of their base syntactic systems. Rather, the significant differences were found in the onset and acquisition time necessary for learning base syntax and the utilization of an aspect of that system, once acquired, for producing major lexical items in a variety of utterances." (p.60).

This finding, which seems to contradict Menyuk's earlier conclusion, becomes compatible with it once a closer look is taken at the results of both studies. In both cases, the aphasic children manifest the linguistic rules of the normal children; i.e., they are similar in linguistic competence. Both studies, however, also found that the aphasic children used their rules significantly less frequently than the normal children. Consequently, the groups differed in linguistic performance, or the implementation of their internalized rules.

MORPHOLOGY

Morehead and Ingram observed differences in morphological development when they matched the subjects on mean length of utterance. The first level that they used was one which is usually referred to as the two-word utterance stage. The speech of children at this point is characterized by predominantly one- and two-word sentences. There was no difficulty in finding both aphasic and normal children at this level. This was not the case, however, for the subsequent level, one which was set for an MLU of 2-1/2 to 3 morphemes per utterance. The normal child, as is noted in various places in the literature, passes very quickly from the two-word utterance stage to three or more words per utterance. The two-word stage may last from two to six weeks but usually not much longer. Consequently, Level II was a transitory stage for the normal children. This was not the case for the aphasic population. For these children it was found to be a common and important level.

The linguistic analysis of both groups at this level revealed a difference in the use of morphological endings. The normal child at this period typically had two- and some three-word utterances with a virtual absence of grammatical inflection. The aphasic children, on the other hand, all used some grammatical inflections at this early level. Thus, while these children were delayed in their progress as measured by the length of their sentences in terms of using major categories, such as noun and verb, they nevertheless continued in their acquisition of inflectional endings on the words they were using.

SEMANTICS

The important ramifications of the difference found at Level II, however, go beyond the fact that aphasic children acquire inflections earlier than normals in relation to mean length of utterance. In recent years, child language investigators have noted that there are underlying semantic relations expressed in children's early speech. Bloom (1970), for example, has noted that the two-word utterance mommy sock, which consists of two nouns together, may represent two different semantic relationships. It may be "possessive + object" to mean "mommy's sock", and "agent + object" to mean "mommy puts on my sock". Consequently, there are important semantic relations that underlie children's early sentences.

Concerning the comparison between aphasic and normal children at Level II, it was found that both groups were using similar underlying semantic relationships. While the normal children very quickly passed from expressing two such relationships to three or more in an utterance, the aphasic children were limited by and large to only two semantic relations per utterance. This effect, based on a semantic rather than a syntactic phenomenon, led Morehead and Ingram to conclude that these children are probably not suffering from a syntactic deficit, but a more general dysfunction of those semantic-cognitive precursors that underlie language.

Ingram (1970) conducted a pilot study to compare normal and aphasic children on a cognitive feature of language to determine if the aphasic delay was the result of syntactic or semantic dysfunction. Specifically, he took the English question words what, where, who, how, why, when, and observed their occurrence in the spontaneous questions of 10 normal and 10 aphasic children. The normal children, between 2-1/2 and 3 years of age, showed three stages of question word usage: 1) what, where, 2) why, how, and 3) who, when. These stages appeared to be cognitive ones, based on the child's age rather than his syntactic development.

The 10 aphasic children were all between 5 and 10 years of age and, consequently, far beyond the age of 3 when all of these question words typically first appear. It was hypothesized that if childhood aphasia was primarily a syntactic deficit, the aphasic children would use all of the possible questions, but with reduced syntax. This, however, was not the case. Instead, the aphasic children showed the same cognitive stages as did the normal children. As in the Morehead and Ingram study, the results suggested a deficit in those semantic aspects that underlie language.

SUMMARY: A PROFILE OF THE APHASIC CHILD

Our clinical observations and recent experimental findings support the impression that aphasic children are impaired in their perceptual abilities for the auditory events that constitute speech. The basic impairments are manifest initially in faulty discriminations and categorizations and in slow evolvement of rules that govern language. The congenitally aphasic child, as he acquires and improves in his ability for speech sound discrimination, and develops a vocabulary of fifty or more words, does not begin to combine words into two-word utterances as does a normal child. He seems to need a lexical inventory of almost 200 words before he produces two-word utterances. He is slow in developing syntax, and remains at each syntactic level considerably longer than the normal child. We have some evidence to indicate that even when an aphasic child understands basic syntactical constructions, he does not employ them as readily and as often as does a normal child. As a general observation, we may state that up to age 9 or 10 there is a greater disparity between linguistic competence and performance for aphasic children than for normal children. A "typical" profile of a

9-year-old developmentally aphasic child who has received the benefit of two or more years of training would, on the basis of his productive language, reveal him to be at about the level of a 4-year-old child in his phonemic ability, at about the same level in lexical inventory, and perhaps at the level of a thirty-month-old child in his syntactical ability.

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