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that the disorder is specific to language, and is developmental or congenital rather than acquired.

B. Associated Characteristics (Inclusionary Criteria)

Although clinical definitions have tended to focus on exclusionary criteria, primarily for the purpose of differential diagnosis, research has focused on developing inclusionary criteria based on investigations which demonstrate profiles that are characteristic or associated with developmental language delay. Research in the field has focused on two main approaches: 1) investigating in more detail the receptive and expressive linguistic development of language impaired children (the psycholinguistic approach); and 2) investigating in these children perceptual, motor, and cognitive mechanisms that are presumed to be prerequisites for normal language development (the neuropsychological approach).

1. Linguistic Characteristics

Determining the patterns of language acquisition in LI children has been a major focus of research. The central questions to be answered are: 1) What is the nature of language acquisition in the LI child; and 2) Is language acquisition in the LI child merely delayed, or is it deviant as well as delayed? To answer these questions, the grammars of LI children must be characterized with respect to the linguistic representations and grammatical principles embodied in each linguistic component (phonology, morphology, syntax, and semantics) and at different levels of grammar (e.g., D-structure, S-structure, logical form, phonetic form). In addition, to determine patterns of grammar acquisition in the LI child, analyses of the internal changes in their grammar at consecutive stages must be carried out. Only through such analyses can the nature of language acquisition be ascertained. Such analyses require knowledge of linguistic theory, however; and for the most part, linguistic theory has not informed the description of language disorders in children. Rather, what has largely been documented are many linguistic phenomena associated with the language development of LI children. Descriptions converge to build a picture whereby certain phenomena are characteristically associated with language-learning in the LI child, and it is these that will be detailed below.

a. Phonology

In phonology, there are two main questions to be addressed: 1) whether LI children are using normal phonological principles in their acquisition; and 2) whether LI children are acquiring the language-particular facts of the target language (in this case, English). Most phonological studies of LI children have been concerned with the second question, and most of these deal with English-specific rules of allophony, phonemic distinctions, and syllable structure.

Numerous studies have examined the phonetic realization of segments and syllables in the speech of LI children (Compton, 1970; Ingram, 1976; Oller, 1973; Campbell and Shriber, 1982; Shriberg et al, 1986). The consistent conclusion was that LI children demonstrate, on the whole, nearly identical phonological processes as those found in the grammars of younger, normal children (syllable

and segment simplification and assimilation as reflected by cluster reduction, final consonant deletion, substitution of one stop for another or of stops for spirants, etc.). However, these studies are in general actually concerned with the phonetic specification of segments or segment combinations, and as a result indicate that the phonetic processes extant in the speech of LI children are normal. Unfortunately, they say little about their phonology, that is, for example, whether or not LI children are acquiring and making use of the actual phonological rules of adult English. Nonetheless, these studies suggest (albeit indirectly) that in many instances, underlying phonological representations of individual lexical items are normal.

A few studies stand out as exceptions in that they address the first question raised above (Camarata and Gandour, 1984; Leonard, 1985; and to a lesser extent, Leonard and Leonard, 1985). In the Camarata and Gandour study, the authors are able to show how, by utilizing a rather straightforward phonological analysis (in this case, that of examining the distributional facts for the occurrence of certain phonetic segments) what looks like an aberrant and unprincipled system on the surface can be revealed to be the output of a normal phonological rule, one that just doesn't happen to hold for English. In this case, the important distinction between the acquisition of language-particular facts versus what is a possible phonological rule is made. In the Leonard and Leonard study, the importance of looking at even word-level phonetic context in capturing the rules a child may be using is demonstrated. Although the authors do not appear to appreciate the larger theoretical context into which their findings could be placed (i.e., as evidence in support of the theory of CV or skeletal phonology and evidence to indicate that LI children, like normal children, appear to know and make use of phonological tiers in their language acquisition) once again they are able to make generalizations about data which, without consideration of contextual phonetic information, could not have been observed. In addition, as with the Camarata and Gandour study, Leonard and Leonard are able to suggest a rule in the child's system which can be motivated phonetically (as is the case with almost all known phonological rules) suggesting that normal underlying phonological principles are at play, even when the language-particular facts have not been mastered. Leonard (1985) proposes a specific mechanism to account for how both LI and young, normal children arrive at distorted productions of target words. Although he does not offer an explanation for phonological disorders, themselves, he argues convincingly for strong similarities between LI and much younger normal children in both their surface and underlying lexical phonologies.

While the above data suggest a delay in the phonological acquisition of LI children, an additional and important finding emerging from studies of their phonological development is that early acquired forms persist, or coexist in free variation with later acquired forms, over protracted periods of time (e.g., Lorentz, 1972; Edwards and Bernhardt, 1973; Salus and Salus, 1973; and to a lesser extent, Ingram, 1976). As the acquisition of new phonological forms presumably reflects changes in the grammar that should rule out the old forms, the coexistence of distinct and competing phonological representations is a phenomenon which potentially marks the phonological development of LI children as deviant. It suggests that LI children may be constructing grammars which tolerate a variance in representations which would be disallowed in the

normal course of acquisition. Such grammars might then be the result of ^{of a} normal acquisition processes. Free variation of competing forms might, however, reflect specific production difficulties rather than differences in grammar per se, and only the analysis of a variety of phonological phenomena over successive stages in phonological development can help to decide between these possibilities. The situation remains an unexplored but potentially critical area to investigate further in addressing the delay versus deviance issue.

b. Morphology

There are perhaps three primary questions to be addressed in this area: 1) Do LI children know the principles underlying word formation and acquire normal word-formation rules; 2) Do LI children acquire the word-formation rules of English normally; and 3) Does inflectional and other nonlexical morphology bear the same relationship to syntax and phonology in the grammars of LI children as it does in the grammars of normally developing children.

There are few, if any, studies that address the first two questions directly. Most studies in this area have examined the acquisition of specific morphemes and not knowledge of word formation per se. It is striking, however, that no study reports the creation of impossible (in the sense of not allowed by human grammars) word forms by LI children. Moreover, no study reports the use of noun morphology with verbs or vice versa. While English is a less than ideal target language in this regard, given its paucity of bound morphology and the phonetic isomorphism of many of the relevant forms which exist, the data on acquisition of nonlexical morphology in LI children suggest that their grammars embody both normal general principles and correct language-particular rules for word formation. Their use of inflectional morphology also shows consistent and accurate syntactic classification of both roots and inflectional morphemes.

Some work has been done examining the interaction of morphology with phonology in LI children (Smit and Bernthal, 1983; and Camarata and Gandour, 1985). Predictably, there is a clear interplay between the phonetic abilities of LI children and the realization of many morphological inflections. However, there are no data to suggest that morphology and phonology interact in an abnormal way in this population.

Most studies pertaining to acquisition of morphology in LI children have concentrated on the acquisition of specific morphemes, the order in which they are acquired, and the relationship between occurrence of particular morphemes in the speech of LI children and "grammatical stage" as defined by measures of utterance length. Ingram, (1972) Kessler, (1975) Johnston and Schery, (1976) and Steckol, (1976) for example, studied the acquisition of a predefined set of inflectional and freestanding grammatical morphemes on which there are considerable normal acquisition data. They examined the order in which these morphemes were acquired and the stage (determined by MLU or mean number of words per sentence) at which they appeared. In each of these studies, LI children appeared to acquire these morphemes in approximately the same order as normal children, but neither their earliest occurrence nor the point of mastery co-occurred with the same developmental stage as was the case for normal children. Typically, LI children produced specific morphemes at earlier stages

* particularly w/ respect to mechanisms of change from one grammar to the next (G_1 to G_2 , etc.).

than normal children, but did not control them until later stages. A somewhat more enlightened study (Johnston and Kamhi, 1984) reveals that LI children differ from normals in that the LI children tend to produce constructions requiring the use of more grammatical morphology, but then omit more of these forms in obligatory environments.

These studies, then, suggest that with respect to order of acquisition of non-lexical forms, LI children evidence normal acquisition patterns, but that with respect to the relationship between morphological acquisition and syntactic "stage," LI children may exhibit deviance. Here, as before, informed linguistic analyses are called for, however. Length of an utterance tells us little about its internal syntactic structure. Although MLU or MMU have been widely used as indices of grammatical development, acquisition in languages that have considerably richer morphological systems than English demonstrate the inadequacy of such measures rather clearly (e.g., Hyams, 1983; Berman, 1981). Children learning a language with an elaborate morphology such as Hebrew, German, or Italian, for example, use inflectional morphemes even in single-word utterances, that is, utterances with the simplest syntactic structures possible. Johnston and Kamhi also point out the inadequacy of MLU as a measure even when considering only rather syntactic factors. What is needed, then, are studies of the relationship between the acquisition of actual syntactic structures and acquisition of morphology, on the order of those carried out on normal acquisition (e.g., Hyams, 1983, 1986; Klein, 1985). Such analyses will determine whether particular changes in morphology (e.g., acquisition of the finite/infinite clause distinction, ~~linked to acquisition of tense morphology~~) Only then will we have direct evidence as to whether the acquisition of morphology in LI children is normal or not.

c. Syntax

The central questions to be addressed here are: 1) Do LI children appear to construct grammars embodying universal syntactic principles; 2) Do LI children show normal acquisition patterns in the instantiation of these principles for English; and 3) Do LI children show normal patterns for acquiring English-specific syntactic phenomena.

Studies in this area rarely address these questions. For the most part, they consist of taxonomic-type investigations of the syntactic forms used by LI children. Menyuk (1964) and Leonard (1972) found that LI children used "normal" NP, AUX, and VP structures, as well as structures involving embedded clauses (complements and relatives). Morehead and Ingram (1973) found that LI children on the whole used particular syntactic categories and structures less frequently than normal age-matched peers, but with the same frequency as normals matched for MLU. Johnston and Kamhi (1984) found LI children typically to have acquisition difficulties with grammatical markers in general.

Very few studies in this area have been guided by syntactic theory. Early exceptions undertook to perform early-version transformational grammar analyses on the speech of LI children, finding on the whole that LI children produced sentences that involved fewer distinct phrase structure and transformational rules than did normal peers (Morehead and Ingram, 1973; Menyuk, 1964; Lee, 1966). Researchers in this area have failed to utilize more current syntactic

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* are systematically linked to concomitant acquisitions in morphology.

theory, however, and syntax perhaps more than any other component of the grammar has been underinvestigated.

Two findings that have emerged nonetheless are worth noting. Both of them are reported in Lee (1966). In this article, among other things, she considers the fact that LI children frequently produce ungrammatical utterances. First, Lee observes that in many cases, LI children produce ill-formed sentences that result from using semantically appropriate lexical items whose syntactic requirements lie outside their syntactic competence. For example, children may use verbs like "guess" or "think," which require a sentential complement (in most cases) before their grammars can generate sentential complements. This may be a phenomenon that occurs in normal acquisition, as well, but the extent to which such potentially problematic asynchronies exist in the grammars of LI children may be abnormal and may provide an important clue regarding the character of grammar building in this population. A second noteworthy observation made by Lee is that LI children produce ungrammatical utterances consisting of word strings that appear to lack any internal syntactic structure. This raises the disturbing possibility that in at least some instances, long past the earliest stages of "beginning to talk," LI children may be constructing utterances outside the framework of a grammar. Since the examples Lee presents do not appear to be social formulas or other typically automatic or "extragrammatical" utterances, this phenomenon could be a marker of clearly deviant language development.

As the distinction between children with preschool language impairments and those evidencing school-age developmental dyslexia may be at least partially artificial, one study of adult developmental dyslexics deserves mention here. Kean (1984) conducted a linguistic investigation into the syntactic abilities (judgement, interpretation, and processing) of adults who were dyslexic as children. She found that the adult dyslexics failed to make correct grammaticality judgements for sentences involving construal of pronouns and anaphors and, in addition, incorrectly interpreted sentences involving certain kinds of referential dependencies. In both cases, the sentences causing problems for the dyslexics involved the Binding principles, syntactic constraints governing the interpretation and dependency relations of the different classes of noun phrases: R-expressions (regular nouns), pronouns, and anaphors (reflexives and reciprocals). What Kean found, therefore, was an anomaly or deficit in a specific aspect of syntactic knowledge. Although only a pilot study, her findings raise very specific questions concerning the syntactic abilities of this and other disordered populations. What is especially important about this work with dyslexic adults is that the generalizations concerning their performance could be made only through Binding Theory, part of current syntactic theory. Other generalizations concerning patterns in the performance of LI children will also be observable and characterizable only through a theory about the knowledge base in question.

Clearly, much more research on the syntax of LI children is called for. The essential questions in this area remain completely unanswered. For the most part, syntax in LI children has been taxonomized, not characterized. This is an unfortunate state of affairs, as an examination of the syntax of LI children may shed the clearest light on whether or not they have specifically linguistic deficits. However, there is no question that productive research in

this area, work which can uncover important generalizations about the syntax of this population, will have to be informed and guided by linguistic theory. Only then can basic questions concerning the LI child's acquisition of even the most fundamental properties of human syntax be addressed. Some of these questions are currently being studied as part of the NINCDS-funded San Diego Longitudinal Study of the Outcomes of Early Language Disorders (Tallal and Curtiss, 1980-1988).

d. Semantics

The major questions to be addressed in the area of semantics are: 1) Do LI children acquire a normal lexicon, wherein words are learned, represented, and used in a normal manner; and 2) Do LI children learn to map propositional meanings onto linguistic structures in a normal fashion.

Work on semantics in general suffers from the absence of a coherent theory of semantics or semantics acquisition. Therefore, the work on semantics in children with language disorders has proceeded in much the same fashion as equivalent work on normal language acquisition. Both of the above questions have been addressed, with a concentration on the acquisition of meaning relations between words and, more recently, acquisition of individual lexical items themselves.

Research into the acquisition of meaning relations in LI children has found that these children express the same range of thematic roles as do normal children. Freedman and Carpenter (1976) for example, found no differences between normal and LI children in the semantic roles they encoded in their utterances at the earliest stages of speech. Leonard et al (1976, 1978) also found no differences in the range of semantic roles expressed between LI children and age-matched normal peers, but did find differences in the frequencies with which specific roles were expressed when age-matched peers were used, with LI children tending to use earliest acquired semantic relations more frequently. These differences disappeared when language-matched peers were used for comparison.

It is difficult to know what to make of these findings. These studies examined only a relatively small set of possible semantic categories which may have left areas of difference unexplored. Moreover, the set considered may represent semantic primitives or primes, an unlearned, basic set of meaning relations. Evidence from Brown (1973), Bowerman (1973), Greenfield and Smith (1976) and many others studying the earliest stages of language production suggests that this may be the case, as even the youngest and least linguistically developed children in these studies express all of the semantic roles used in the above-mentioned studies on LI children. However, using a more extended set of semantic categories, including those of irrealis, intentionality, causative, obligation, and temporality, Curtiss and Tallal (1985) again found no differences between LI and language-matched normals on the range of categories expressed. Differences between groups also failed to show up when considering degree of unsemantic or semantically ill-formed propositions.

The expression of multipropositionality has, however, been shown to differen-

tiate between at least some LI and language-matched children. Johnston and Kamhi (1984) found that LI children expressed fewer logical propositions per utterance, even while producing utterances which were comparable in length to those of MLU-matched normals. This resulted from the increased use by LI children of simple progressive aspect and greater use of motion verbs whose obligatory arguments can be expressed within a single proposition. In the Curtiss and Tallal study, in contrast, there was a significant difference only between a particular subgroup of LI children and both the other LI children and the age-matched normals, on the extent to which they could express multipropositionality.

Recent studies have also examined the nature of lexical acquisition (e.g., Leonard et al, 1982; Chapman et al, 1983; Schwartz and Leonard, 1985; Camarata and Schwartz, 1985). To date, these studies are consistent in their findings. LI children appear to acquire lexical items in a normal manner. What is especially intriguing is the possibility raised by the findings of Leonard et al (1982) and Chapman et al (1983) that LI children may also acquire vocabulary at the same rate as normal children. A mismatch between a normal rate of acquisition on the one hand, and areas of lexical impairment on the other, may give rise to some of the production abnormalities noted in the lexical acquisition patterns of LI children (e.g., the concomitant use of early, semantically overextended words alongside semantically more restricted synonyms). This kind of lexical variation, where more advanced or fully specified lexical entries coexist and are used alongside less fully specified entries to express the same meaning, whether or not they arise as a result of a normal rate of lexical acquisition combined with more delayed lexical development in other areas, once again raises the possibility of deviance in the grammar. This, as well as all other areas of semantic representation and use, clearly needs further investigation.

e. Pragmatics

Although not technically part of the grammatical system, a major rule system interfacing with grammatical knowledge is the pragmatic system, the rules governing the use of language in context. In examining the nature of pragmatic function in LI children, the question of whether or not these children are more globally communicatively impaired can be addressed. In addition, in language development and mature use, form and function interact in important ways. It is of specific interest, therefore, to determine if children impaired in the acquisition of linguistic form are also impaired in the social and communicative functions of language.

Questions to be asked in this area include: 1) Do LI children exhibit normal patterns of communication; and 2) Are LI children able to use their linguistic knowledge in the service of communication in a normal fashion, that is, do they adequately and appropriately map their linguistic knowledge onto the rules of social discourse.

This area of investigation has seen a considerable growth in research attention. Prior to the last decade, the pragmatic abilities of LI children had yet to be explored. In the last decade, however, a multitude of studies

have been conducted on this general topic. The results to date are somewhat inconsistent.

One area that has been examined is conversational participation, that is, the ability to appreciate the reciprocal nature of conversation and to adequately and appropriately play both speaker-initiator and listener-respondent. Bartak et al (1975) found that unlike autistic children, LI children were quite skilled in their conversational participation, both as initiators and as respondents. Stein (1976), Watson (1977), and Sheppard (1980), on the other hand, found LI children to show somewhat restricted conversational participation, relying more heavily than other children on back channel devices. These findings indicate a lower degree of responsiveness and assertiveness in conversational interactions. Fey et al (1981), Jacobs (1981), Prelock et al (1981), Van Kleeck and Frankel (1981), Fey (1981), and Fey and Leonard (1984) support the early study by Bartak et al, finding that LI children do not exhibit deficits in conversational participation, especially when compared with children who are somewhat comparable linguistically. These latter studies reveal the importance of not confounding linguistic-pragmatic factors with factors such as age, cognitive maturity, personality, etc. They also point to the importance of separating the ability to perform certain pragmatic acts from the linguistic means with which those acts are performed. A more restricted range of linguistic devices for performing conversational acts may be expected in children who have linguistic deficits. They do not, in themselves, however, indicate pragmatic deficits. Curtiss and Tallal's (1985) findings from the San Diego longitudinal study support this contention. They found that the range of pragmatic acts children display in a conversational dyad can be extensive and comparable across LI and language-matched normals. Complicating matters somewhat, however, they also found that the degree of conversational initiative LI children display may depend on their particular performance strengths and weaknesses. Different expressive-receptive performance profiles were associated with different degrees of conversational initiative, which, it appears, may be more related to linguistic facility in handling particular situational contexts or tasks than to linguistic maturity, per se. What is more, this study suggests that pragmatic performance may change quite dramatically over time.

A second area of pragmatic function which has been investigated is the ability to regulate discourse, that is, the ability to provide feedback regarding your partner's communicative effectiveness. Watson (1977) found that LI children request clarification less than normal children. In contrast, Fey (1981) and Griffin (1979) report that LI children request clarification as often and use the same types of devices to do so. Most studies in this area, however, (e.g., Stein, 1976; Hoar, 1977; Gale et al, 1981) report that LI children are less versatile in the means by which they request clarification, consistently relying on the already given structure of the interlocuter's utterance to do so. These latter findings again point out the difference between linguistic limitations and pragmatic ones.

A third area of pragmatics studied has been speech act range, i.e., the set of functions that utterances are intended to serve. In general, findings in this area mirror those found in other pragmatic areas studied. When linguistic abilities are not considered (e.g., Geller and Wollner, 1976), LI children may

appear to be deficient compared to normal children. However, when linguistic and other potentially confounding factors are noted, no such deficits are found (e.g., Fey et al, 1978; Ball and Cross, 1981; Snyder, 1978; Curtiss and Tallal, 1985) although a more restricted set of linguistic means to express intention or function is again often noted.

Another pragmatic ability which, when investigated, has led to inconsistent results, is the ability to code switch, i.e., the ability to produce stylistic variations to suit the social situation. Fey and Leonard (1984) report that LI children failed to simplify their speech when talking to younger children. However, Shatz and Gelman (1973) and Sachs and Davin (1976) found that many young normal children also fail to make stylistic adjustments when talking to adults or babies. In contrast, Fey (1981), Fey et al (1981) and Messick and Newhoff (1979) found that LI children appropriately modify their speech to the age and status of their conversational partners.

The bulk of the evidence on pragmatic function seems to indicate that LI children are not globally, communicatively impaired. Specific task factors may give rise to the appearance of pragmatic deficits, but no pragmatic dysfunctions have consistently been demonstrated. As knowledge of pragmatic ability in the normal population increases, however, new areas to investigate are revealed. It may yet be the case, therefore, that LI children will be shown to have pragmatic deficits in addition to deficits in other areas already known to exist.

The studies of LI children detailed above reveal the important distinction between the mastery of rules of grammar on the one hand and the use or performance of this knowledge on the other. LI children differ from normal children and from each other in their ability to map their linguistic knowledge onto pragmatic acts. This distinction between linguistic knowledge and use is one that may be of major importance in characterizing the impairments that LI children display, as is made clear in considering the issue of linguistic subgroups.

f. Linguistic Subgroups

One finding that consistently arises in studies of LI children is that not all LI children perform similarly. Three subgroups are widely recognized, including: some LI children who comprehend significantly more than they produce (expressively impaired); some who speak remarkably well, given how poorly they perform on tests of comprehension (receptively impaired); and some who seem significantly impaired across the board, regardless of task or performance domain.

Although the three performance profiles referred to above define hallmark characteristics of LI children, key questions regarding the subgrouping of this population remain unanswered. For example, do LI children also fall into subgroups based upon nonlinguistic performance factors? (See Wilson et al, 1980 for a review of this area.) Are the classical subgroupings of LI children meaningful linguistically, that is, are the performance characteristics peculiar to each of these subgroups generalizable along grammatical lines? Are performance strengths and weaknesses, which define subgroup membership, con-

sistent over time, that is, are such subgroupings meaningful clinically?

Attempts to define subgroups along linguistic dimensions have recently been made (e.g., Nation and Aram, 1975; Wolfus et al, 1980). Such studies report a number of distinct patterns of linguistic abilities which distinguish among LI children and, thereby, suggest ways to define subgroups based on more detailed performance characteristics. Some of the results of these studies, however, are in conflict with each other. For example, in the Wolfus et al study, semantic performance did not correlate significantly with phonological ability, whereas the two areas did correlate significantly in the Aram and Nation study. Other results, though not conflicting, are difficult to interpret. For example, in both studies, syntactic production did not correlate significantly with semantic ability, but semantic and syntactic ability did correlate when receptive syntax was the relevant measure. Furthermore, both studies defined subgroups by performance mode deficits, yet the specific constellation of linguistic abilities correlating with these subgroups differed substantially in the two studies.

As part of the San Diego Longitudinal Study, Tallal and Curtiss (1980-1988), these questions pertaining to subgroupings are being investigated. Data from the first two years of this study yield some surprising answers (Curtiss and Tallal, 1985). In this study, LI children were classified into four subgroups, based on their standardized test performance at the time they were selected into the study: 1) receptively impaired, those children whose expressive language age exceeded their receptive language age by a minimum of four months; 2) expressively impaired, those children whose receptive language age exceeded their expressive language age by at least six months, but was within one year of their CA; 3) severely impaired, those children whose expressive and receptive language ages were both more than one year below their CA; and 4) mildly impaired, those children whose expressive and receptive language ages placed the child more than one year below his/her CA only when averaged together. All of the groups were compared each year longitudinally on their ability to comprehend and produce several different clusters of linguistic structures, each of which shared a particular linguistic structure or principle. There were two noteworthy results. First, the pattern of performance across clusters was the same for all of the subgroups. Even more interesting, however, subgroup 2 (the expressively impaired group) outperformed subgroup 1 on every cluster, regardless of the structural linguistic parameters involved. The quantitatively, but not qualitatively, different result obtained suggests that the impairment (or set of impairments) of both groups may be somewhat task-dependent and may lie principally in an area other than linguistic knowledge, per se, since the linguistic signal has the same properties regardless of which performance channels it must pass through. A major difference between these two groups, then, may be that subgroup 2's performance is enhanced or at least unimpeded by certain parameters of structured tasks, whereas subgroup 1's performance is compromised in the same circumstances. Second analyses point to the same conclusion.

In a second set of analyses, Tallal and Curtiss performed detailed linguistic and conversational analyses of free speech data from 30 of the LI children and 30 language-matched normals. The 30 LI children represented 10 children from each of the first three subgroups. First, detailed pragmatic analysis was

performed. The only significant difference found between subgroups was that in year 1 of the study, subgroup 1 (receptively impaired) showed significantly more conversational initiative than the other subgroups and the normal children. Aside from this difference, however, in the first two years of the study, the three subgroups did not differ significantly from each other, either in pattern or in level of communicative performance, across the numerous parameters evaluated. Second, in evaluating semantic performance, the use and appropriateness of 24 separate semantic roles or structures and semantic ability was examined. Despite the numerous opportunities for differences to be noted, only one significant difference between groups emerged. Subgroup 1 produced significantly more multipropositional utterances than subgroup 2. This was true in the first year (four-year-old) and second year (five-year-old) children in the study. Regarding syntactic performance, once again a rich variety of parameters were examined. At year 1 of the study, significant differences between subgroups were noted. Subgroup 2 used a significantly smaller range of syntactic structures than the other three groups, and subgroups 2 and 3 demonstrated significantly poorer control of syntactically complex structures and produced a significantly higher percentage of ungrammatical morphological and syntactic structures. By year 2 of the study, however, there were no longer significant differences between subgroups. Importantly, these results demonstrate that test performances which showed large expressive language differences between the different subgroups of four-year-old LI children did not translate into significant differences in syntactic, semantic, or communicative performance in spontaneous speech by age five. Moreover, even during the first year of the study, few differences between subgroups emerged, except in the area of syntax. These results again suggest that something other than knowledge of the linguistic system, per se, may be what is differentiating LI children so consistently into subgroups on the basis of standardized test performance. In support of this interpretation is the fact that ^{*}production of specific linguistic structures was successful (well-formed) on one production task (sentence completion, for example), but unsuccessful (ill-formed or omitted) on another (spontaneous speech). Such differences appear to be related directly to the capacity to handle task-specific features, that is, to couple linguistic knowledge with particular linguistic ^{processing} requirements. Furthermore, although some children succeeded more often with sentence completion than on spontaneous speech, while others performed in the opposite pattern, children within the same subgroup generally appeared to perform similarly. These results are consistent with the hypothesis that the classical subgroupings of LI children relate to psycholinguistic and neuropsychological impairments in this population, rather than to factors pertaining to their acquisition of linguistic knowledge. These unexpected data, implicating neuropsychological rather than linguistic deficits as the potential basis of these classically recognized subgroups of LI children, make it imperative that we take even more seriously hypotheses that characterize LI children as having neuropsychological rather than linguistic deficits.

2. Neuropsychological (Perceptual/Motor) Characteristics

There is no doubt that LI children have difficulty with various aspects of linguistic processing and/or production. Deviation in the development of linguistic performance may be attributable to difficulty acquiring higher order semantic or syntactic rules. However, it is also possible that linguistic

*in many instances, performance with a particular linguistic structure varied, even within the same performance modality. that is,

entities. This is evidenced by the separation between professionals serving language impaired and reading impaired children, both in their clinical and their theoretical training. Whereas speech pathologists and audiologists serve language impaired children, special educators and reading specialists serve reading impaired children. Conferences on developmental dysphasia (developmental language disorders) rarely include papers on developmental dyslexia (reading impairment) and vice versa. Significantly, even the National Institutes of Health have two separate agencies for overseeing research on these populations. Whereas language impairments (aphasia) fall under the auspices and responsibilities of the NINCDS, research on reading impairments (dyslexia) falls within the domain of the NICHD. Similarly, the DSM-III classifies developmental language and reading disorders separately. The results of longitudinal research studies, however, clearly demonstrate that it may be the age of the child rather than the neurological basis that differs between developmental language and developmental reading disorders. Continuing to separate these developmental communication disorders ultimately fails the many children who "progress" from language to reading impaired. Although not all reading impaired children have concomitant oral language deficits, (Tallal et al, 1986) these research suggest that a very high percentage of LI children have some degree of delayed reading acquisition. It is suggested that to continue to separate these disorders potentially impedes progress toward the eventual treatment and prevention of these communication learning disorders.

4. Cognitive Characteristics

For more than 20 years, LI children have been operationally defined as having normal nonverbal intelligence and normal cognitive capacity. The conclusion that LI children had normal nonlinguistic cognition probably arose because, in order to make differential diagnoses of specific language impairment, as opposed to mental retardation, children had to perform within normal limits on nonverbal portions of standardized intelligence tests. Research on this point remains controversial, however, with some studies suggesting that LI children may exhibit deficits and/or delays in nonlinguistic areas of cognition, and others refuting this interpretation.

LI children have demonstrated difficulties with many different nonverbal aspects of cognition: means/ends knowledge, that is, what children do to obtain objects or to cause actions (Snyder, 1978); interpreting and drawing inferences from visually depicted events (Mackworth et al, 1973; Otto et al, 1973); classification (Johnston and Ramstad, 1978); figurative thought (thought involving visual mental representations), including haptic problem-solving, seriation, and mental rotations (Kamhi, 1981; deAjuriaguerra, 1976; Weismer, 1983); rule and hypothesis formulation (Kamhi et al, 1984); and short-term memory processes, especially with respect to parameters relating to memory capacity (e.g., Kircher and Klatzky, 1985).

On the basis of this and other research, some researchers have hypothesized that LI children do not have a selective language deficit, but have a more general representational deficit which underlies both their linguistic and nonlinguistic difficulties (Morehead, 1972; Morehead and Ingram, 1973; Inhelder, 1966, 1976; deAjuriaguerra, 1976). The finding that LI children exhibit deficits in representational abilities across a range of tasks and at

different points in development is consistent with such a view. Such deficits could explain some of the specific impairments noted in the language development of this population. For example, the delay in speech onset, the protracted rate of lexical acquisition, the impoverished range of semantic functions and relations expressed, and the limited propositional complexity of speech could all be the linguistic reflections of representational and conceptual impairments. Moreover, a deficit in rule formulation and hypothesis testing could have equally significant negative consequences for language acquisition.

Such conclusions are premature, however. First, many investigations of nonlinguistic cognition in LI children have failed to find any such deficits in this population. (See Stark et al, 1983, for review.) Studies of the symbolic play of LI children have produced equivocal results (e.g., Lovell et al, 1968; Terrell et al, 1984) as have investigations of operative thought (e.g., Inhelder, 1966; Johnston and Ramstad, 1978). In addition, several of the studies cited above, which purported to find evidence of nonlinguistic cognitive deficits of LI children, presented data from which alternative conclusions could easily be drawn. For example, Johnston and Weismer (1983) concluded that LI children possess an impairment of visual imagery, even though these children did not differ significantly from control children either in the accuracy of their judgements, or in the number of training trials needed to reach criterion on a mental rotation task. The LI children did respond significantly more slowly on the task, implying simply that such children were motorically slow. In another study, Kamhi (1984) concluded that LI children evidence deficits in hypothesis testing ability and in nonlinguistic symbolic abilities. The data simply do not support these conclusions. LI children performed normally on a concept acquisition task and on a discrimination learning task (in terms of number of trials needed to reach criterion). However, significantly more LI children than controls were unable to verbalize the correct solution to this latter task, hardly a surprising result given that these are, by definition, language impaired children. The LI children also performed significantly worse on a haptic recognition test, from which the authors concluded that such children possess a general problem with symbolic representation. Clearly, a more parsimonious explanation for these data would be that the LI children have a problem with cross modal sensory integration (in this case, tactile sensation-visual recognition) as reported by Tallal et al (1981).

Second, both theoretical linguistics and psycholinguistics support the contention that linguistic and nonlinguistic rules and representations may differ considerably (e.g., Chomsky, 1980; Curtiss, 1982, in press; Demopoulos and Marras, 1986). Therefore, there is no a priori reason to assume that a child with linguistic representational difficulty would necessarily also have nonlinguistic representational difficulty.

Third, not all LI children evidence nonlinguistic deficits; in almost every study cited, at least some of the LI children performed normally on nonlinguistic, cognitive measures. This indicates that LI children do not comprise a single, homogeneous population. Therefore, the fact that many LI children manifest a range of developmental dysfunctions which could impair their language acquisition does not preclude the possibility that a subgroup of these children have a truly selective linguistic deficit.

There is currently no conclusive evidence as to whether the various cognitive deficits that LI children demonstrate stem from a single underlying impairment, or whether they are causally related. However, an investigation into possible relationships between the linguistic and nonlinguistic cognitive deficits in these children would be germane to at least two important issues in the cognitive sciences: First, are language, mental imagery, and other symbolic abilities separate faculties of mind, embodying distinct cognitive principles, or are they different manifestations of a single set of cognitive principles? Second, which perceptual and/or cognitive abilities are prerequisites for language acquisition? Because the LI child commonly shows perceptual as well as cognitive deficits, a rigorous examination of linguistic, cognitive, and perceptual function, in the same impaired population, could provide crucial evidence on the fundamental relationships between language development and aspects of cognition and perception which are not strictly linguistic. The first such study, wedding linguistic, cognitive, and neuropsychological investigations of the same population, is currently underway as part of the San Diego Longitudinal Study (Tallal and Curtiss, 1980-1988).

5. Social-Emotional Characteristics

Investigating the role that language may play as a mediator in emerging social and emotional development in children has occupied a central position in the field of developmental social cognition. With the development of language, it has been suggested that the child gains a new and powerful means of classifying logical connections and developing reasoning skills that enable him/her to differentiate emotional and conceptual domains and gain mastery within them (Hasaibi and Breuer, 1980).

Thus, it might be expected that serious developmental language impairment could have a profound impact on social and emotional development. Indeed, LI children offer a unique opportunity for evaluating the potential relationship between emerging language (or lack thereof) and social and emotional development. However, despite the potential for studying this important developmental issue, until recently few empirical studies of the social and emotional status of LI children have been reported. This is obviously a fruitful area for continued research.

The studies of Cantwell et al, 1980, and Baker et al, 1980, provide perhaps the most comprehensive review and new information on the relationship between speech and language disorders and psychiatric disorders in children. These authors report the results of a comprehensive psychiatric evaluation of 100 consecutive cases of children seen in a community speech and hearing clinic. Psychiatric diagnosis of this cohort revealed the presence of a diagnosable psychiatric disorder, according to DSM-III criteria, in approximately 50 percent of the group studied. It is important to note, however, that included as "diagnosable psychiatric disorder," were diagnoses of developmental disorders such as reading and math deficits and attention deficit disorder. Baker et al (1980) reported a differential degree of these disturbances in children with various linguistic profiles. Children with speech articulation problems, without concomitant language disorders, were found to show the least prevalence for these DSM-III diagnoses. Children with speech and language dis-

A. Language Testing

When children are brought into a clinic because of a suspected language-learning problem, the first order of priority for the clinician is to determine whether or not a speech or language problem exists, and to characterize the problem if one does exist. To accomplish this task, systematic methods for assessing or in some way "measuring" speech and language are required. For many years, language sampling procedures were relied upon, but in the last 25 years an abundance of formal language assessment instruments have been developed and become available for this purpose. Some of these tests focus on the assessment of abilities hypothesized to underlie or be requisite to language acquisition (e.g., auditory perception and memory, representational gesture, etc.) rather than on speech or language itself. Some tests focus on particular speech or language abilities and/or modalities of performance (e.g., articulation, receptive vocabulary, comprehension of syntax, expressive morphology). Still others have a more comprehensive focus, testing different components of linguistic knowledge across performance modalities (e.g., production and comprehension of vocabulary, morphology, or syntax). Some of the more well-known and widely used tests include the Illinois Test of Psycholinguistic Abilities (ITPA; Kirk et al, 1968), the Peabody Picture Vocabulary Test (PPVT; Dunn, 1959), the Berry-Talbot Exploratory Test of Grammar (Berry, 1966), the Assessment of Children's Language Comprehension (ACLA; Foster et al, 1969), the Northwestern Syntax Screening Test (NSST; Lee, 1970), the Test of Linguistic Development (TOLD; Newcomer and Hammill, 1977), the Test for Auditory Comprehension of Language (TACL; Carrow, 1973), the Carrow Elicited Language Inventory (CELI; Carrow, 1974), the Token Test (De Renzi and Vignolo, 1962), and the Clinical Evaluation of Language Functions (CELF; Semel and Wiig, 1980).

There is seemingly no lack of tests for the clinician to use. Indeed, such tests continue to proliferate. The use of these tests is routine and assumed essential for the identification and diagnosis of language disorders. Careful examination of tests currently available, however, reveals serious shortcomings from both a psychometric and a theoretical linguistic perspective. McCauley and Swisher (1984), Spekman and Roth (1984), and Lieberman and Michael (1986), for example, point out numerous test flaws across a wide range of speech and language tests, flaws which hold true equally for tests not examined by these authors. Serious psychometric flaws include, for example, inadequate normative samples and test reliability, and failure to achieve a test validity in most if not all respects. Most serious among inadequacies are a failure to demonstrate construct validity--the degree to which a test measures the theoretical construct it is intended to measure--content validity--the extent to which, when judged by an expert the test provides relevant information about the behavior being tested--criterion-related validity--the degree to which performance on the test in question is related to some other measure of the behavior being assessed--or reliability--the consistency with which a test measures a given behavior or ability.

Inadequacies in content and construct validity translate, in linguistic terms, into the absence of a theoretically grounded approach for analysis of linguistic abilities. The consequence of using an assessment instrument whose design is not informed by any theory of language, is that it is difficult if not im-

possible to know what the information gathered from such assessment means. Unless the practitioner using the test has the necessary expertise to construct the larger picture, as it were, a child's test scores, even details or profiles of test performance, may leave most questions concerning the child's disorder unanswered. This shortcoming on the part of most available language tests is reflective of a problem for the field in general, which, in large part, has proceeded uninformed by linguistic theory. In spite of the large number of language assessment tests currently on the market, there is still a need for new, carefully designed, theoretically grounded language tests which can differentiate a child with a language disorder from a linguistically normal child by virtue of either a significant developmental delay in linguistic growth, or an abnormal pattern of linguistic growth. Such tests will need to be comprehensive in scope, testing each component of linguistic knowledge (semantics, morphology, syntax, phonology) across linguistic activities and performance modalities, in ways that are appropriate and relevant for all the years of language acquisition. They will also need to reveal not only level of performance, but detailed patterns of performance, such that the acquisition of specific linguistic rules and general principles of grammar are both revealed. There is also a need for tests to assess the ability of the child to make use of her/his linguistic knowledge in the service of communication.

Finally, it cannot be over emphasized the importance of valid, reliable standardization of language tests across large populations of children. Because both the pattern and time course of language has been shown to differ dramatically in normally developing children (See Stark et al, 1982, for review.) it is essential that appropriate norms be established if reliable diagnosis of language impairment in children is to be made. Based on these norms, critical decisions pertaining to school placement and treatment are made that will potentially affect the child's ultimate development. It is a disgrace that these essential decisions are currently being made based on tests which lack validity and reliability and are so poorly normed. Only with psychometrically valid tests that are both broad and in-depth in their investigation of communicative and linguistic function and that are based on well-established normative data can a language disorder be adequately identified or characterized.

The validity and reliability of different test procedures (imitation, sentence-completion, object manipulation, picture-pointing, etc.) for revealing a child's linguistic or communicative competence is also a much discussed and important topic. The issue involves whether or not a particular task may consistently incorrectly estimate a child's linguistic abilities, perhaps because of memory or other processing factors involved in the task or because of the non-linguistic cognitive load it imposes. We will not enlarge upon these questions here, but for some interesting and informative discussion on this topic, see, for example, Slobin and Welsh, 1973; Prutting et al, 1975; Daily and Boxx, 1979; Connell and Myles-Zitzer, 1982; Lust et al, in press; and Hamburger and Crain, 1982, 1984.

Despite the numerous problems with testing and available tests, the clinician must nonetheless make an evaluation of a child's language. The importance of including a language sample as part of the assessment procedure is now widely recognized, and in the hands of a skilled practitioner, can be used to great benefit in evaluating, at a minimum, the expressive language and communicative

performance patterns of a child. This must be used in conjunction with a well-designed formal language test. A promising, soon-to-be-published candidate, which has been used very successfully in the San Diego longitudinal study and which is currently being normed with LI and normal children between the ages of two to nine years as part of this study, is the CYCLE (Curtiss and Yamada, to appear). Articulation tests, and other carefully designed and relevant non-language perceptual, motor, memory and cognitive tests, also must be included in the diagnosis of language disorders. Test development and standardization based on the principles discussed in this section is also critically important for assessing associated characteristics of LI children in a reliable manner.

B. Differential Diagnosis

Once it has been established that a child is delayed in language development, it is important to determine whether the language delay is the primary disability or the symptom of a more primary developmental disability such as hearing loss, mental retardation, deformity or paralysis of the oral musculature, or autism. Assessment by an audiologist, child psychologist, speech pathologist, pediatric neurologist, and psychiatrist are in order to rule out these other disabilities as the primary cause of the language disorder. Again, standardized, valid and reliable procedures are needed for assessment of hearing, oral-motor integrity, and psychiatric disturbance in young children. These areas will not be discussed in detail in this report. However, due to its importance to the appropriate differential diagnosis of developmental language disorder, particularly as it is differentiated from mental retardation, issues pertaining to intelligence testing of potentially LI children will be discussed.

Specific developmental language delay is, by definition, a disorder that is specific to language development and thus must be differentiated from more general mental retardation. Therefore, it is essential that in addition to demonstrating that language abilities of a child are significantly below that which would be expected based on his/her chronological age, it is important to establish that they are also significantly discrepant from that which would be predicted based on the child's mental abilities. Thus, the child who demonstrates language and general cognitive abilities that are both significantly, but equally, behind her/his chronological age would not fit the diagnosis of specific developmental language impairment, as language in such cases cannot be demonstrated to be discrepant from other mental capacities. It is, therefore, critical that the assessment of intelligence and language not be confounded. That is, for children suspected of language disorders, intelligence tests that have been developed to assess intelligence without the need for understanding complex verbal instructions or for giving verbal responses must be utilized. For a child with specific developmental language delay who is given an auditory verbal, language-loaded intelligence test such as the Stanford-Binet (Terman and Merrill, 1973), the McCarthy Scales of Children's Ability (McCarthy, 1970) or the Peabody Picture Vocabulary Test (Dunn, 1959), the resultant IQ score will reflect the child's language disorder, not necessarily the child's cognitive abilities. According to Wilson (1986), the LI child may do very well with visually mediated cognitive and visual-constructional tasks, but a measure such as the Stanford-Binet IQ score, which is heavily verbally loaded, does not appropriately reflect such a child's cog-