THE DEVELOPMENT OF LANGUAGE STRUCTURE IN
CHILDREN WITH DOWN SYNDROME*

Anne E. Fowler

I. INTRODUCTION

Studying children with Down syndrome (DS), Lenneberg (1967) would argue, should be a wonderful way to study language development. Rather than tracking the rapid progress of non-handicapped children through developmental stages, one could choose a level of interest and examine it at a leisurely pace, for exactly the same effect. Despite substantial delays in the onset and timing of language development, the language structures that are acquired by children with DS have standardly been described as normal, unremarkable in the sequence of their development, and with no evidence of deviant forms not observed at some point in normal development (Bloom & Lahey, 1978; Evans & Hampson, 1968; Rondal, 1975; Rosenberg, 1982; Ryan, 1975).

The evidence presented here does not challenge this standard view; like prior investigators we find no evidence for aberrant constructions in children with DS. The aim here is to move beyond the descriptive account of “delay without deviance” towards a better understanding of the nature and extent of the language delay associated with Down syndrome. In this paper, I argue that much of the confusion and heterogeneity generated in this early research can be—indeed has been—alleviated by a more sophisticated developmental approach to designing and interpreting language studies. Recent studies have begun to yield consistent and coherent conclusions regarding the course of language learning in children with DS by acknowledging or removing the variability


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contributed by chronological age (CA), by the particular component of language being studied and by the language level at which the child is functioning—factors hypothesized to be important in normal language development. By teasing apart these factors, which have all too often been grouped together in the past, a developmental approach to the specific case of Down syndrome not only provides us with a much sharper descriptive picture than any alternative approach, but also allows us to move beyond description to shed light on the process of learning language in nonhandicapped populations.

II. THE “STANDARD VIEW”

To set the stage for the discussion of language in children with DS, I will first briefly review the general conclusions derived from the voluminous literature concerning the effects of mental retardation (MR) on language learning, without regard to etiology. Despite the enormous variability inherent in these studies in terms of subject population, experimental procedures, and level of language under study, there is much agreement that MR language is similar in kind to that of normals, differing only in a delay at least commensurate with the degree of retardation. (See Cromer, 1974; Rondal, 1975; Rosenberg, 1982; Ryan, 1975, and Yoder & Miller, 1972, for extensive reviews.)

A review of the literature on spontaneous usage suggests that MR children use the same structures as younger non-MR children and even talk about the same things with the same basic vocabulary. They appear to learn language facts in the same order as non-MR children and, as has been noted in virtually every published study, the order of difficulty on any given set of task items parallels that observed normally. For example, inasmuch as syntactic complexity does arise in MR populations, it appears to follow a pattern of increasing difficulty mimicking the normal course of syntactic development. (See Lackner, 1968, for a particularly influential study in this regard.)

In studies of comprehension, as in spontaneous production, the order of difficulty posed by various tasks and grammatical constructions remains comparable for MR and non-MR children (Graham & Gulliford, 1968; Lackner, 1968; Lovell & Dixon, 1967). Indeed, two quite sophisticated studies suggest that MR children rely on strategies for comprehending sentences that are directly analogous to strategies evident in early stages of language development (Dewart, 1979; Duchan & Erickson, 1976).

In experimentally-controlled elicitation tasks in which children are asked to produce or repeat a target utterance, MR children and non-MR children make similar kinds of errors, reductions, and deletions and show comparable effects of the grammatical structures being manipulated (Anastasiow & Stayrook, 1973; Berry, 1976; Rondal, Lambart & Sohier, 1981). For example, both groups find it easier to imitate simple active affirmative sentences than sentences that are passive, negative, or embedded (Berry & Foxen, 1975). Indeed, even in highly self-conscious morphological cloze tasks (“this is a dish, here are two ___,” Berko, 1958), which prove very difficult in absolute terms, both the order of difficulty and the error patterns observed in MR children fit expectations derived from normal developmental research (Dever & Gardner, 1970; Newfield & Schlanger, 1968).

Finally, looking across tasks also reveals a similar order of difficulty across groups of children. Both MR children (Graham & Gulliford, 1968; Lovell & Dixon, 1967) and non-MR children
(Fraser, Bellugi, & Brown, 1963) find it easier to repeat a construction verbatim than to produce it in a controlled elicitation procedure.

In sum, in studies looking at qualitative features of MR language, it is of great significance that there is no positive evidence for novel grammatical systems or comprehension strategies defying the normal pattern of acquisition (though see Cromer, 1972, and Fowler, 1984, for some suggestive evidence otherwise).

Despite these well-documented commonalities across MR and non-MR children, there is considerable variability in the findings particularly with regard to degree of language delay. Extreme delays in the MR child have occasionally even led some investigators to raise the possibility of deviant language systems (e.g., Haber & Maloney, 1978; Naremore & Dever, 1975). Conclusions regarding the extent of delay appear to vary depending on the age and etiology of the subjects, the task and language area under study, and the actual analysis employed. While some carefully selected samples of MR children acquire syntactic skills commensurate with MA expectations (cf. Kamhi & Johnston, 1982, and Lackner, 1968), most MR children lag behind their mental age counterparts (e.g., Naremore & Dever, 1975). Studies looking at quantitative factors stress the differences between MR and non-MR language; those looking for qualitative differences stress the commonalities. In general, studies relying upon spontaneous speech samples stress qualitative similarities; those with less natural, more self-conscious tasks with pre-determined expectations (cloze tasks, Berko tasks, and elicited repetition) tend to stress large differences in absolute level of skill (Bartolucci, Pierce, & Streiner, 1980, as opposed to Lovell & Bradbury, 1967). The area of language being focused upon also bears heavily upon one's conclusion regarding degree of delay.

Studies relying upon vocabulary measures find MA to be a good predictor except at abstract levels (see Rondal, 1975, and Rosenberg, 1982, for summaries); those relying upon grammatical measures find a greater lag, such that the constructions produced by MR children are less grammatical and often less complete or "complex" than those of MA-matched controls (e.g., Goda & Griffith, 1962; Lyle, 1961; McLeavey et al., 1982; Naremore & Dever, 1975; Ryan, 1975). Such a disparity between grammatical and lexical knowledge appears to hold up across both production and comprehension. Although comprehension skill, in particular, is very often assessed by a single undifferentiated measure confounding vocabulary size, sheer memory demand, and syntactic difficulty, those studies that do distinguish between structural markers (e.g., tense, number, negation) and open-class vocabulary suggest that there may be a relative sparing of lexical/semantic skill in MR children. Grammatical knowledge is overall extremely limited, and it appears to lag further and further behind lexical knowledge as chronological age increases whether the task is comprehension (e.g., Bartel, Bryen, & Keehn, 1973), or production (e.g., Bliss, Allen & Walker, 1978; Ryan, 1977).

Because of these influences of language level, language area, and language task on performance level, in discussions concerning deviance in MR language, what appears to be disagreement may be more a matter of terminology than of contradictory results. Although, as stated above, no study has provided positive evidence for deviance in linguistic strategies or structures, some studies have claimed deviance due to the absence of a structure or strategy that is present in the normal developmental sequence (e.g., Haber & Maloney, 1978; Naremore & Dever, 1975). For example, although non-MR children go through a stage in which their language lacks inflectional markers, one might wish to term deviant a system in which such markers never developed. In such cases, it might better be claimed that MR language is deficient rather than deviant inasmuch as it
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is characterized by delays far exceeding what might be expected on the basis of general cognitive measures. As hinted at in this short review, in the remainder of this paper it will prove critical to distinguish carefully between language areas and to keep in mind the particular task and language level under investigation. In addition, by looking at a well-defined subgroup of MR individuals, it will be possible to remove much of the variability contributed by etiology, chronological age, and intellectual level that confounds research on more heterogeneous groups. Thus, we may ask, in children with DS, what of language learning remains consistent with the normal learning process, and what influence does the syndrome exert uniquely regarding specific areas of difficulty, the extent of difficulties observed, and the actual course of acquisition.

III. CHILDREN WITH DOWN SYNDROME: A SPECIAL GROUP WITH REGARD TO LANGUAGE?

For as long as people have been studying language in MR children, there have been language studies focusing on children with DS specifically, either side by side with a more heterogeneous group (e.g., Lyle, 1960, 1961) or standing alone to represent retardation in general (e.g., Lenneberg, Nichols, & Rosenberger, 1964). Despite this long-standing interest, conclusions vary widely regarding whether or not Down syndrome warrants special attention, whether language associated with DS differs in important ways from language associated with retardation generally. For example, in an overview of studies conducted in the 1950's and early 1960's, Evans and Hampson (1968) concluded that there was no pattern of language acquisition unique to children with DS. They reported that first words could appear any time from one year to six years of CA, and first sentences any time from one year to 17 years CA. There appeared to be little correlation between IQ and language level (see also Lenneberg, Nichols, & Rosenberger, 1964). And, except for a generally higher incidence of articulatory and voice defects, there was no consistent relationship between how children with DS compared with other MR groups of children. On the basis of these findings, they argued that further research specifically directed to language in individuals with DS would be unrewarding. (See also Bloom & Lahey, 1978, and Rosenberg, 1982.)

In fact, however, research focusing exclusively on individuals with DS consistently reports a large discrepancy between measured language skill and MA-based expectations. In the same paper quoted from above, Evans and Hampson (1968) noted that the "worst" area of development in individuals with DS is language and that they lag behind MA-matched non-MR controls in language development by as much as 50%. Although the definitions of "verbal" and "nonverbal" are often quite general and vary from study to study, a large body of evidence points to a delay in speech relative to traditional motor, intellectual, and social indices (see Gibson, 1978, for a comprehensive review). To cite but one example, using the Stanford-Binet to assess the skills of five- and six-year-old children with DS, Thompson (1963) found that not one child in 29 had language skills that were qualitatively on a par with his overall MA score; these children were most advanced in motor development and were often more mature on the Vineland Social Maturity Scale than on the Stanford-Binet. The language delay is also evident over time, as seen in a long-term longitudinal investigation of home-reared children with DS followed from birth. Share (1975) reported that, throughout childhood, development performance on language measures was well below motor and personal/social skills, as assessed by Gesell developmental norms. Several recent studies of very young children also suggest that the inferiority in language-related skills extends back to the very earliest stages of development (Dameron, 1963; Share, Koch, Webb, & Graliker, 1964; see also Greenwald & Leonard, 1979; Mahoney, Glover, & Finger, 1981, and Mervis, in press.)
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Several studies (Castellan-Paour & Paour, 1971; Lyle 1959, 1960; Mein, 1961) suggest that the language handicap is even more extreme in children with DS than in other subgroups of the MR population, matched for CA and IQ. This result is consistent enough for Evans (1977) to revise his earlier position and conclude that there is "general agreement that of all sub-groups in the severely retarded population, mongols [individuals with DS] are the most severely language handicapped" (p. 103). For example, Johnson and Abelson (1969) reported not only that the lack of the "ability to communicate with others understandably" was the most noted handicap of institutionalized adults with DS, but also that this difficulty was far more widespread among individuals with DS than in others at a comparable level of retardation. Only 18.8% of the sample with DS could "communicate usefully" (n = 2606; mean CA = 21 years, mean IQ = 28.6); this compared to 35.4% of the other severely to moderately retarded samples (n =20606, mean CA = 24.5, mean IQ = 32). In contrast to their inferiority on language, the group with DS was considered to be more socially adaptive and socially competent and obtained relatively better ratings on such rudimentary self-help items as toileting, dressing, and feeding. It is unfortunate that while circumventing the problem of selection inherent in such comparisons, the only language measure was extremely general and incorporated a number of different aspects of language.

Rondal et al. (1981) found clearer differences between MA-matched groups of moderately retarded children with and without DS when compared for performance on an elicited verbal imitation task; the group with DS showed a much greater tendency to rely upon echolalic responses, indicating a general failure to comprehend the structures in question.

For all this evidence, Rosenberg (1982) concluded that "etiology does not predict linguistic performance in the mentally retarded" (p. 338) on the basis of two studies that failed to find differences between groups with and without DS (Lyle, 1961; Ryan 1975, 1977). In Ryan's study, the subjects in both groups were home-reared and were matched on MA (mean = 3;1 years), IQ (mean = 40) and CA (5;0 to 9;0 years). Although there were small differences regarding grammatical complexity that favored the mixed MR group over the group with DS, Ryan concluded that "the similarities between the two subnormal groups were more striking than the differences" (p. 275).

There is reason to suspect that the confusion concerning this question may arise in large part from the vagueness with which the "heterogeneous MR" groups are defined and derived. Such groups are standardly defined only in terms of IQ, and may or may not include children with organic brain damage, acquired retardation, etc. Obviously, to determine the relationship between language and etiology, it is necessary to compare language development in a number of well-defined subgroups.

Two such studies have been conducted, with rather interesting results. Wing (1975, cited in Gibson, 1978) compared language skill in subjects with DS to the language acquired by IQ- and age-matched MR children who had suffered organic brain damage; she concluded that seriously retarded children with clear-cut organic pathology experience even greater language problems than do children with DS.

The second study (Burr & Rohr, 1978) looked not at the development of grammatical or syntactic skills, per se, but focused instead upon the pattern of processing and expressive skills suggested as underlying language ability and assessed in the Illinois Test of Psycholinguistic Abilities (McCarthy & Kirk, 1961). Previous studies had suggested that individuals with DS
exhibit a characteristic profile on this test, in which verbal encoding and auditory processing are differentially impaired relative to those components stressing visual processing or motor encoding (Bilovsky & Share, 1965; Evans, 1973; McCarthy, 1965). Burr and Rohr compared the profile for the group with DS to profiles derived for each of three other groups of MR children matched to the group with DS on IQ and CA. The three control groups were moderately to severely retarded as a result of biological brain damage (e.g., premature birth, birth hypoxia), a known environmental cause, or no diagnosed cause. The children with DS showed a consistent disadvantage in the verbal skills relative to the visual tasks; this was true even when the tasks were matched both on dimensions of receptive versus productive skill and on the level of abstraction required. This disadvantage was both more pervasive and greater in magnitude than that found for any of the other etiological groups, leading Burr and Rohr to suggest that early prenatal disruption yields a different pattern of loss than postnatal environmentally-caused retardation; specifically, they suggested that syntactic development was most vulnerable to prenatal disruption.

In sum, there is much evidence to suggest that Down syndrome is characterized by a specific impairment within the language domain; further details on the nature and scope of this deficit will be developed below. Secondly, this impairment appears to be more extreme in children with DS than in other MR subgroups, particularly those in which the retardation resulted from damage at or after birth. However, the heterogeneity of the usual control group precludes a clean answer to this question.

IV. TAKING A DEVELOPMENTAL APPROACH

I introduced this paper arguing that it is only by taking a developmentally informed approach that we can construct an accurate and detailed picture of language learning in children with DS. One component of such an approach, justified on the research presented thus far, is to restrict our focus to biologically well-defined subgroups. In this section, I introduce three other developmental principles of potential theoretical and methodological significance.

I first point out that maturational factors (e.g., as assessed by CA) exert a unique effect on the intellectual growth curves of children with DS. Gibson (1978) reviews the evidence that MA (such as assessed by the Stanford-Binet) does not increase linearly in children with DS (Zeaman & House, 1962), although it does, by definition, in the normal case. Relatively rapid growth in the pre-school years is interrupted by plateaus in growth that become both lengthier and more frequent in the school-age years, with an actual decline in MA scores apparent by adolescence (Gibson, 1966). More current work raises the possibility that early onset of Alzheimer's disease may explain the decline in IQ, at least in part (e.g., Ross, Galaburda, & Kemper, 1984; see Gibson, 1978, for a review). The methodological implication is that matching for MA without regard to CA may group together children at varying points on a lengthy plateau.

It remains to be determined whether CA exerts an effect on language development in children with DS independent of its effect on MA. However, this is the view of Lenneberg et al. (1964), who made some important claims about a critical period of language acquisition based, in part, upon the language growth curves observed in his longitudinal study of 62 children with DS. Over a three-year period, children with DS who had attained puberty failed to make any discernible progress in acquiring language structure; this was in contrast to younger ages in which some growth was observed. Lenneberg (1967) argued that at puberty language learning was no longer possible due to a loss of brain plasticity. Although Lenneberg's critical period hypothesis and the
data on which it was based have since been challenged on many important details (Best, Hoffman, & Glanville, 1982; Dennis & Whitaker, 1977; Molfese, 1977; St. James-Roberts, 1981), a critical period for language acquisition remains an important theoretical construct regarding adult-child differences in second language learning (Krashen, 1975). It must still be explained why native fluency in American Sign Language is achieved only by children under the age of 6 years (Fischer, 1978; Newport, 1982), and why age plays such a crucial role in transforming pidgin languages into creoles (Newport & Supalla, 1980; Sankoff & Laberge, 1973). Further research establishing the effects of CA specific to language learning in children with DS may prove an important empirical base for testing and refining the critical period hypothesis.

The second developmental principle derives from the “modularity” hypothesis of cognition: One cannot conduct language research without at least acknowledging the hypothesis that language is acquired, processed and represented independently of cognition generally. (See Lenneberg, 1967, for an early statement of this hypothesis supported, in part, by his findings from research on language learning in children with DS; see Fodor, 1983, for a current statement of the position and for a discussion of what constitutes relevant data; see Keil, 1981, for a discussion of modularity from a developmental perspective). Indeed, the well-documented dissociation between language structure and general MA in children with DS only serves to strengthen this hypothesis.

There are several methodological points following from the modular point of view. For one thing, the modularity hypothesis provides a strong theoretical argument against MA-matching, as it suggests MA to be a rather meaningless construct, potentially averaging over several distinct domains. It becomes only sensible to rely upon a general measure from within the language domain when matching groups of children with and without DS for comparisons of internal language structures. It also follows that to make serious statements about the specificity of the language deficit in DS, it is essential to show growth in another, distinct well-defined non-linguistic domain (e.g., see work by Cornwell, 1974, and Gelman, 1982, for exploratory studies on number knowledge in children with DS). An important corollary of the modularity hypothesis is that one must in turn treat the subdomains of language and communication (morphology, syntax, lexicon, nonverbal communication, and discourse) as potentially separable and distinct domains (see also Abrahamson, Cavallo, & McCluer, 1985; Beeghly, Hanrahan, Weiss, & Cicchetti, 1985; and Mervis, in press, for relevant studies).

Finally, in order to characterize the development of grammatical structures, one must be sensitive to the various, internally coherent, stages of language development. Although Brown (1973) introduced language stages more as descriptive aids than theoretical constructs, they have proven to be very useful heuristics, indeed, in studies of language development over the years. Whether or not distinct theoretical or biological substrata underly different stages, quite distinct grammatical systems are connoted by the pre-linguistic stage and the five stages outlined by Brown (1973) moving from one-word to complex syntax. A great deal of information would be sacrificed if performance of children at several stages of development were collapsed into a single average score. One cannot, for example, average together two children at a one-word stage (Stage I) and one child with simple syntactic structures (Stage III) and claim that children with DS are on average in language stage II (consistently combining words). Even more to the point, questions asked about language in children with DS may have quite different answers depending on the language level under study.
As is discussed below, children with DS tend to cluster at a few early stages of language development, and remain there for extended periods. This slow-motion view of development may reveal theoretically important leaps in the system that constitute major obstacles for the child with DS, even while they are achieved seemingly effortlessly by the non-handicapped child.

We were guided by these principles in a study of the internal structure of language in adolescent children with DS conducted in 1980 (Fowler et al., 1980, 1981). This study is presented in some detail as an illustration of the developmental approach, as well as to provide a framework for further research. I go on to discuss the extension of these findings to other stages, ages, and tasks in our work and that of others.

V. THE LANGUAGE STRUCTURE OF CHILDREN WITH DS COMPARED TO NON-HANDICAPPED CHILDREN MATCHED ON MLU

The aim of this study was to test the implicit assumption of the currently accepted view outlined above: that retarded language development is a slow motion and limited replica of normal language development. Under this assumption, if one were to cut out a horizontal slice in the developing language of a non-MR child at some stage, S, one should be able to superimpose this slice on the developing language of a child with DS also at Stage S'. This study involved just such a comparison, establishing comparable slices, or stages, in the developing language of children with DS, and in those who are not handicapped, and then looking for internal discrepancies.

Of particular interest was the possibility of differential delays, with different structures developing at different rates. Instead of assuming that language, or even syntax, is one bounded and homogeneous system, the focus was on the interrelationships of a number of aspects of language. Under conditions of gross mental impairment, are all aspects of language affected equally? By juxtposing performance on several internal measures of syntactic development, the intention was to identify which structures created the greatest difficulty for children with DS and thus begin to frame some hypotheses about the nature and extent of their deficit.

As the basis of comparison, children with and without DS were equated on an anchor measure of language development: mean length of utterance in morphemes (MLU), as defined by Brown (1973). This choice was justified on several grounds. First, as has been stressed in the studies reviewed above, the more common alternative, MA, greatly overestimates the language of children with DS. The quantitative differences resulting from an MA comparison are too great to uncover any more subtle qualitative differences; they also prohibit accurate comparisons of progress among various measures since each and every measure shows a decrement relative to MA.

The second rationale for using MLU rather than the MA measure derives from research on non-MR children; there too, vocabulary development (on which MA depends heavily) proceeds independently of syntactic development. In Newport, Gleitman, and Gleitman (1977), for example, MLU fails to correlate with vocabulary usage. On the other hand, as a measure of internal syntactic complexity, MLU surpasses any other single measure of linguistic competence in the early stages of language development both in its predictive powers and in its breadth of application across child language studies (Bloom, 1970, 1973; Brown, 1973; Nelson, 1973; Newport et al., 1977; Shipley, Smith, & Gleitman, 1969).

Despite its apparent superficiality as a language description, MLU apparently incorporates a number of specific and interesting aspects of developing syntax. Shipley et al. (1969, appendix),
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for example, calculated the correlation of a number of early language measures, and found that MLU (there ranging from 1.0 to 2.0, in children 18 to 33 months of age) correlated with each of the other candidate measures (e.g., use of verbs, pronouns, or articles) better than any of the other measures correlated with each other, making it the best available predictor of overall language growth. (See also Newport et al., 1977 for replication up to MLU 3.5). Bloom, Lightbown, and Hood (1975) found MLU to be a useful independent variable against which to predict the expression of semantic relations; Brown (1973) and deVilliers and deVilliers (1978) found MLU to be a fair index of when certain grammatical inflections and functors would become productive, and Klima and Bellugi (1966) used MLU to make some very well-defined predictions about the emerging structure of negative and interrogative constructions.

To these one might add that this measure of productive language is relatively free from the effects of motivation, attention, practice, and inference that typically plague structured tests of language comprehension or production. Indeed, to obtain a reliable MLU one has merely to collect a minimum of 100 utterances from the child in a naturalistic situation (which can be anything from playing a game to taking a walk) where the child is at ease and has something to talk about (Brown, 1973). Thus a speech sample may easily and fairly be collected from a child of any age or language level, without that child's being test-savvy or even desirous of doing well.

Hypotheses

In this study, the first hypothesis concerned the potential dissociation between the length and complexity of utterances. As noted above, the mean length of an utterance is a good indicator of the kind of morphological and syntactic structures a non-MR child has acquired and is prone to use. However, beyond the very earliest stages, length does not logically have to mirror complexity. Although *whose book did you read?* is complex by virtue of wh-movement and subject-auxiliary inversion, it includes the same number of morphemes (five) as the more straightforward construction *they walk to the store*. It is possible that children with DS are held back in utterance length by a production limit that masks their more advanced syntactic competence. If so, one might find evidence for constructions that are short enough to fit within the production limit, but more complex than ordinarily found at that MLU stage in non-MR children.

The second hypothesis was that some aspects of language are more affected than others by general intellectual factors. Especially in light of the large disparity between MA and language level, one might expect that those facets of language most closely tied to general intelligence proceed in a different fashion from the more purely linguistic facets. Of particular interest was the use of closed class items: that area of language that is at once least semantic and most vulnerable. The class of "little" words that glue sentences together includes grammatical inflections, articles, prepositions, and pronouns. These "functors" have been characterized as carrying no content, distinguishing them from the content words that include nouns, verbs, adjectives and adverbs. They also constitute a class in historical development of languages by virtue of their finite nature: the language acquires new closed class elements at an extremely protracted rate (over hundreds of years) as distinct from the open class system that acquires hundreds of words per year. And they fall together as a phonological class in that they, as opposed to open class words (nouns, verbs, adverbs, adjectives) lose stress within the total intonation of the sentence, resulting in *he's* for *he is*, *can't* for *can not*, etc. (Kean, 1977; see Gleitman & Wanner, 1982, for an in-depth overview of the open-class closed-class distinction).
The closed class system is fragile in many respects; hence, the expectation that it might be more impaired in retarded populations. It develops relatively late in child language (e.g., Bloom, 1970; Brown, 1973) and is missing both in pidgin languages (Newport, 1982; Sankoff & Laberge, 1973) and in invented language (homegloss) of deaf children (Feldman, Goldin-Meadow, & Gleitman, 1978). It is selectively impaired in Broca’s aphasia (Kean, 1977) and is more dependent on input characteristics than other language components (Gleitman, Newport, & Gleitman, 1984). Despite the well-attested fragility of closed class grammar and its distinctive developmental course (again, see Gleitman & Wanner, 1982, 1984, for an extended discussion), it has not been adequately determined whether this specific aspect of language is differentially affected in individuals with DS.

In sum, not all facets of language skill should be affected equivalently by Down syndrome retardation. Specifically, it was suggested 1) that length would be more compromised than syntactic complexity and 2) that the closed class system would be more affected than either open class vocabulary or sentence length. Thus, when children with DS and non-MR children are matched for utterance length, the grammar of those with DS is predicted to be more advanced in terms of syntactic complexity (as in embedding) and vocabulary measures, and less well-developed on measures of morphological development.

Subjects

The subjects included four moderately retarded adolescents in a stimulating parochial day school. The four were selected for homogeneity of age (CA 10;9 to 13;0 years, mean = 12;7), intelligence level (Stanford-Binet IQ 46 to 56; mean = 51; MA 6 to 7 years; mean = 6;3), and language level (all were in Stage III, using the criteria of Brown, 1973). This language level (MLU 2.75 to 3.25; mean = 2.98) was representative of adolescent children with DS at that school and appears to be in keeping with other studies of adolescents with DS (Mein, 1961; Ryan, 1975; Semmel & Dolley, 1971). As controls, non-MR youngsters were sought who had MLU’s as close to 3.0 as possible. This was not easy; by 36 months of age, children have moved well beyond that language level and one has to “catch” younger children as they move through the level of interest. The controls in this study were 30 to 32 months of age, consistent with established norms (Bloom, 1970; Brown, 1973; Miller, 1980). The young age was surprising because the adolescents appeared, at least impressionistically, to be communicating well beyond a 3-year-old level. The resulting disparity in age (CA 12 vs. 2 1/2 years; MA 6 vs. 3 years) made dissociation all the more likely in the various analyses employed. (Refer to Table 1 for subject statistics).

Procedure

All analyses were based upon spontaneous speech samples collected under naturalistic conditions. Children interacted with the experimenter at school in a half-hour of free play/conversation in a quiet room away from the classroom. The children had met and talked with the experimenter on previous occasions. The conversation centered about a large three-dimensional house with miniature furniture and people. The children were encouraged to talk about the objects, to talk about own homes and families, and even to make up conversations using the objects as props (i.e., to play house). The sessions were videotaped and recorded on a hi-fidelity stereo tape recorder. The recordings were transcribed as soon as possible after the task by the experimenter. The utterance length measures were obtained as described below. In addition, internal analyses
were performed to tap three different aspects of linguistic skill: syntactic complexity, grammatical morphology (closed class knowledge), and vocabulary (open class knowledge).

Table 1
Subject Characteristics

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<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
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<tr>
<td>Chronological age (years)</td>
<td>mean 12;3</td>
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<td></td>
<td>range 10;9-13;0</td>
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<td>Mental age (years)</td>
<td>mean 6;3</td>
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<td>IQ</td>
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Utterance length statistics
(based on spontaneous utterances)

<table>
<thead>
<tr>
<th></th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number utterances produced</td>
<td>166.5</td>
<td>195.0</td>
<td>-0.86</td>
</tr>
<tr>
<td>MLU: mean length in morphemes</td>
<td>2.98</td>
<td>3.32</td>
<td>-1.32</td>
</tr>
<tr>
<td>Upper bound in morphemes</td>
<td>7.50</td>
<td>8.75</td>
<td>-1.56</td>
</tr>
<tr>
<td>Longest 10%: MLU in words</td>
<td>5.35</td>
<td>5.50</td>
<td>-0.29</td>
</tr>
<tr>
<td>Proportion one-word utterances</td>
<td>0.15</td>
<td>0.12</td>
<td>0.68</td>
</tr>
<tr>
<td>Word: morpheme ratio</td>
<td>0.95</td>
<td>0.92</td>
<td>1.63</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample 2-tailed t-tests.
***p < .001; ** p < .01; *p < .05; +p < .10.

Utterance Length Measures

The guidelines outlined in Brown (1973) served as the basis for the calculation of MLU, with some variations. The primary deviation from his procedure was to incorporate in this analysis only those utterances initiated by the child; responses, imitations, and long lists without internal structure (e.g., counting or recitation of family names) were excluded. Additionally, only five tokens of any exact phrasing were included in the MLU analysis in order to relieve any possible bias introduced by repeated use of stock phrase such as what's that? Finally, analyses in this study were based upon all utterances produced rather than on only the first 100 utterances of a transcript. (See Fowler, 1984, for justification of these variations).

Brown's (1973) upper bound serves as an index of optimal—as opposed to mean—performance. This is simply the length of the single longest utterance produced in the session, measured in morphemes. To the same end, the MLU for the longest 10% of the utterances was also
calculated. The fourth and final utterance length measure concerned the distribution of utterance lengths. Given an average length of utterance, the goal was to determine whether, perhaps as a function of usage factors, children with DS rely to a greater extent on very short utterances than other children with comparable syntactic skill.

**Results.** By design, all subjects had MLU's indicating they were in Brown's Stage III or IV. The average MLU of the group with DS and the non-MR group was 3.0 (range = 2.6-3.3) and 3.3 (range = 2.8-3.8), respectively (see Table 1). As intended, the difference between groups was not significant. In keeping with a generally low usage of inflectional morphology, MLU in words rather than morphemes was slightly, though comparably, lower in both groups (2.8 and 3.0 for the children with DS and the non-MR children, respectively); the word:morpheme ratios were .95 and .92, again not significantly different.

Brown reports the upper bound (in morphemes) for Stage III to be 9 morphemes. In this study the upper bound of the children with DS ranged from 7 to 9; of the normally developing children from 7 to 10, for a non-significant difference. When only the longest 10% of the utterances were taken into account, the MLU's (in words) of the two groups were nearly identical (children with DS: 5.35; non-MR children: 5.50). Although it might have been expected that the children with DS would be more variable in sentence length, alternating perhaps between long and very short utterances, this was not the case. The shape of the distribution of utterance lengths was similar across both groups. In each group, two and three word utterances made up more than 50% of the total and there was no utterance longer than 9 words. One-word utterances made up 15% of the utterances produced by the children with DS and 12% of the utterances produced by the non-MR children; this difference was nonsignificant.

**Syntactic Measures**

**Measures of internal complexity.** As a first look at the internal structure of the utterances produced, counts were made of the number of major constituents (noun phrases and verbs) per utterance and, in turn, of the number of words and morphemes entering into each constituent category. Length may derive from a greater number of sentential constituents (e.g., *see you help boy*) and from the internal length of these constituents (e.g., *going to the store*). These measures were developed by Newport et al. (1977), who found them to correlate highly with MLU in very young non-MR children.

This analysis was based upon a sample of 50 consecutive utterances from each child. Candidate utterances required a main verb other than be (explicit or not). A new MLU based on this sample was also computed. For this analysis, nouns were defined as nouns or pronouns, whether in subject or object position; they could also occur as objects of prepositions. Morphemes per noun phrase also included articles, inflectional markers; words per noun phrase excluded inflections. Verbs were defined to include only immediate verbal constituents: semi-modals, auxiliaries, not and the verb. Sentential elements not included in this count were optional elements such as adverbs as well as particles and prepositions.

**Results.** The mean length of non-copulaic utterances was identical across populations; in addition, there were virtually the same number of major constituents (noun phrases and verbs) per utterance (see Table 2). There was, however, one internal difference: the group with DS relied upon significantly fewer morphemes per noun phrase. As will be supported in other measures to
be presented, this is due, in part, to the fact the children with DS relied heavily on pronouns rather than upon expanded noun phrases.

### Table 2

**Measures of Internal Complexity (following Newport et al., 1977)**

(Based upon 50 consecutive nonequational utterances)

<table>
<thead>
<tr>
<th></th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean words per utterance</strong></td>
<td>3.68</td>
<td>3.73</td>
<td>-0.18</td>
</tr>
<tr>
<td><strong>Major constituents per utterance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nounphrases/utterances</td>
<td>1.37</td>
<td>1.37</td>
<td>0.10</td>
</tr>
<tr>
<td>Verbs/utterance</td>
<td>1.07</td>
<td>1.01</td>
<td>1.81</td>
</tr>
<tr>
<td>Other (particles, adverbs)</td>
<td>0.36</td>
<td>0.55</td>
<td>-1.43</td>
</tr>
<tr>
<td><strong>Internal structure of major constituents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Words/nounphrase</td>
<td>1.62</td>
<td>1.72</td>
<td>-1.63</td>
</tr>
<tr>
<td>Morphemes/nounphrase</td>
<td>1.71</td>
<td>1.85</td>
<td>-2.44*</td>
</tr>
<tr>
<td>Morphemes/verbphrase</td>
<td>1.45</td>
<td>1.50</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample 2-tailed t-tests.

**p < .01; *p < .05; +p < .10**

**Expression of thematic relations.** As a context-dependent measure of syntactic development, productions were analyzed for presence or absence of arguments made obligatory by certain verbs (or implied verbs). Does a child with DS choose to encode and delete the same thematic arguments as the non-MR child, when both are equally limited in productive language skill? Attention was focused upon locative expressions for two reasons. First, they were elicited in quantity by the task at hand—placing objects in a model house. And second, normative developmental data on locatives were collected by Bloom, Miller, and Hood (1975); their analysis was the basis of the coding and scoring scheme relied upon here. Bloom et al. investigated three locative sentence frames. “Agent-Locative Action” utterances were defined as expressing the movement of an object (Patient) by an independent Agent, as in I'm trying to put this back in here. This sentence type requires an Agent (syntactic subject), Patient (object), Place, and Verb. The “Mover-Locative Action” sentence type, e.g., you can come my house, includes those utterances specifying a movement in which the Agent was also the Patient moved, hence the “Mover.” This argument structure requires a Mover (subject), Verb, and Place. Bloom et al.'s third locative category, “Locative State,” specifies a state rather than a movement, e.g., sleep, sit, be, belong and go, as in this goes here. This category also requires a Patient (subject), Verb, and Place.

**Results.** At the language level under study, children in both groups were explicit in expressing most of the obligatory thematic relations tapped (see Table 3). Of the 10 relations under study,
Table 3

Oligatory Thematic Relations Expressed in Locative Utterances
(Proportion of times an argument or verb is expressed where obligatory)
(following Bloom et al., 1975)

<table>
<thead>
<tr>
<th>Locative Utterance Category</th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agent Locative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean # in category</td>
<td>6.75</td>
<td>11.75</td>
<td>-1.27</td>
</tr>
<tr>
<td>Agent</td>
<td>0.39</td>
<td>0.51</td>
<td>-1.67</td>
</tr>
<tr>
<td>Verb</td>
<td>1.00</td>
<td>0.99</td>
<td>0.67</td>
</tr>
<tr>
<td>Patient</td>
<td>0.76</td>
<td>0.96</td>
<td>-1.07</td>
</tr>
<tr>
<td>Place</td>
<td>0.87</td>
<td>0.99</td>
<td>-1.25</td>
</tr>
<tr>
<td><strong>Mover Locative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean # in category</td>
<td>12.25</td>
<td>12.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Mover (Agent and Patient)</td>
<td>0.65</td>
<td>0.69</td>
<td>-0.23</td>
</tr>
<tr>
<td>Verb</td>
<td>0.65</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Place</td>
<td>0.97</td>
<td>0.83</td>
<td>1.31</td>
</tr>
<tr>
<td><strong>Locative State</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean # in category</td>
<td>12.25</td>
<td>23.75</td>
<td>-1.01</td>
</tr>
<tr>
<td>Patient</td>
<td>0.93</td>
<td>0.84</td>
<td>0.80</td>
</tr>
<tr>
<td>Verb/copula</td>
<td>0.79</td>
<td>0.62</td>
<td>0.80</td>
</tr>
<tr>
<td>Place</td>
<td>0.94</td>
<td>0.96</td>
<td>-0.31</td>
</tr>
<tr>
<td>Average score for 10 thematic categories</td>
<td>0.85</td>
<td>0.84</td>
<td>0.38</td>
</tr>
</tbody>
</table>

Proportion Syntactic Categories Expressed

<table>
<thead>
<tr>
<th></th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nouns</td>
<td>0.72</td>
<td>0.75</td>
<td>-0.45</td>
</tr>
<tr>
<td>Subject</td>
<td>0.70</td>
<td>0.68</td>
<td>0.30</td>
</tr>
<tr>
<td>Object</td>
<td>0.76</td>
<td>0.96</td>
<td>1.07</td>
</tr>
<tr>
<td>Verbs</td>
<td>0.93</td>
<td>0.92</td>
<td>0.22</td>
</tr>
<tr>
<td>Stative</td>
<td>0.79</td>
<td>0.62</td>
<td>0.93</td>
</tr>
<tr>
<td>Non-stative</td>
<td>1.00</td>
<td>0.99</td>
<td>0.00</td>
</tr>
<tr>
<td>Place terms</td>
<td>0.95</td>
<td>0.92</td>
<td>0.47</td>
</tr>
</tbody>
</table>

*a* Syntactic scores were obtained by averaging across thematic categories, according each sentence type was equal weight.

Note: Groups were compared using independent-sample t-tests (2-tailed tests).

There were no significant differences across groups.
85.1% were expressed by the group with DS and 83.7% by the non-MR group. When scores were compared across individual and averaged categories, there were no significant differences across the two groups.

Although small numbers and potential differences in scoring procedures preclude statistical comparison with Bloom et al.'s findings, the subjects in this study seemed to be performing as well as, if not better than, the children at the close of the normative study (MLU=3.0). In both studies, non-stative verbs were expressed virtually 100% of the time. In addition, the children in this study consistently included the place term across the three locative sentence types (DS 95%; non-MR 92% expressed); this was well beyond the 55% average quoted by Bloom et al. Bloom also reported that stative locative verbs (sits, belongs, etc.), were consistently expressed in her population (near 100%), just as were the non-stative verbs. In this study, however, non-stative verbs were often only implicit in both groups; frequently producing utterances such as the doll ______ upstairs while placing it in a dollhouse implying a verb such as goes or belongs; the difference between groups was not significant (children with DS 79% expressed; non-MR children 62%). In part, of course, this may arise from a failure to produce the contractible copula (the doll’s upstairs).

When attention is restricted to obligatory nominal arguments, more variability is apparent. Overall, nominal arguments entering into locative relations were supplied 72% of the time by children with DS and 75% of the time by the non-MR group. The largest tendency to omit an obligatory nominal involved the Agent (subject) of "Agent locative utterances," as in I'll put this right here. Although the tendency not to express this form was somewhat greater among the DS group (39% supplied) than among the non-MR group (51% supplied), not one of the eight subjects supplied it more than 75% of the time. (Bloom et al. reports an average score of 54%.)

The children were more apt to express the "Mover" in the Mover Locative category. Although this category is similar to the Agent category above in also serving as sentence subject, thematically it also serves as Patient. The two groups performed comparably (64.8% DS; 68.8% non-MR) with two children in each group supplying this argument less than 75% of the time, and only one child (non-MR) supplying it more than 90% of the time.

Sentence subjects were most consistently supplied when functioning as the Patient in the Locative State utterances (e.g., ______ belongs in the kitchen). Each child supplied this argument a minimum of 75% of the time, which was the mean performance reported by Bloom. The high scores observed (92.8% DS; 83.5% non-MR) may be artificially inflated by coding procedures requiring that a minimum of two arguments be supplied in order to be included in the analysis. Thus here, meaning this goes here, would not be included in the analysis.

Bloom reports that the Patient in object position, as in Agent Locative utterances (e.g., I'll put ______ right here), was supplied consistently (70%) from MLU 1.2 on. In this study, as anticipated, each child in the non-MR provided it at least 90% of the time (group average 96%). Although the average score obtained by the group with DS (75.5%) did not differ significantly from the non-MR score, there was variability in the group with DS. Whereas two of the children with DS, like the non-MR children, provided the Patient consistently, a third supplied it only 80% of the time, and the fourth consistently failed to express it (22% supplied).
Bloom et al. focused on children at the earliest stages of language; their observations, presented in thematic terms, were concluded at just the level of interest here. Although the children in this study performed like Bloom et al.'s youngsters in being more apt to express a nominal argument that incorporates both Agent and Patient than one that is Agent alone, the more obvious facts seem to concern grammatical categories. Although differences between groups regarding tendency to express sentence subject (children with DS 70%; non-MR children 68%) or grammatical object (children with DS 76%; non-MR children 96%) failed to reach significance, a significant interaction indicates a greater split between these two categories in the non-MR group than in the group with DS.

Indices of complex syntax. The two previous syntactic measures are useful in analyzing language samples produced from the onset of two-word combinations in Stage I. They should, and do, reveal a good deal of positive evidence for internal linguistic structure and regularity. In the level of interest here, children are on the verge of mastering aspects of complex syntax. Most notably, they must acquire the intricacies of the verbal auxiliary system (both movement rules and grammatical terminology) to produce correct negative and interrogative structures. Additionally, children just beyond this stage acquire many means of coordinating and embedding sentence clauses such as conjunctions, relative clause structures, or preposing; here, too, they must master movement rules and grammatical markers. To measure progress made in this direction, a count was made in this study of some of the earliest appearing aspects of complex syntax, such as have been noted by researchers such as Menyuk (1969) or Bellugi (1967). Constructions of interest included subordination and coordination, subject/auxiliary version in yes/no and wh-questions; passive voice constructions with got or be, and choice of negative markers.

Confirmation of syntactic development was sought via a normed measure of syntactic complexity devised by Scarborough (1985): The Index of Productive Syntax (IPSyn). This measure, based upon a 100-utterance sample, awards points for the occurrence of 56 kinds of morphological and syntactic forms. Normative data are available, based upon 48 transcripts from children aged 24 to 48 months; the scale is of potential value for children below and beyond this age range. Because full credit is awarded if a construction occurs twice in a 100-utterance transcript, this analysis serves as a measure of optimal more than mean performance.

Results. There was very little evidence for use of complex constructions in either group; what small differences existed between groups failed to reach significance (see Table 4a). Little use was noted of the passive construction, subject auxiliary inversions, possessives or conjoined clauses. In both groups, the primary means of expressing negation was through negative modals, fitting with descriptions in the literature of negation at this stage (e.g., Klima & Bellugi, 1966). Primitive forms like he have no chin or this not fit were observed primarily in the non-MR group, while the children with DS tended to produce very few negatives overall.

Multi-verb utterances were also rare, comprising less than 5% of the utterances in either group, and consisting primarily of conjunctions and concatenations. Similar multi-verb utterances were produced in both samples: a DS subject produced put it on get more, but do that fix this came from a non-MR child; I want it shut was produced by a child with DS and and keep a door closed by a non-MR child. Preverbal adjectives occurred rarely and in both samples consisted of such common constructions as big truck or little boy.
### Table 4a

**Indices of Grammatical Complexity**  
(Presented as average number of occurrences per 100 utterances)

<table>
<thead>
<tr>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utterances with 2 or more sentence nodes</td>
<td>3.83</td>
<td>2.38</td>
</tr>
<tr>
<td>Conjunction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noun + noun</td>
<td>1.15</td>
<td>0.17</td>
</tr>
<tr>
<td>Verb + verb</td>
<td>0.40</td>
<td>0.00</td>
</tr>
<tr>
<td>Sentence + sentence</td>
<td>0.42</td>
<td>0.60</td>
</tr>
<tr>
<td>Pre-nominal adjectives</td>
<td>1.13</td>
<td>2.13</td>
</tr>
<tr>
<td>Negative forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No + verb</td>
<td>0.00</td>
<td>0.98</td>
</tr>
<tr>
<td>Not + verb</td>
<td>0.20</td>
<td>1.18</td>
</tr>
<tr>
<td>Negative modals</td>
<td>3.40</td>
<td>2.58</td>
</tr>
<tr>
<td>Passive forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Got + verb</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Be + verb</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Use of possessive form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noun's noun</td>
<td>0.85</td>
<td>0.60</td>
</tr>
<tr>
<td>Auxiliary inversion in yes/no questions</td>
<td>0.25</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample t-tests (2-tailed tests).  
There were no significant differences between groups.

### Table 4b

**Performance on Index of Productive Syntax (Based on Scarborough, 1985)**

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noun phrase</td>
<td>16.25</td>
<td>15.75</td>
<td>0.20</td>
</tr>
<tr>
<td>Verb phrase</td>
<td>17.50</td>
<td>16.75</td>
<td>0.70</td>
</tr>
<tr>
<td>Questions and negatives</td>
<td>11.50</td>
<td>9.75</td>
<td>0.63</td>
</tr>
<tr>
<td>Sentences</td>
<td>15.50</td>
<td>12.00</td>
<td>2.18+</td>
</tr>
<tr>
<td>Total</td>
<td>60.50</td>
<td>54.25</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample t-tests (2-tailed tests).  
**p < .01; *p < .05; +p < .10**
The two groups also performed comparably in overall performance on Scarborough’s (1985) IPSyn measure (children with DS 60.5; non-MR children 54.25). The scores of the group with DS were consistent with those reported by Scarborough for her 30-month-old group of non-handicapped children; the non-MR group here was somewhat behind this average. Although the two groups in this study were highly comparable on the three subscales of this test tapping complexity of noun phrases, verbal auxiliary development, and devices for constructing negative and interrogative sentences, there was a notable difference regarding sentence complexity. This last subscale looks at means of embedding and coordinating sentence clauses; however, following Miller (1980), it is more concerned with movement rules and word order than it is with whether the particular grammatical markers are expressed. Thus, the child who produces *want my mommy come here* is credited with being able to produce infinitival sentences with a subject distinct from the matrix subject despite the fact that the infinitival marker *to* was unexpressed. Although both groups, and Scarborough’s as well, had this advantage, as shown in Table 4b, the group with DS were relatively more advanced on such constructions than were the non-MR children.

**The Closed Class System**

It was suggested above that the acquisition of closed class vocabulary might be more affected in individuals with DS than would the acquisition of open class vocabulary. In particular, it was hypothesized that grammatical morphology might lag behind other aspects of syntactic development. This question was addressed in part by the *Word/morpheme ratio* presented in Table 1; this measure of use of bound inflections is calculated as the ratio of the number of “words” (defined phonologically) to the number of morphemes. The difference is made up by nominal and verbal markers such as the plural or past tense marker. The ratio of word to morpheme was very high across groups; neither group made much use of inflectional morphology (DS 0.95; non-MR .92). The nonsignificant advantage that does occur for the non-MR group is a function of one child with DS who used very few inflections at all, and one non-MR child who was more advanced on this measure. The two analyses presented next look in more detail at closed class knowledge.

**Closed class vocabulary.** To assess the development of closed class vocabulary, a count was made of all tokens of the five major closed class categories: pronouns, prepositions, modals, wh-forms, and demonstratives. This figure was compared to the total number of words in each speech sample. To supplement this measure of dependence on closed class vocabulary, we also made a measure of lexical sophistication within these categories by looking at the diversity of vocabulary types falling into these and other categories of closed class markers.

**Results.** Pronouns, prepositions, modals, wh-forms and demonstratives made up a similar proportion, overall, of the lexical items produced by children with DS (31%) and by non-MR children (30%). Differences between groups within individual categories were not remarkable, although there was a marginally significant tendency for the non-MR children to use more demonstrative terms (*this, that*); this was complemented by a non-significant tendency on the part of the children with DS to use a greater number of pronouns (see Table 5). In terms of diversity of the closed-class items employed, children with DS had a slight, but non-significant, advantage over the non-MR children. This difference was particularly evident with modals and wh-forms, where it neared or attained significance (see Table 6).
Development of Language Structure

Table 5
Usage of Closed Class Vocabulary–Tokens
(mean proportion of words falling into each of 5 closed class categories)

<table>
<thead>
<tr>
<th></th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean # words per corpus</td>
<td>468.25</td>
<td>474.75</td>
<td>-0.18</td>
</tr>
<tr>
<td>Closed class categories</td>
<td>16.56 13.81</td>
<td>3.66 4.52</td>
<td>1.57</td>
</tr>
<tr>
<td>Pronouns</td>
<td>3.66</td>
<td>1.97</td>
<td>1.21</td>
</tr>
<tr>
<td>Prepositions</td>
<td>3.23</td>
<td>2.78</td>
<td>1.17</td>
</tr>
<tr>
<td>Modals/semimodals</td>
<td>4.01</td>
<td>6.68</td>
<td>-2.02+</td>
</tr>
<tr>
<td>Wh-terms</td>
<td>3.54</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>Demonstratives</td>
<td>31.00</td>
<td>29.75</td>
<td>0.51</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample t-tests (2-tailed tests).

**p < .01 *p < .05 +p < .10

Use of grammatical morphemes in obligatory context. For a more fine-tuned measure of morphological development, an assessment was made of use in obligatory context of the first 14 grammatical morphemes to occur regularly in early child language. These include prepositions, verbal auxiliaries, and nominal and verbal inflections. Brown was able to identify the contexts where these morphemes should appear, calculate the proportion of cases where they do in fact appear, and track the development of each over the language-learning period. His methods were adapted for cross-sectional study by deVilliers and deVilliers (1978); their procedures were adopted here.

Results. Sufficient information was available for comparison across groups for eight of the fourteen morphemes (i.e., there were at least four identifiable obligatory contexts per subject); averaging across these morphemes the overall percentage supplied for each group was virtually identical: 68% for the group with DS, 66% for the non-MR group (see Table 6). There appear, however, to be some differences regarding the pattern of acquisition for individual morphemes. This is evidenced in the scores achieved for the progressive (-ing), the first morpheme typically acquired. Although the non-MR children provided this form quite consistently (86% supplied), the children with DS were much more variable (61% supplied, p < .10). There are eight cases of full mastery of the first four morphemes (90% usage in obligatory context) among the four non-MR children in this study, while there are only four such cases among the non-MR group. This difference is masked when one looks across the full range of the 14 morphemes: there, the overall score is nine in each group. In some sense, the non-MR group is “more normal,” mastering the earlier morphemes first and only later going on to acquire the more difficult morphemes. While
one cannot infer the developmental sequence from this single point data, it appears that the DS group has moved on to more difficult morphemes (notably, the copula) without having fully mastered the simplest ones.

Table 6

Usage of 14 Grammatical Morphemes in Obligatory Contexts
(following Brown, 1973 and deVilliers & deVilliers, 1978)
(# subjects reaching 90% criterion presented in parentheses)

<table>
<thead>
<tr>
<th>Grammatical morphemes</th>
<th>Children with Down Syndrome</th>
<th>MLU-matched controls</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=4)</td>
<td>(n=4)</td>
<td></td>
</tr>
<tr>
<td>Progression marker -ing</td>
<td>0.61(0)</td>
<td>0.86(2)</td>
<td>-2.16+</td>
</tr>
<tr>
<td>Preposition on</td>
<td>0.84(1)</td>
<td>-a(1)</td>
<td>-</td>
</tr>
<tr>
<td>Plural -s</td>
<td>0.84(2)</td>
<td>0.92(2)</td>
<td>-0.59</td>
</tr>
<tr>
<td>Preposition in</td>
<td>0.73(1)</td>
<td>0.75(3)</td>
<td>-0.07</td>
</tr>
<tr>
<td>Past tense irregular</td>
<td>0.82(0)</td>
<td>0.63(0)</td>
<td>1.20</td>
</tr>
<tr>
<td>Articles a &amp; the</td>
<td>0.43(0)</td>
<td>0.49(0)</td>
<td>-0.46</td>
</tr>
<tr>
<td>Possessive 's</td>
<td>-0(0)</td>
<td>-(0)</td>
<td>-</td>
</tr>
<tr>
<td>3rd person irregular</td>
<td>-0(0)</td>
<td>-0(0)</td>
<td>-</td>
</tr>
<tr>
<td>Contractible copula</td>
<td>0.82(2)</td>
<td>0.62(0)</td>
<td>1.31</td>
</tr>
<tr>
<td>3rd person regular -s</td>
<td>0.25(0)</td>
<td>0.36(0)</td>
<td>-0.71</td>
</tr>
<tr>
<td>Past tense regular</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Contractible auxiliary BE</td>
<td>-(1)</td>
<td>0.39(0)</td>
<td>-</td>
</tr>
<tr>
<td>Uncontractible auxiliary BE</td>
<td>(0)</td>
<td>-(0)</td>
<td>-</td>
</tr>
<tr>
<td>Overall proportion supplied^b</td>
<td>0.68</td>
<td>0.66</td>
<td>0.16</td>
</tr>
<tr>
<td>Mean number morphemes acquired per child</td>
<td>2.25</td>
<td>2.25</td>
<td>0.00</td>
</tr>
</tbody>
</table>

^a Averages were not calculated when there were fewer than four obligatory contexts for three out of four subjects.

^b Overall proportion based upon just those 8 morphemes for which there was sufficient data for both groups.

Note: Groups were compared using independent-sample t-tests (2 tailed tests).

+p < .10

It may well be that what non-MR children learn, they learn fully, hence rapidly reaching near 100% on the earliest morphemes. Children with DS, in contrast, may work on more constructions simultaneously but never acquire fully—or use consistently—even the earliest rules acquired.
Open-class Vocabulary Measure

At the language level under study, it is difficult to make a fair assessment of productive vocabulary, especially in a single spontaneous speech sample. Nonetheless, a gross measure of vocabulary usage was derived by calculating the ratio of different vocabulary types produced to the total number of words in the corpus (following Nelson, 1973). While this measure clearly does not explore the depth of the child's lexical knowledge for open class items, it probably does provide a fair index of the closed class lexicon, which is, after all, both finite and frequently used. The type/token ratio also serves as a measure of information value independent of the syntactic structure employed.

Table 7

Measure of Lexical Diversity
(Presented as number of different vocabulary types per 100 words)

<table>
<thead>
<tr>
<th></th>
<th>Children with Down Syndrome (n=4)</th>
<th>MLU-matched controls (n=4)</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of words in corpus</td>
<td>468.25</td>
<td>474.75</td>
<td>-0.180</td>
</tr>
<tr>
<td>Open class categories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nouns</td>
<td>5.94</td>
<td>9.48</td>
<td>-3.69*</td>
</tr>
<tr>
<td>Verbs</td>
<td>5.52</td>
<td>5.79</td>
<td>-0.27</td>
</tr>
<tr>
<td>Adjectives</td>
<td>0.90</td>
<td>1.33</td>
<td>-0.70</td>
</tr>
<tr>
<td>Adverbs</td>
<td>3.05</td>
<td>2.54</td>
<td>1.08</td>
</tr>
<tr>
<td>Total</td>
<td>15.41</td>
<td>19.13</td>
<td>-2.10+</td>
</tr>
<tr>
<td>Closed class categories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pronouns</td>
<td>3.09</td>
<td>2.56</td>
<td>1.20</td>
</tr>
<tr>
<td>Prepositions</td>
<td>1.33</td>
<td>1.48</td>
<td>-0.66</td>
</tr>
<tr>
<td>Modals &amp; semimodals</td>
<td>1.36</td>
<td>0.69</td>
<td>2.46*</td>
</tr>
<tr>
<td>Wh-forms</td>
<td>1.08</td>
<td>0.68</td>
<td>2.31+</td>
</tr>
<tr>
<td>Demonstratives</td>
<td>0.48</td>
<td>0.48</td>
<td>0.00</td>
</tr>
<tr>
<td>Quantifiers</td>
<td>0.93</td>
<td>0.87</td>
<td>0.22</td>
</tr>
<tr>
<td>Logical forms</td>
<td>0.25</td>
<td>0.42</td>
<td>-1.47</td>
</tr>
<tr>
<td>Total</td>
<td>8.50</td>
<td>7.18</td>
<td>1.82</td>
</tr>
<tr>
<td>Overall Total</td>
<td>23.90</td>
<td>26.47</td>
<td>-1.03</td>
</tr>
</tbody>
</table>

Note: Groups were compared using independent-sample t-tests (2-tailed tests).
*p < .05, +p < .10

Results. Non-MR children produced an average of 19.13 different open-class vocabulary types per 100 words produced; they appeared to rely upon a wider range of open-class vocabulary than did the children with DS (mean = 15.41, t = -2.10, p < .10) This nearly significant difference
Anne E. Fowler derives almost entirely from the significantly greater tendency of the non-MR group to use different noun types (see Table 7). Thus, although PPVT scores indicate the children with DS should have access to a higher vocabulary, they tended not to rely upon a large (especially nominal) vocabulary in this spontaneous speech sample. As was observed in the analysis of closed class vocabulary, the child with DS tended to rely on pronouns where possible.

Summary

In sum, despite the fact that this set of measures was chosen specifically with the aim of uncovering plausible differences, similarities across groups of children at the same language stage were more striking than were any small differences. Performance on each measure was within the expectations derived from the normal literature relevant to that stage, and was confirmed on the basis of measures made on a non-MR control group. The children with DS in this study appear to be at a linguistically stable, if extremely restricted, point of development, with no syntactic or grammatical measure deviating from that stage one way or the other. Overall, the combination of the syntactic measures employed reveal DS subjects to be at a level of simple phrase structure grammar—one that cannot be reduced to semantic generalizations perhaps (see Slobin, 1980, for a discussion of the normal course), but one that precedes, across the board, the dramatic changes required to build the complex syntax with its associated verbal auxiliary system, sentential embedding, and movement rules.

Despite the small sample sizes, some differences between groups were large and consistent enough to approach or obtain a level of significance. In contrast to our initial expectations, where differences did occur, it was usually the child with DS who lagged behind the normally developing child despite attested higher verbal MA: they supplied early grammatical morphemes and grammatical objects less consistently, and produced less complex noun phrases. And, despite relatively advanced receptive vocabulary scores, in actual usage, the children with DS relied more heavily on pronouns than nouns.

Even where children with DS maintain an advantage, there are important disclaimers. For instance, far from being altogether insensitive to the little words of language, they were actually somewhat more advanced in the acquisition of different closed class terminology than non-MR children at this language level. And yet, other analyses make it apparent that the children with DS are extremely limited in their ability to use these forms appropriately and consistently to serve syntactic/grammatical functions. Similarly, although they produced complex sentences of appropriate length and word order, our results suggest that this level of syntactic complexity is not at all supported by appropriate grammatical markers.

Although the results of this study are at best suggestive, it serves as a good starting point in arguing several points about the development of language structure in children with DS. These arguments have gained considerable support in subsequent research, and have been extended to children at different ages, at different language stages, and in different experimental tasks.

VI. DISCUSSION: THE NATURE OF LANGUAGE IN CHILDREN WITH DS

VI.1. Internal Structure as a Function of Language Stage

There are, by now, many studies reiterating the main finding of this study: when appropriate matching procedures are employed, internal analyses fail to distinguish the language structures
employed by children with DS from those produced by non-MR children at that language stage. This is true at the language level discussed above as well as at earlier stages of development, whether it is receptive or productive knowledge being assessed. This conclusion also appears to hold in the few longitudinal studies that have been undertaken to date. In most of these studies, MLU has been the matching criterion of choice. The consistency of language levels within DS has resulted in a number of studies focusing on a few language stages, thus yielding a more detailed picture of language development than currently available for other, more mixed, groups.

The virtue of comparing language structure of children with DS and without DS as a function of general language level has recently been demonstrated in several studies of mildly to moderately retarded children with DS at Brown's (1973) Stage I. At this early stage, marked by the onset of two-word utterances, the focus has been on determining the "relational" or "thematic" meanings encoded in two-word combinations (Buium, Rynders, & Turnure, 1974; Coggins, 1979; Dooley, 1977; Fowler, 1984). Although these studies vary in the semantic coding systems employed, they are in full agreement that children with DS choose to encode much the same thematic relations as non-MR children at the same language stage. Coggins (1979), for example, classified all two-word utterances of four children with DS (aged 3;10 to 6;2) to find that they showed as much diversity as non-MR children studied in Bloom, Lightbown, and Hood (1975) and Schlesinger (1971). Approximately 70% of their utterances fell into the nine "semantic categories" most frequently encoded by non-MR children at Stage I. Paralleling normal development, Coggins observed a shift from Early Stage I to Late Stage I in the tendency of the children with DS to rely increasingly on locative and stative categories. Coggins also noted that the children with DS, like non-MR children at this stage, failed to make conditional or hypothetical statements, refer to past or future events, or use grammatical morphemes productively. Within this same language stage, Harris (1983) reports that there is an effect of chronological age (CA 2;6 - 6;9 years) on language structure. The younger children with DS were indistinguishable from MLU-matched non-MR children, but the older children employed somewhat different means to expand their utterances.

A common feature of non-MR speaker at Stage I is the spontaneous imitation of adult utterances. Coggins and Morrison (1981) found that, like non-MR children studied by Bloom, Hood, and Lightbown (1974), children with DS vary considerably in the amount of spontaneous imitations produced. Of primary interest to these researchers was the finding that children with DS were selective in their choice of structures to imitate: like non-MR children, they chose to imitate words that did not occur frequently in their spontaneous productions. (See Shipley et al., 1969, for the normal case.) Coggins and Morrison suggested that this selective imitation points to a strategic attempt to resolve differences between the child's productions and the adult input.

Rondal (1980) found spontaneous imitations of children with DS to be comparable in both number and complexity to those produced by non-MR children, not only at Stage I (MLU 1.0-1.5 and 1.75-2.25), but at a somewhat higher MLU level (2.5-3.0) as well. Language level was a significant factor in both groups: in children with DS as in non-MR children, the absolute number of imitations decreased and the length and complexity of imitations increased as language level improved. In both groups, there was a tendency to imitate the end of a maternal utterance, which Rondal suggests shows a "perceptual centration" on the final part of adult utterances. (See Slobin, 1973, for the normal case.) Indeed, of a wide number of measures taken, the only difference distinguishing the children with DS from the non-MR children was a greater tendency to imitate modifiers from the mother's speech.
Two studies have been conducted, looking at the internal structure of language as it develops over time, starting at Stage I. Dooley (1977) conducted a year-long observational study of two children with DS (IQ 51 and 44; starting CA 3;10 and 5;2); both children were in Brown’s (1973) language Stage I throughout the study. Over the year, one child made approximately one month’s progress (MLU 1.48 to 1.75) relative to non-MR children studied in Brown (1973); the other child actually declined somewhat in MLU (1.84 to 1.73). With the exception of the fact that they failed to change significantly over the period, the children were similar to Stage I non-MR children on internal measures (semantic relations, grammatical morphemes, utterance diversity and size of lexicon). The only difference of note was a greater tendency on the part of the children with DS to rely heavily on routinized expressions and proforms (it, they, here, there, do) in keeping with our findings above. Dooley, however, notes that this tendency also varies in the normal population.

Fowler (1984) reports on a child with DS, Rebecca, (IQ 57; CA 4;3 to 7;5) who was observed on a monthly basis over a three year period (CA 4;3 to 6;11 years); Rebecca’s language moved from Stage I to Stage III/IV over this time period. Despite a slow start in Stage I, Rebecca grew consistently from MLU 1.4 to 3.5 in a normally rapid period of time (13 months). This was followed by an extended plateau (10 months) at the 3.5 period. Near the close of the study, Rebecca was veering into Stage V (MLU = 4.0), but with considerable fluctuation. On internal analyses (semantic relations, grammatical morphology, negative and interrogative constructions), Rebecca’s language was indistinguishable from the norm between the stages of I and III, but for a slight advance in semantic relations relative to MLU. Upon reaching the 3.5 threshold, progress on these internal measures halted and interesting overgeneralizations were observed in the verbal auxiliary system and wh-interrogation. Although modest further progress has been made in her syntactic development, this development appears to have diverged from the normal course both in rate and character.

At a higher language level, Ryan (1975, 1977) compared children with DS with non-MR and non-DS MR children on general measures of internal structure evident in spontaneous speech; she too found no differences between groups when matched on MLU. In a study on thematic relations extending the work above with Stage I children, Layton and Sharifi (1979) found that school-aged children with DS (CA 7;4 to 12;2 years; MLU 3.5-5.5) used verb types similar to those found in non-MR children matched on MLU. However, they did find different proportions of usage. Most notable was a much lower use in the DS group of “process” verbs involving a change of stage, e.g., John cut the paper, to explain which they invoked a conceptual deficiency. Rondal (1978a) found no overall differences between children with DS and language-matched controls on syntactic complexity as determined by Lee’s (1974) Developmental Sentence Scoring procedure. Like Wiegel-Crump (1981), however, he reports that at the higher MLU levels advanced constructions fail to develop in the child with DS at a level commensurate with normal expectations.

Studies of comprehension skill as a function of general language stage suggest that structural language deficits cut across comprehension equivalently. Bridges and Smith (1984) compared the performance of children with DS (CA 4;4 to 17;1) with that of non-MR children (CA 1;11 to 4;4), when asked to act out active and passive semantically biased and neutral sentences. Rather than relying upon MA, they used a general standardized comprehension measure (Reynell, 1969) as their criterion for selecting normal controls. There were six groups of matched pairs ranging in VCA (Verbal Comprehension Age) from 2;6 to 5;0 years. In this study, groups did not differ significantly in overall percentage correct response. The pattern of errors was comparable across groups; the groups were affected equivalently by manipulations of the semantic plausibility of
the sentences presented. The children with DS were, however, six to twelve months behind the non-retarded children (as measured by VCA) in acquiring syntactic comprehension strategies.

Fowler (1984) also used an object manipulation procedure to compare the syntactic comprehension strategies and skills of schoolchildren with DS (CA 6;9 to 16;8) with those of young toddlers (CA 2;3 to 3;2) matched for two different productive language levels (MLU 3.15 to 3.55 and 4.0 to 4.65); the DS group had significantly higher MA’s as assessed on the PPVT-R (Dunn & Dunn, 1981). In this study, too, there were no differences in mean performance overall, or in the semantically reversible condition. The effect of syntactic type (actives, passives, datives, and three relative clause types) was constant across groups. However, there was a significant interaction between group and effect of semantic plausibility, suggesting that the children with DS may depend more heavily on semantic inferencing skills. The children with DS performed better in the plausible conditions, and worse in the implausible conditions, than did the non-MR controls. The apparent contradiction between Fowler (1984) and Bridges and Smith (1984) is likely a function of the matching procedure. The VCA measure employed by Bridges and Smith incorporates lexical as well as syntactic knowledge; consistent with the lexical/syntactic split discussed below, it appears to have overestimated syntactic knowledge in the DS group, but to have been a fair measure of semantic inferencing skill. On the other hand, the measure selected by Fowler (MLU) turned out to be an appropriate index of syntactic comprehension knowledge, but underestimated lexical knowledge. Differences between groups in Fowler (1984) relevant to plausibility factors appear to be a function of large differences in vocabulary level. (See Dewart, 1979, for comparable results with a group of MR children without DS).

VI.2. Differential Delays Within the Verbal/Communication Domain

I reviewed evidence above demonstrating that children with DS experience difficulties with verbal measures that are incommensurate with their general developmental status. In these studies, however, language skills are often not well-defined or contained and the contrast skill or score is often a vague all-purpose measure. In this section, I go one step further to argue that even relative to other well-defined measures within the verbal/communication domain, the child with DS appears to be especially hampered in acquiring grammatical and syntactic structures. A large number of studies point to a split between lexical and structural knowledge; a growing literature suggests that syntactic development may also lag behind other closely related well-defined skills such as communicative function and symbolic play. These disparities are evident from the onset of syntax, with the gap only increasing as the child becomes older.

Lexical versus structural development. The study presented in detail above, the superior MA’s of the children with DS relative to their MLU scores support the hypothesis that lexical knowledge in children with DS is spared relative to structural knowledge as assessed by measures of syntax and morphology. This particular hypothesis has received considerable, if indirect, support. In studies of lexical knowledge, whether the task is to produce, recognize, or identify vocabulary items, children with DS are on a par with, or only slightly behind, MA-matched controls, retarded and not (e.g., Bartel et al., 1973; Blount, 1968; Lyle, 1960; Ryan, 1975; Spreen, 1965). On the other hand, when grammatical or syntactic indices are taken, children with DS standardly perform on a lower level than their MA peers (Lyle, 1960; Paour & Paour, 1971 [cited in Gibson, 1978]; Ryan, 1975; Spreen, 1965). Most convincing are several studies in which grammatical and lexical measures have been made on the same subjects, demonstrating a greater delay for grammatical than for lexical forms, relative to MA. This disparity is maintained whether the task
involves production or comprehension structures and appears to increase with chronological and mental age (Bless, Swift, & Rosen, 1985; Hartley, 1982; Lyle, 1960; Rogers, 1975; Ryan, 1975).

Evans (1977) provided evidence for such a lexical/structural split in a factor-analytic study using a wide range of measures including verbal and nonverbal intelligence, CA, several structural and fluency measures derived from spontaneous speech samples, and performance on the subtests of the ITPA (McCarthy & Kirk, 1961). In Evans' data there was a consistent pattern of clustering of measures according to three largely distinct factors. Significantly, there was a sharp dichotomy between the "general verbal ability" factor and the "structure of speech" factor. Stanford-Binet Mental Age was the highest loading on the verbal factor, but was insignificant on the "structural" factor; CA, in contrast, loaded moderately but significantly on the "structural" factor, but not on the "verbal" factor. Those measures loading on the structural factor included sentence length, complexity, ratio of nouns to verbs and other parts of speech, and a task of grammatical morphology. These were largely independent from the general "verbal" measures including vocabulary, general intelligence tests, and most of the ITPA measures. Those measures tapping fluency of speech correlated only among themselves and nonsignificantly with the other two factors.

Hartley (1982) also found that DS difficulties in syntax surpassed those in the lexicon and went on to show that this disparity was more extreme in children with DS than in a mixed MR group. Her conclusion was based on patterns of performance on The Token Test for Children (Di Simoni, 1978) which she administered to children with DS (mean CA 11;0 years), to MR children of other etiologies (mean CA 10;7 years), and to non-MR children (mean CA 4;7 years). The three groups were matched on receptive vocabulary score: mean MA on the PPVT was 4;2 years for each group. The Token Test, which requires the subject to manipulate wooden objects of varying shapes and colors, incorporates conditions that allow the experimenter to manipulate memory demands directly, as in (1) versus (2) below, as well as syntactic requirements, such as (2) versus (3). In this analysis, Hartley further divided the tasks standardly labeled syntactic into those she considered to be primarily syntactic and those which she thought were really more lexical or "spatial," illustrated by (3) versus (4).

(1) Give me the red circle

(2) Pick up the big red circle and the small green square

(3) Before picking up the yellow circle, touch the red square

(4) Put the white circle in front of the blue square

Both groups of MR children were significantly less successful on all parts of the test than non-MR children matched for MA. Children with DS, in turn, performed less well than other non-DS children of similar age and IQ. Only on the spatial items was there no difference between the DS and the non-DS children; this was in direct contrast to the significant difference found between MR groups on the sentences stressing syntactic skill. Although Hartley hypothesized that children with DS process "simultaneous," but not "sequential" information, her results can also be handled by invoking a lexical/syntactic split that holds up even when the lexical items under study are highly relational spatial terms.
A more recent body of developmentally informed research has examined the development of language structure, as indexed by MLU, within the context of more general communication skills. This literature has focused on Stage I of syntactic development. The general finding is that children with DS exhibit communicative skills at a level equivalent to, or more advanced than, communicative behavior of non-MR children at Stage I (Coggins, Carpenter, & Owings, 1983; Coggins & Stoel-Gammon, 1982; Leifer & Lewis, 1984; Owings & MacDonald, 1982; Scherer & Owings, 1984). Beeghly and Cicchetti (1985) found not only that the communicative skills of children with DS were more mature than those of MLU-matched controls, but went on to show that they were equivalent to those of MA-matched controls whose MLU well exceeded that of the group with DS. Related findings are reported by Weiss, Beeghly and Cicchetti (1985) in regard to symbolic play, often thought to rest on the same cognitive basis as language behavior. There too, on indices of symbolic play, children with DS perform at a level on a par with general cognitive development and are generally more advanced than their language level (Stage I) alone would predict. Other studies of older individuals with DS suggest that functional communicative skills exceed verbal abilities, but these have not been as well controlled (Leuder, Fraser, & Jeeves, 1981; Nisbet, Zanella, & Miller, 1984; Price-Williams & Sabsay, 1979). One must be careful, however, to keep in mind that a relative advantage on measures of communicative skill such as turn-taking or very early gestural skill need not imply that children with DS would have any real advantage in acquiring a structured sign language over spoken language. Although there is an advantage for gestural over spoken communication at the earliest stages of development in all children, this advantage appears to drop out for both non-MR children and children with DS prior to the onset of syntax (Abrahamsen et al., 1985; Petitto, 1985).

The emergence of language. Thus far, I have focused upon children who have already begun to combine words (Stage I). Recently, however, there has been a surge of interest attempting to place the onset of syntax—and of first words—within a well-defined developmental context. This research on the pre-linguistic and early linguistic child with DS is in keeping with research at other stages regarding a lack of qualitative differences. Children with DS speak with the same early vocabulary (Gillham, 1979), follow highly constrained rules of lexical acquisition (Mervis, in press), and select from similar kinds of nonverbal gestures as those used by normal children (Greenwald & Leonard, 1979). Within narrow and well-defined domains, development proceeds in an orderly, if not rapid fashion.

Also consistent with the findings reviewed thus far, confusion is generated at the first attempt to examine the interrelationship between one and another subdomain of language or, between general cognitive development and the emergence of language. Although Lenneberg et al. (1964) reported that the onset of first words and first sentences in children with DS intercalated nicely with major developmental milestones of walking and running, other studies conducted at that time suggest that children with DS show an inferiority in verbal skill relative to more general developmental measures even at early ages (Dameron, 1963; Share et al., 1964). A few recent studies have made a more careful exploration of the relationship between the onset of first words and phrases, and measures of cognitive development hypothesized to underlie language skill (Greenwald & Leonard, 1979; Mahoney et al., 1981, and Mervis, in press) to yield a rather complicated story.

Greenwald and Leonard (1979) focused on the prelinguistic stage, comparing performance on a sensorimotor task with measures of communicative behavior in situations designed to induce either an imperative or declarative response. Children with DS and normally developing children
were selected as consistently functioning either at stage 4 or 5 on three scales of the Uzgiris and Hunt (1975) Ordinal Scales of Psychological Development. At stage 4, the children with DS ranged in age (CA) from 10 to 19 months (mean IQ 52); these were compared to non-MR children between 7 and 9 months of age (mean IQ 110). At this emphatically pre-linguistic level, no group differences emerged in communication measures: both groups were equally adept at using "imperative" gestures and neither group displayed any evidence of making "declarative" gestures. More advanced levels of communicative behavior were found at stage 5 in both groups. However, although the imperative task continued to yield nonsignificant group differences, the non-MR children (CA 9-13 months; mean IQ 125) by sensorimotor Stage 5 had achieved a significant advantage over the children with DS (CA 16-26 months; mean IQ 68) in the kinds of declarative gestures relied upon. The major source of this advantage was a greater tendency on the part of the non-MR children to express themselves verbally. Indeed, the group with DS relied almost totally on nonverbal gesture whereas vocalization frequently replaced or accompanied gesture in the non-MR group.

A separate subgroup of older pre-schoolers with DS (CA 31 to 54 months; mean IQ = 62), although still at Stage 5 on the sensorimotor scale, obtained more advanced communication scores and were more apt to use a verbal response than either of the younger groups. The authors suggest this shows some independence between the cognitive and linguistic tasks, perhaps facilitated by the massive linguistic intervention provided for these children. While it seems that the Stage 5 level of sensorimotor development may be associated with a wide range of communicative skill, even within the groups with DS some of the variability may arise from grouping as a single category both verbal and nonverbal communication skills (see Beeghly & Cicchetti, 1985, for a cleaner separation of these skills in Stage I children). Greenwald and Leonard's findings that declarative, but not imperative, gestures are delayed in the infant with DS are of particular interest in light of research on referential looking in the pre-linguistic infant with DS. Miller (in press) reviews several studies, most notably Jones (1977, 1980) in which children with DS (MA 8 to 22 months) exhibited significant deficits in referential looking behavior relative to general developmental level. Jones (1980), however, did not find that the children with DS vocalized significantly less than the MA-matched non-MR children. Further disentanglement of what pre-linguistic behaviors do and do not correlate with later linguistic patterns will surely aid our theoretical understanding of what elements constitute precursors to language learning.

Mahoney et al. (1981) employed more explicitly linguistic (as opposed to communication) measures to report that language skill lagged behind sensorimotor functioning in very young children with DS. They matched children with DS (CA 24 to 38 months) and non-MR children (CA 12 to 19 months) on the Bayley Mental Developmental Scale (Bayley, 1969) such that each group approximated a developmental age of 17 months (DS 13 to 23 months, mean = 16.8; non-MR 12 to 23 months; mean = 17.1). Although the children with DS scored comparably or higher than the non-MR children on 5 out of the 6 subscales of Uzgiris-Hunt scales of general sensorimotor development, the non-MR group had a substantial advantage on the vocal imitation subscale and on both receptive and expressive measures of the Receptive and Expressive Early Language Test (Bauch & League, 1970).

Finally, in a longitudinal study bridging the gap between pre-language and language, Mervis (in press; see also Cardoso-Martins, Mervis, & Mervis, 1985) examined the ongoing relationship between cognitive development and linguistic development. Consistent with the findings of
Lenneberg et al. (1964), she reports that the emergence of referential language, both in comprehension and production, is in keeping with developmental expectations. In children with DS, referential comprehension was first demonstrated at a mean MA of 14.5 months (Bayley) in children with DS, compared to a mean MA of 13.8 months in non-MR children. Similarly, the onset of referential production occurred at a mean MA of 18.9 months in the group with DS compared to a mean MA of 19.5 months in the non-MR group. These results were supported by a separate analysis that showed children with DS and non-MR children to be comparable in their stages of sensorimotor development at the onset of referential communication.

On the other hand, Mervis reports vocabulary size is less well associated with sensorimotor measures. When groups were matched on sensorimotor development at four distinct points (all within stages 5 and 6), vocabulary size was consistently smaller in the children with DS; the greatest difference in vocabulary size was apparent at the final point, upon complete attainment of stage 6. Mervis did not find differences in vocabulary size when she equated groups on interpolated MA levels (Bayley, 1969), but stresses that such differences were apparent in a larger-scale study conducted by Strominger, Winkler, and Cohen (1984). In that study, 36-month-old children with DS showed large deficits in vocabulary size relative to their mental age. Although they had a mean mental age of 20.6 months on the Bayley scales, their vocabulary size (mean = 18.5 words; range 0 to 85) was closer to that of a normally developing child of 18 months (mean vocabulary = 22) than to the average 21 month old. By 21 months, the non-MR child has typically undergone a vocabulary explosion and has an average vocabulary of 118 words. Mervis concludes that “these results suggest that a major reason for the large differences in size of vocabulary between children with DS and non-handicapped children is that the vocabulary spurt for the child with DS does not begin at the mental age that would be expected, based on the findings concerning non-handicapped children” (p. 43).

Given the close relationship between the vocabulary spurt and the onset of syntax in the non-handicapped child (Gleitman & Wanner, 1982; Lenneberg, 1967), this particular delay may presage directly the structural deficits already discussed.

VI.3 Homogeneity of Language Structure: A Ceiling on Language Development?

In recent years, much attention has been paid to the fact that, despite a poor prognosis for language development, some children with DS acquire considerable linguistic maturity and may even learn to read and write. Consider, for instance, the celebrated account of a mildly retarded DS boy (IQ 60) who learned to read and write, and kept a diary of his life from CA 11 to 45 years (Seagoe, 1965). At his most mature stage (age 24), his language, analyzed for syntactic complexity, was at the level of a bright five year old, except for a high redundancy of words of “low rank” and few words at a “high rank.”

Despite the well-documented fact that language in DS can range from mutism to linguistic maturity, seemingly independent of IQ (Evans & Hampson, 1968; Lenneberg et al., 1964), such reports obscure the fact that individuals with DS by and large fail to move beyond the most rudimentary stages of syntactic development. Gibson (1978) reviews two very early studies on DS language that report that DS children cluster at extremely low level of language development. Muir (1903) reported that the development of language in children with DS, although paralleling that of normal children in very early vocabulary development, did not move beyond the stage of acquiring a few verbs even in his “most accomplished mongol.” Similarly, Brousseau and
Brainerd (1928) stated that children with DS were "disinclined" to use sentences. More evidence derives from Thompson (1963) and Wiegler-Crump (1981), both of whom remarked upon the reliance of subjects with DS on short, simple sentences. Wiegler-Crump (1981) used Lee's (1974) Developmental Sentence Scoring procedure to assess the language skills of 80 children with DS (CA 6:0 - 12:7 years; MA 2:0 to 6:11 years). These children exhibited a more homogeneous pattern of syntactic usage than MA-matched non-MR children; they relied almost exclusively on low-level syntactic structures with very little variety of construction; this changed little across the MA-range observed.

This clustering of DS children at very low language levels is echoed in a number of recent studies, also focusing on syntactic skills, but using more experimental procedures. Semmel and Dolley (1971) made a study of comprehension and imitation skills, relying upon the procedures and theoretical framework underlying the work of Lovell and Dixon (1967), Lackner (1968), and Graham and Gulliford (1968), but restricted themselves to children with DS (CA 6 to 14 years; IQ 22 to 62). Although qualitative similarities held across these studies in regard to the role of syntactic type in these tasks, Semmel and Dolley found that most of the DS subjects could comprehend and reproduce only simple active declaratives; they were at base level for negatives, passives, and negative passive sentences. Individuals with DS seemed to need contextual cues to make any sense of these sentence types.

Analogously, Evans (1977) was completely unsuccessful in his attempt to administer the Berko morphological task to his sample of 101 DS individuals (CA 8.3 to 31.1 years; MA 2.5 to 7.8 years). Out of the 101 subjects, 96 scored 6 or fewer correct responses to the 30 items in the nonsense condition; 61 could not even do the simplest task of supplying a plural for *wug*. Even in his spontaneous language measures, Evans noted that "because of limited speech development no subject reached the ceiling in either the Sentence Structure test or the Linguistic Features Count" (p. 113). In that analysis, more than a third of the utterances produced were one-word long, and the 10 longest utterances in each subject's corpus averaged only 5.2 words.

Rondal et al. (1981) also reported very low levels of skill in sentence repetition tasks, especially in their subjects with DS. Only three Down's subjects out of 19 (age range 5:2 to 12:7 years; IQ range 40 to 49) could successfully imitate a five word active declarative sentence; when the declarative was negative, still five words in length, only one subject could handle it. There were many echolalic responses. Although the constructions produced under these conditions would clearly be considered "deviant" if produced spontaneously, such constructions have been observed in very young non-MR children (24 to 30 months CA) when asked to repeat sentences well beyond their level of proficiency (Lenneberg et al., 1964; Fowler, 1980).

Finally, it should be noted that even studies ostensibly reporting a range of language skill in individuals with DS suggest a largely homogeneous pattern. In the population studied by Lenneberg et al. (1964), for example, 32 of the 35 subjects (CA 5:6 to 13:6) for which he reports data fell into his two middle categories of stage of language development ("mostly words," "primitive phrases"). Only two of the 35 were at the "sentence" level of development, while one child was still at the "babbling" stage (this observation derives from Rosenberg, 1982). Lenneberg et al. found little relation between IQ and language level, but did hint at an IQ threshold of 50, beyond which considerable syntactic competence was possible though certainly not guaranteed.
Andrews and Andrews (1977) also reported tremendous variability in the spontaneous speech samples collected from 39 DS children (CA 5;8 to 17;9; IQ 31 to 60). Although there are methodological problems with this study due to the limited quantity of speech collected per child, it appears that the variability that exists stems primarily from usage factors (quantity of speech and the like). On structural measures such as MLU, however, the children in this sample were highly consistent in obtaining low scores.

From these various studies, the generalization seems to emerge that DS may exert considerable influence on the ultimate language level that a DS individual child will attain. Although a few will reach the language level of a five year old and will have limited skills in reading and writing, the child with DS is not apt to move beyond the level of simple phrase structure grammar found in non-MR children younger than three years of age.

VII. EXPLANATORY ACCOUNTS OF THE SPECIFIC LANGUAGE DEFICIT IN CHILDREN WITH DS

On the basis of the research presented, it is quite clear that the course and limits on language learning in children with DS cannot be explained as a simple function of general cognitive development, either as assessed by MA or by more sophisticated measures of communicative skill or sensorimotor development (see also Cromer, 1974, 1976). Several explanatory accounts have been put forth in an attempt to explain why it is there is such a large discrepancy between measured MA and the final language attainments of individuals with DS, and why learning appears to stop at the point that it does. Although none of these accounts has been unequivocally ruled out, and several may play a role, I present them here as possible directions for future research.

A commonly invoked explanation for deficits in heterogeneous MR children above and beyond those predicted by general cognitive factors is that they are less motivated than non-MR MA peers in performing the task at hand (Zigler, 1969). However, motivation fails to account for normal language learning: whereas it is presumably extremely crucial for all individuals to have a rudimentary communication system for basic needs, the elaboration of such a system to incorporate complex linguistic syntactic forms (e.g., *can I have a cookie* vs. *cookie*) lacks motivational explanation in all cases. And yet, it is just this elaboration that is lacking in the child with DS. Note too that the child with DS studied today is not the depressed institutionalized child of yesterday about whom motivational accounts were hypothesized. Today’s subjects often live at home in family settings and receive special attention from very early ages at home and in the schools. Motivation is also high in adult workshops: Evans (1977) noted his subjects with DS were highly motivated to use speech and regularly did so with the support of linguistically able non-MR adults. Nonetheless these individuals continued to perform in language well below MA expectations. Perhaps most telling concerning the role of motivation in acquiring syntax are two explicit studies of the effects of institutionalization on language in children with DS. Although McNutt and Leri (1979) found that institutionalization dampened progress across many areas of development, including vocabulary and verbosity, both they and Wiegel-Crump (1981) report no differences between institutionalized and home-reared children with DS on a wide range of syntactic measures.

A second account put forth to account for the extreme linguistic deficits in children with DS refers specifically to the language environment. Given the discrepancy between the child’s age/size and linguistic capacities, it is possible that the speech directed to him or her is inappropriate.
That is, whatever advantage is derived from the tendency to speak to young children in short, simple sentences (comprehensibility, perhaps), may be denied the retarded child at similar stages in the acquisition sequence. (For discussion of the facilitative effects of motherese in normal language learning, see Fernald & Simon, 1984; Furrow, Nelson, & Benedict, 1977; Gleitman et al., 1984, and Newport et al. 1977.) A number of studies have addressed this issue and rendered this hypothesis implausible; mothers interact with their children with DS in much the same way as they interact with their non-MR children at comparable language levels. Most compelling is the finding that MLU is a much better predictor than MA or CA of the characteristics of a mother's speech to her child. (See Peterson & Sherrod, 1982; Rondal, 1978b, and Rosenberg, 1982, for comprehensive reviews of the relevant literature). Even where differences in mother's style of interaction do emerge, it has not been possible to assign a specific result to that difference. Mervis (in press) reports that although mothers make fewer adjustments to accommodate to the early lexical categories of their children with DS, this difference seems to have no direct effect on the categories formed and maintained by their children.

Miller (in press) is in agreement with these results, but suggests that a lack of maternal responsiveness at the pre-linguistic level may be responsible for a delay in language. In a review of the literature, he reports that mothers are less responsive to infants with DS (and vice versa); that mothers of infants with DS tend to talk while their child is vocalizing rather than engaging in turn-taking behavior, and that mothers are more directive, intrusive, and controlling while interacting with children with DS than are mothers interacting with non-MR children of comparable mental age (see also Beeghly, Weiss, & Cicchetti, 1984; Hanzlik & Stevenson, 1986). The results of intervention studies seeking to mitigate these differences look promising; however, thus far, they lack controls. Furthermore, it is not clear how one should go about matching pre-linguistic groups as a function of language level; we know in any case that early sensorimotor and communication measures are poor indices of how far along the child is toward acquiring verbal skill.

A third proposal to account for the specific language deficit suggests that the neurological structures underlying language are particularly impaired in children with DS. Although there is overwhelming evidence of anatomical, physiological, and neurochemical abnormalities in the brain of children with DS (e.g., Ross et al., 1984), such differences have not yet been specifically related to differences in language function. Two attempts have, however, been made to relate language differences to a lack of a dominant language hemisphere as assessed by dichotic listening tasks.

Looking for the biological underpinnings of a specific language impairment in individuals with DS, Zekulin-Hartley (1981) administered a dichotic listening task to children with DS, to heterogeneous MR children matched to the group with DS on IQ and CA, and to non-MR controls matched to the MR groups on MA. Whereas both groups of children without DS showed the expected right ear advantage in processing linguistic serially presented auditory stimuli (digits and common object labels), children with DS showed a significant left ear advantage.

Sommers and Starkey (1977) used the dichotic listening paradigm to look at differences within the syndrome comparing two groups of children representing the extremes in language functioning. All subjects, selected from a day-school population of 150 children, met a minimum criterion of being able to point correctly to each of the dichotic words and foils used in the test; all had normal hearing and were predominately right-handed. The high-language group (n =15, CA 7:0 to 19:0 years, mean IQ = 46, mean MA = 64 months) was functioning at a language age of 5:3, as assessed by the Carrow (1973) Test for Auditory Comprehension of Language. These
children had a mean MLU of 7.5 words, used both simple and complex grammatical structures, and produced appropriate and intelligible verbal responses to stimulus materials. In contrast, the low performance group (n = 14, CA 7;1 to 17;8, mean IQ = 39, mean MA = 51 months) was functioning at a language level of 3;7 years, had a mean MLU of 2.5, and spoke in three- and four-word sentences at the base phrase structure level. Their speech was telegraphic, intelligibility was poor, and verbal perseveration and inappropriate responses were common. Despite the clear differences between groups in linguistic skill, and despite the great care taken to use a sensitive and reliable measure, the ear advantage in both groups was essentially zero. This contrasted with non-MR controls (3;0 to 5;5 years CA, mean MA 5;1) who showed the expected significant right ear advantage. Although dichotic listening tasks are fraught with methodological pitfalls (Bryden, 1982), the lack of a right ear advantage is at least suggestive of a seriously impaired language area. Converging evidence from other biological indices is crucial to exploring this hypothesis further.

The fourth explanation is Lenneberg’s (1967) critical period hypothesis discussed above. As noted there, this hypothesis fails on many points. Nonetheless, a maturational account contains a great deal of merit. All longitudinal studies spanning the pre-school years report maximal language growth to occur by age 7. For example, Share (1975) reports on the developmental progress, measured using the Gesell developmental examination, of 76 children with DS followed from birth; at the time of the report, these children ranged from 7 to 18 years CA. In this study, most language development occurred between CA 4 and 6 years, during which time the child with DS typically moved from the developmental level of 15 months MA to two and a half or three years MA. This report is consistent with our findings (Fowler, 1984; see Fowler et al., forthcoming) and also appears to fit with the data presented in Lenneberg et al. (1964). Indirect support is provided by several cross-sectional studies in which the gap between syntactic and lexical knowledge widens with growth in CA (see Miller, in press, for a review). A revised version of the critical period hypothesis would suggest that specialized language abilities are no longer available after the age of 7 years, consistent with reports from normal language development (Newport, 1982).

Alternatively, one might wish to account for these same facts not as a function of chronological age, but of linguistic stage. If, indeed, impaired brain function sets a limit on the level of language that can be accommodated, it may well be that language skill is acquired in a timely fashion consistent with general maturational development, but beyond the limiting language level, growth will cease or differ from the normal course (see Fowler, 1984). The considerable evidence speaking to a ceiling on language skill supports this hypothesis, but from the data presented, it is not possible to distinguish the effects of chronological age from those of language stage. (See Fowler et al., forthcoming, for a full discussion of these last two hypotheses and for a more extended set of longitudinal data bearing on this issue).

VIII. OVERVIEW

In sum, the measures and procedures that have been used to study language in DS vary in many ways. But, taken together, they seem to suggest a coherent picture. Individuals with DS tend to form a well-organized human subset with regard to the prognosis for language development: They are a diminished case of the normal within the language domain and represent a particularly well-studied and straightforward case of the delay/deficit observed in MR language generally.
1) Research on children with DS serves to reinforce the view that language in MR individuals is qualitatively similar to the language of younger non-MR children, particularly in Stages I through III. This holds up across a wide number of detailed internal analyses such as the one presented here. Such studies are motivated and informed by the current developmental perspective in that groups are matched for developmental level within the developing domain of interest (here, language), reflecting a general trend toward domain-specific research (e.g., Keil, 1981). Also in keeping with this trend, the language measures taken are not presented as a single summary index: rather, the internal measures employed in research on children with DS (thematic relations, morphological usage, etc.) are treated as coherent rule-governed systems that are potentially separable from other language measures. Although work on other well-defined domains to contrast with syntactic growth is progressing, much more research needs to be done in this direction.

2) By virtue of studying a biologically well-defined subgroup, some insight has been gained into the course and prognosis of language development under one condition of retardation. Individuals with DS appear to be more consistent in terms of the degree of language delay than are more diffuse groups of MR individuals. Language consistently develops more slowly in children with DS than do other aspects of motor or cognitive development; this lag is evident in infancy and grows wider as the children with DS become older.

3) Although comparisons between biologically well-defined subgroups remain to be done, the available evidence suggests that children with DS, as a group, are more impaired in linguistic skill than are subgroups of children whose retardation is acquired, and are on a par with, or behind, subgroups with obvious organic brain-damage.

4) Working from a developmental model of normal language acquisition, and finding comparable matches in terms of language stage, it becomes possible to determine what the child with DS is or is not capable of in absolute terms, rather than relative to some arbitrary MA measure. Some children with DS do acquire substantial linguistic competence, to the level of a normally developing five year old. Although a general IQ of approximately 50 appears to be a prerequisite for, though not a guarantee of linguistic success, it has not yet proven possible to predict, on non-linguistic grounds, how to distinguish the few children who will acquire syntax from the great majority whose language will level off at an early age without acquiring the complexities of syntax or morphology. Many of these children appear to be stalled at the level of a two and a half year old non-MR child.

5) It was suggested above that MA overestimates structural linguistic knowledge in MR populations generally, which might reflect a split between lexical and syntactic knowledge. This question has been systematically addressed in DS, experimentally manipulating the demands on the child to tap one or the other aspect of language skill. Converging evidence from both comprehension and production strongly supports the conclusion that the language deficit in DS is most pronounced in the grammatico-syntactic components with a relative sparing within the lexical domain (also within nonverbal communication). On the other hand, within the structural components of language, it appears that the deficit is consistent across syntax and morphology and across comprehension and production.

6) Although there are no data available for other subgroups of MR individuals, a small data base is accruing concerning the course of language learning over time in individuals with DS, based on longitudinal and systematic cross-sectional research. On the basis of this preliminary
research, it appears that language learning does not proceed at a constant pace from birth to puberty. Rather, a great deal of language learning appears to take place by seven to nine years of age (CA); for brief periods it may proceed at a near normal pace. In regard to internal analyses of the language systems acquired, the conclusions presented above appear to hold up across the entire developmental sequence, whether defined in terms of CA, MA, or language level, with a widening of the semantic/syntactic gap as CA increases.

Much work remains in order to understand why children with DS stop where they do in the language acquisition sequence, to determine why some children do in fact make better progress in language, to explain differences in consistency and usage that emerge on detailed internal analyses, and to explore more fully the possibility of different learning mechanisms leading to similar results. It should be apparent that the research on DS, by taking a stance that is at once developmental, domain-specific, and biological has greatly enhanced our general understanding of the effects of retardation on language development.

References


