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Personal Tribute

MABEL RICE

Melissa Bowerman was my teacher and mentor during my doctoral studies. If I remember correctly, I formally enrolled in three courses that she taught, and there probably were independent study enrollments to cover the time she devoted to my dissertation project. Most important, however, were the many occasions on which she devoted time to substantive conversations with me about the many questions and observations I wanted to discuss with her regarding children's language acquisition. In retrospect, I am deeply impressed by her ability to convey respect for what surely were naïve and poorly formed contributions on my part.

I recall a formative discussion in which I shared with her my hope that my studies of normative language acquisition would provide benchmarks to help identify children who deviate from the expected course of acquisition. My recollection is that she was somewhat horrified that I had such an unrealistic expectation. She helped me apprehend that it is the nature of the questions asked of the available literature that determine the nature of the answers to be discovered. Simply put, my questions were not the questions of scholars of children's language acquisition, in the general sense, although relevance was surely to be found in their questions and contributions. She encouraged me to seek answers to my questions, in effect, to assume ownership and responsibility for the search for answers. It is my pleasure to honor her guidance with my chapter in this volume, as a form of interim report of how the search for answers to my questions has fared in the elapsed time since her tactful and generous guidance.

There is something like a full circle of influence operating here. As Professor Bowerman notes (1988), her interest in normal language acquisition was sparked by conversations with a speech pathologist who "described a child in her clinic who, despite apparently normal intelligence, had not progressed beyond the most rudimentary syntax" (1988, p. 23). Bowerman regarded training in speech pathology as a rather circuitous route to learning about normal acquisition, and chose a

more direct route of studies with Roger Brown. When I met her, I was trained in speech/language pathology, so the direct route to normal acquisition studies was not a viable option. As it turned out, although my path has been more circuitous nevertheless it seems to have returned to some of the basic issues and questions that guided the work of Bowerman, Brown, and many others.

Professor Bowerman's style of scholarship and teaching made a lasting imprint on me. I recall well the symposium at the Society for Research on Child Development conference held in Boston, 1981, in which Roger Brown introduced several of his graduates who spoke on the topic of "The Development of Language and Language Researchers: Whatever Happened to Linguistic Theory" (cf. Kessel, 1988, p. 2). In his introduction of Bowerman, Brown characterized her as the "Jane Austen of language acquisition scholars." As I remember it, he made reference to her precision, her astute and detailed observations, her tight line of argumentation, her patience and persistence, and her deceptively gentle style, all of which in combination could deliver a devastating and decisive critique of a misguided hypothesis. He may also have noted that she was fearless, in that she applied this scholarly approach to all ideas and models, regardless of the levels of popular acceptance or the acclaim of their proponents. These characterizations rang true to me, as I thought of how she had demonstrated those qualities in her teaching and mentorship. She provided a powerful and pure model of the highest standards of scholarship, in which ideas matter and should hold up to serious scrutiny. I took her example as one to aim for, even if such expectations are only intermittently possible to achieve.

For her paper in honor of Roger Brown, Bowerman quoted Brown and Bellugi (1964) as the original source of the fundamental issue that motivated her scholarship: "The discovery of latent structure is the greatest of the processes involved in language acquisition, and the most difficult to understand" (p. 315). Upon rereading Bowerman's paper, I am struck by the realization that the issue has been at the core of much of my work as well, even if it might not have always been obvious as my program of investigation unfolded. In retrospect, this is not surprising, given Bowerman's powerful impact as teacher and mentor and the many ways in which her example has influenced intellectual inquiry.

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10

Language Acquisition Lessons from Children with Specific Language Impairment
Revisiting the Discovery of Latent Structures

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The central theme of this chapter is drawn from Melissa Bowerman's paper in honor of Roger Brown (Bowerman, 1988), in which she quoted Brown and Bellugi (1964) as the original source of the fundamental issue that motivated her scholarship: "The discovery of latent structure is the greatest of the processes involved in language acquisition, and the most difficult to understand" (p. 315). As a student of Bowerman's, I was well tutored in the significance of the latent structure issue for theories of children's language acquisition.

Much of my scholarship has focused on children with language impairments and a search for the ways in which their language acquisition mechanisms are weak or show a deficit, in order to enhance the identification of affected children and the development of effective intervention programs. The focus on the limitations of language acquisition mechanisms can obscure the ways in which affected children also demonstrate robust language acquisition mechanisms that seem to parallel those of unaffected children. My intent here is to honor Bowerman's formative influence on my scholarship by broadening the perspective on children's language impairments with consideration of the fundamental issue she introduced to me.

In this chapter I evaluate the nature of the language impairments of children with Specific Language Impairment (SLI) in terms of the "discovery of latent structures," with an eye toward the relevance of the work for enhancing our

understanding of the underpinnings of language acquisition of children in general. In so doing, I draw heavily on my own work, as well as that of my contemporary colleagues. I begin with a brief description of the condition of SLI. The main structure that follows is one frequently used by Bowerman in her writing—namely, first laying out a phenomenon and an explanatory model or perspective, and then evaluating the model via the pros and cons drawn from available evidence. The long-standing prevailing model posits that the language problems of children with SLI are attributable to problems with the discovery of latent language structures. In closing I will argue that children with SLI are surprisingly like unaffected children, in spite of some striking and powerful deficits in language acquisition, deficits that persist for a long time. This apparent discrepancy between what they can and cannot do poses strong challenges to generic one-size-fits-all-dimensions-of-language accounts of language acquisition and more specifically language impairments associated with SLI.

SPECIFIC LANGUAGE IMPAIRMENT IN CHILDREN

Specific Language Impairment (SLI) is a disorder in which children perform below age expectations on language measures despite having adequate cognitive and sensory skills for language development. SLI is usually diagnosed according to a set of inclusionary and exclusionary criteria. Children are included if their performance on an omnibus language measure is at least one standard deviation below age expectations (a level approximately equivalent to the 15th percentile of the normative distribution). Children are excluded if their nonverbal intelligence is below age expectations, or if they have hearing loss, clinical levels of neurological impairment, or a diagnosis of psychiatric impairment such as autism. It is estimated that approximately 7% of children aged 5 to 6 years can be classified as SLI (Tomblin, Records et al., 1997).

Recent epidemiological investigation has established that in the general population speech impairments are orthogonal to language impairments (Shriberg, Tomblin, & McSweeny, 1999). Because children with speech impairments are more likely to be identified for clinical services and children with SLI who participate in experimental studies are often recruited out of clinical caseloads, an overlap of speech and language impairment is often reported for children who participate in scientific studies. Thus it is important to keep in mind that although sampling confounds may exist in much of the literature, in the general population language impairments are essentially independent of speech impairments.

There is now an extensive literature that is largely devoted to the determination of the nature of the language impairments of children with SLI, the extent to which related cognitive and social abilities are also affected, and the identification of possible etiological factors (cf. Leonard, 1998). With regard to the nature of the language impairments, it has been very helpful to keep in mind two different benchmarks for characterizing the language systems of affected children. One benchmark is the expectation relative to a child's chronological age, which is the reference level for clinical diagnosis. The second benchmark is the performance

of younger children at equivalent levels of language acquisition, often indexed by mean length of utterance (MLU). There is strong reason to believe that children with SLI are delayed in the onset of their language acquisition. A long-standing question is whether their language impairment is a matter of general language delay, in which case their language systems should be highly similar to those of younger children. In this scenario, the language of affected children would be generally immature and expected to synchronize across linguistic dimensions in the same way as the language of younger children. An alternative is a delay-with-disruption model (Rice, 2003, 2004a, 2004b, 2007). This model captures the fact that some elements of affected children's grammars are less developed than expected, even relative to younger control children. In effect, while many elements are delayed, some elements are even weaker than a general delay would predict. The point to highlight here is that age defines a "delay," wherein general immaturity is a unifying construct, whereas a "disruption" involves areas of weakness that are unsynchronized within an immature grammar.

The nature of the underlying factors that account for the language impairments of SLI has been a topic of lively debate. The major views can be categorized in two ways. One approach targets a breakdown in learning processes, broadly conceived. In recent models this perspective focuses on putative limitations of memory, input processing, or general cognitive mechanisms (cf. Leonard, 1998). Another approach places emphasis on domain-specific limitations inherent in the underlying linguistic representations. Under this perspective, language acquisition mechanisms (and, presumably, breakdowns in those mechanisms) can be relatively independent of general learning mechanisms. A final general observation is that genetic models are under current investigation. Evidence in support of genetic contributions is accumulating and attracting widespread support, although precise genetic sources for language impairments have yet to be identified (Fisher, 2005; Rice & Smolik, 2007; Rice, Warren & Betz, 2005; Smith & Morris, 2005). Although the genetics initiative was first resisted by advocates of the general learning breakdown approach (see critique by Conti-Ramsden, 1997 and reply by Rice, 1997; Snow, 1996), it is now embraced by most scholars as consistent with either general learning deficits or language-specific deficits. In today's scholarship, a possible inherited contribution to language impairment is best regarded as compatible with either perspective. Under the general learning perspective, general learning mechanisms that guide language acquisition could be weakened as a consequence of genetic variations (cf. Plomin, 1999; Plomin & Kovas, 2005), whereas under the language domain mechanism model more specific processes relatively targeted to language acquisition could be under genetic control (cf. Fisher, 2005).

Bowerman's fine-grained and rigorous approach to unpacking a linguistic phenomenon could be fruitful for clarifying some of the issues involved in an explanation of the underpinnings of the language impairments of SLI. In this spirit, I explore a relatively unacknowledged conundrum inherent in the available evidence. I frame the issue in terms of the problem of "the discovery of latent structure," as the bedrock process of language acquisition and therefore of prime suspicion as the source of impairment in SLI. I examine available evidence to see the extent to which children with SLI are able to discover latent structures, and

when they apparently do not, and the import of a side-by-side consideration of such evidence.

EVIDENCE THAT SUGGESTS POSSIBLE PROBLEMS WITH THE DISCOVERY OF LATENT STRUCTURES

Much of the literature describing the language of children with SLI has focused on the ways in which these children's language systems are not as expected for age or language-equivalent levels of performance. In effect, we have wanted to know what is underdeveloped in the language systems of affected children. There has been considerable progress in this regard within the last decade. For a comprehensive review, see Leonard (1998). For this discussion three linguistic phenomena provide useful examples: vocabulary development, morphosyntax, and overregularizations.

Delayed Vocabulary Acquisition

One of the hallmark characteristics of children subsequently diagnosed as SLI is late onset of first words, a condition referred to as Late Talking (LT) (cf. Ellis Weismer, 2007; Rice, Taylor, & Zubrick, in press; Rescorla, 2002; Zubrick, Taylor, Rice, & Slegers, 2007). Although only a minority of LT children ultimately are diagnosed as SLI (25% is a likely estimate; Paul, 1996), it is thought that most if not all children with SLI are slow in language emergence. Definitive estimates require an epidemiological prospective study of young children, an expensive undertaking which has yet to be done.

Growth data are available, however, for clinically ascertained children with SLI at 5 years of age with delays in vocabulary development. These data document that the delays persist for years. See Figure 10.1 for the general pattern of the growth trajectories. This figure shows longitudinal outcomes on the raw scores of the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981) for a group of children with SLI and a younger control group, both of whom are participants in an ongoing longitudinal investigation. Graphed in Figure 10.1 are data for three years with 4 data points, once annually, per group, covering an age span of approximately 3 to 8 years of age. The two groups were at equivalent levels of MLU at the start of the longitudinal study (see Rice, Redmond, & Hoffman, 2006 for details). It is important to highlight that although the groups were equated at the outset on MLU, there was no initial matching on the basis of PPVT-R raw score.

There are several points of interest. One is that the affected children's mean level of performance on the vocabulary assessment is equivalent at the outset to the mean of the MLU-equivalent group who were two years younger, on average. Second, the two groups of children maintained a general equivalency of both PPVT-R raw scores and MLU levels throughout the four times of measurement. Third, within each group the vocabulary and MLU levels followed similar, predominantly linear trajectories. The main point here is that the affected children with initial vocabulary delays maintain levels of performance below their age peers

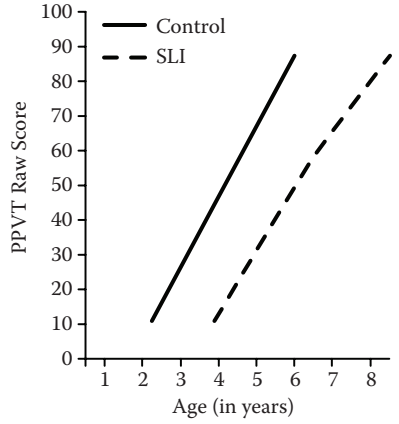

Figure 10.1 Growth of vocabulary in children with SLI and MLU-matched control children.

between ages 5 and 8 years, at levels equivalent to children two years younger. Furthermore, ongoing assessments underway in my lab show the delay to persist well into adolescence.

The implication is that the cluster of abilities needed to figure out the meanings of novel words is not as effective in affected children as in age controls, and is instead more commensurate with younger children. This is also confirmed in a series of experimental studies of word acquisition. Rice, Oetting, Marquis, Bode, and Pae (1994) found that affected children and younger MLU controls needed high frequency input of novel words in order to store them in memory; Oetting (1999) found that 6-year-old affected children used cues to interpret verb meaning as well as younger MLU equivalent controls, but they were less able to retain new verbs than the younger group. Other studies report mixed outcomes for the SLI/MLU groups comparison (cf. Hoff-Ginsberg, Kelly, & Buhr, 1996; O'Hara & Johnston, 1997; Van der Lely, 1994), which Oetting (1999) suggests may be attributable to task differences and memory demands. Although some relatively subtle differences between groups have been reported, overall in the area of lexical acquisition the general picture seems more compatible with a delay model than for a delay-with-disruption model. Especially when we consider longitudinal growth trajectories, there are strong parallels between affected children and younger language-equivalent controls. In each of the groups, vocabulary acquisition and MLU are synchronized over time, although both of these domains are delayed in the affected group relative to their age peers.

Morphosyntax and Finiteness

The picture shifts when we consider the morphosyntactic domain of finiteness marking. For some time verb morphology was known to be a weak element for children with SLI, although morphology was widely viewed as a problem of lexical stem + affix, and surface characteristics of morphology, such as perceptual

salience, were accorded a strong role in accounting for affected children's limitations (cf. Leonard, 1998). Recent advances in linguistic theory (cf. Pollock, 1989) have clarified the close relationship between morphology and syntax, in models of verb movement, universal grammar, and projected clausal sites for moved elements. These distinctions have allowed for a more precise characterization of the nature of language impairments.

Finiteness is a central property that involves *tense* and *agreement* features on verbs in main clauses, features that interact with syntactic requirements of clause structures. In current theories of the adult grammar (cf. Haegemann, 1994) it is hypothesized that features such as *tense* and *agreement* are tightly interrelated in the syntax of clause structure, and that the structural clausal configuration of phrases and sites for finiteness marking are part of an architecture that underlies the movement rules. Note that the term *tense* is used in two ways: It can refer to the semantics of reference to temporal dimensions (as in "present" vs. "past" tense), and it also has a second sense of a required grammatical property which is not so tightly linked to temporal dimensions (e.g., the need to insert auxiliary *DO* in questions). In order to highlight this second sense, sometimes I have used the term *grammatical tense marking* to describe the deficit in SLI children (Rice, Tomblin, Hoffman, Richman, & Marquis, 2004).

"Agreement" involves person and number marking on nouns, markings which are "copied over" onto verbs, where they do not add additional meanings to the verbs. Most of the literature summarized here has focused on subject–verb agreement, although agreement within noun phrases is also of interest. In this framework, tense and agreement features are distinguished from other properties of the underlying syntax.

Pollock (1989) initially worked out how this system is manifest in English grammar in terms of tense and agreement marking and related morphosyntactic properties. Finiteness is marked by the following morphemes: third person singular present tense *-s,* as in *Patsy runs home every day*; past tense *-ed*, as in *Patsy walked/ran home yesterday*; copula or auxiliary *BE,* as in *Patsy is happy* or *Patsy is running*; and auxiliary *DO,* as in *Does Patsy like to run*? In a simple clause there is only one site for finiteness marking, and no more than one finiteness marker can appear, as shown in the following examples where an asterisk is inserted to indicate ungrammatical clauses: **Runs Patsy home every day*; **Does Patsy likes to run*?; **Patsy is runs home every day*; **Does Patsy is happy*? Note that the set of morphemes is not limited to verbal affixes but instead includes irregular stem-internal morphophonological variants and free-standing morphemes as well. Subject–verb agreement requires agreement of the person/number features on the noun and verb. These sentences violate that requirement: **Patsy are happy*; **I runs home every day.*

This perspective brings several advantages to studies of children's grammars. One is a finer set of distinctions to evaluate underlying similarities and differences relative to the adult grammar. Shütze (2004, p. 355) noted: "…it is possible for children with normal syntactic structures to sound very unlike adults, because in their lexicon certain morphemes either are missing or have incorrect features associated with them." In many languages children show an acquisition period in which they

produce infinitival forms of verbs where finite forms are required in the adult grammar (cf. Guasti, 2002 for an extensive review). At the same time, young English-speaking children produce uninflected verbal forms or omitted forms, such as "*Patsy go home" and "*Patsy happy." With Pollock's (1989) study as precedent, Wexler (1992) noted the parallels between English and other languages, such that the uninflected verbal forms of English in children's grammars were the English versions of the infinitival forms evident in children's grammars in non-English languages such as French and German.

Wexler launched a program of investigation with his interpretation of these phenomena as an *optional infinitive stage* (Wexler, 1994, 1996), which was later revised to an *agreement tense omission model* (ATOM) (Schütze & Wexler, 1996; Wexler, Schütze, & Rice, 1998) and then to a *unique checking constraint model* (Wexler, 1998) as the theory evolved to account for a wider range of phenomena across languages. The basic claims about finiteness in English-speaking children, however, remained the same as the theory evolved. The fundamental notion is that, in some languages, young children go through a period in which they seem to treat finiteness marking as optional, although it is obligatory in the adult grammar. At the same time they know many other properties of clausal construction. In the normative literature, the phenomenon is now widely attested, with ongoing discussion and debate about the nature of the underlying linguistic representations, the reasons why this period is evident in some but not all languages, and the way in which finiteness is linked to other properties of the grammar.

The theory was extended to children with SLI in the prediction that their long delay in the acquisition of verbal morphology is an extension of a phase that is part of younger children's grammatical development (Rice, Wexler, & Cleave, 1995). This was regarded as an enriched *extended development model* (Rice & Wexler, 1996), which recognizes the many ways in which the language of children with SLI is similar to younger unaffected children, but with a greatly protracted period of incomplete acquisition of finiteness marking.

This led to a program of longitudinal investigation of finiteness marking in English-speaking children with SLI, across the set of morphemes involved. The children who participated in the longitudinal study of MLU and receptive vocabulary described above also received tasks to measure finiteness marking. Unlike the outcomes for MLU and receptive vocabulary, the results revealed multiple ways in which the affected group did not perform as well as the younger MLU comparison group. Each of the target morphemes showed such a deficit at almost each and every measurement point. Further, the set of morphemes showed strong associations among the items, supporting the prediction that the deficits were attributable to the shared linguistic property of finiteness in spite of differences in surface forms. Finally, the difference was evident across tasks: Spontaneous language samples, elicited production tasks, and grammatical judgment tasks yielded the same pattern of outcome (see Rice, Wexler, & Hershberger, 1998 for the detailed report).

A generalized growth curve for the two groups representing the findings is presented in Figure 10.2, measured as a percentage of finiteness marking in obligatory contexts, collapsed across the individual morphemes, for production data. The

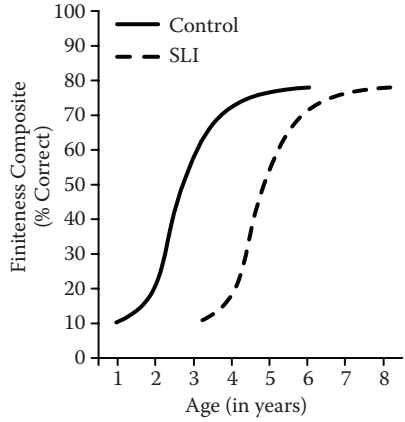

Figure 10.2 Growth of finiteness in children with SLI and MLU-matched control children.

actual ages of measurement are approximately 3 to 6 years for the control group, and 5 to 8 years for the affected group, with projections in this figure for the lower ends of the curves (cf., Rice, Wexler & Hershberger, 1998). Note that the two curves, although similar in growth trajectory, are farther apart than the curves in Figure 10.1, corresponding to the greater lag in finiteness growth relative to the MLU comparison group than for lexical acquisition.

The conclusion is that finiteness acquisition by children with SLI shows a delay-with-disruption, in which this dimension of morphosyntax is so protracted in acquisition that it is, in effect, out of synchrony with the other indicators of language growth, MLU and lexical development. This is the one dimension of language acquisition in which there is consistent and reliable replication of the finding that there is a disrupted element relative to a general language delay. This outcome is reported across different labs (cf. Bedore & Leonard, 1998; Conti-Ramsden, Botting, & Faragher, 2001; Eadie, Fey, Douglas, & Parsons, 2002; Grela & Leonard, 2000; Joseph, Serratrice, & Conti-Ramsden, 2002; Leonard, Eyer, Bedore, & Grela, 1997; Marchman, Wulfeck, & Ellis Weismer, 1999; Oetting & Horohov, 1997). It is widely accepted as a strong candidate as a clinical marker of the condition of SLI (cf. Tager-Flusberg & Cooper, 1999), especially for children in the 4- to 8-year-old age range, as documented by a standardized assessment instrument (Rice & Wexler, 2001). Thus, the empirical phenomenon is well established, although there is a lively and flourishing dialog about the interpretation. One caveat is that a finiteness marker does not necessarily imply that it is the only possible such grammatical marker (cf. van der Lely's 1998 claim of a condition described as "grammatical SLI," thought to be a subset of the generic SLI clinical group characterized by other syntactic limitations), although other possible markers would lead to different predictions for certain elements of grammar.

The major point here is that affected children are obviously quite limited in their ability to discover the latent structure of language that guides finiteness marking. They behave as if they accept a grammar that allows these morphemes to be optional instead of obligatory, a devastatingly inept inference given the structural demands of English.

Although English is the language for which there is the most extensive evidence, the phenomenon is apparent in other languages as well, depending upon the way in which finiteness is expressed in the language. This includes German (cf. Rice, Noll, & Grimm, 1997), and Swedish (Leonard, Hansson, Nettelbladt, & Deevy, 2004), but may be evident only in very young Spanish-speaking children (Torrens & Wexler, 2001) given the early acquisition of finiteness by unaffected Spanish-speaking children (Gathercole, Sebastián, & Soto, 2002). Perhaps most compelling is the evidence from bilingual French/English-speaking children with SLI (Paradis, Crago, Genesee, & Rice, 2003). The study of bilingual children offers the powerful experimental advantage of controlling the variance attributable to individual differences, because the two languages are observed within the same child. French and English offer interesting comparisons because young French-speaking children acquire the grammatical tense marking system at younger ages than do English-speaking children, roughly around 2- to 2½ years in French compared to around 4 years in English. This difference is attributed to differential properties of the morphophonological and morphosyntactic systems of the two languages (cf. Wexler, 2003, who hypothesizes that the differences involve null subjects and operations requiring tense and agreement properties), although the details remain to be worked out and the interpretations are debated. Of interest here, the affected bilingual children at 7 years of age show the expected gap between tense-marking and non-tense-marking morphology in both English and French, although the tense-marking structures appear early on in unaffected French-speaking children. Thus, irrespective of surface differences in how the tense-marking system appears in French versus English, affected children show limited ability to discover the underlying structures.

Late Onset of Morphological Overregularizations

Beginning with the signal study of Jean Berko Gleason (Berko, 1958), children's overregularization of irregular past tense verbs has been taken as indicative of their ability to induce latent structures that guide the phonological expression of morphological forms. An example would be children's use of "falled" instead of "fell." Evidence is available, from the same children reported in Figures 10.1 and 10.2 above, showing that children with SLI are less likely to generate overregularization errors than the younger control children for the period of 5 to 6 years; but when they begin to increase their rate they subsequently follow a trajectory of overregularization rates similar to the younger children (see Figure 9 of Rice, Wexler, Marquis, & Hershberger, 2000, p. 1139). Further evidence for delayed overregularization of irregular past tense forms exists for a large epidemiologically ascertained sample of children with SLI, age control children, and

a group of children with language impairments and borderline nonverbal intelligence (Rice, Tomblin, Hoffman, Richman, Zhang, & Marquis, 2004). Finally, studies of overregularization of plural morphology (e.g., "mouses") found that the children with SLI performed at levels below age peers, although commensurate with the younger controls (Oetting & Rice, 1993; Rice & Oetting, 1993). Overall, the delayed onset of overregularizations is consistent with the possibility that children with SLI are limited in their discovery of the latent structure of morphophonological rules.

RELATED DEFICITS POINTING TOWARD PROBLEMS WITH THE DISCOVERY OF LATENT STRUCTURES

The evidence summarized in the previous section is but a part of the broader literature that documents the dimensions in which language acquisition is not robust in children with SLI. The likelihood that the language weaknesses are attributable to weaknesses in general learning mechanisms is a widely held assumption that is strengthened further by evidence showing performance below age expectations in related abilities. I summarize three areas here.

Possible Memory Deficits

The memory requirements for young children's language acquisition are surely complex, and there is no one widely accepted unifying model. This situation has posed challenges for attempts to link memory deficits to the language impairments of children with SLI. A number of investigations have explored the domain with a number of different tasks. The outcomes differ with regard to the robustness of group differences between affected and unaffected children, the extent to which the results have been replicated across studies and labs, and the coherence of the line of interpretation. One task, involving nonword repetition, stands out above others with replicated findings of group differences between affected children and their age peers (cf. Bishop, North, & Donlan, 1996; Conti-Ramsden 2003; Dollaghan and Campbell, 1998; Gathercole and Baddeley, 1990). Tager-Flusberg and Cooper (1999) identified nonword repetition, as well as tense-marking, as a candidate for a clinical marker of SLI. There are two general findings: Affected children are less able to repeat nonwords of longer lengths (3 to 5 syllables) than are their age peers, and performance on nonword repetition tasks tends to be correlated with language tasks, particularly vocabulary tasks. On the face of it, these outcomes could be regarded as a deficit in memory likely to be affecting their language acquisition, given the similar memory demands inherent in language acquisition.

There is a lively debate, however, about the interpretation of the evidence and whether poor verbal memory plays a causal role in language impairment. A recent special issue of the journal *Applied Psycholinguistics* features a keynote article by Gathercole (2006), who lays out a causal role for temporary phonological storage deficits. But she also notes the likely role of multiple contributing factors.

Her paper is followed by 14 commentaries, many of them critical in nature. For example, Bishop (2006) argues that phonological short-term memory does not play an independent causal role in syntax impairment, based in part on her findings from a twin study showing that the inherited contributions to performance on nonword repetition tasks and language tasks come from different sources. Other complicating evidence includes recent factor analytic studies that yield contradictory outcomes about the pattern of associations between nonword repetition and language tasks (cf. Colledge et al., 2002; Tomblin, Zhang, Catts, Ellis Weismer, & Weiss, 2004; Viding et al., 2003).

Other complications appear with regard to possible speech production limitations in samples of affected children. Recall the earlier conclusion that in epidemiologically ascertained samples the overlap of clinically significant speech problems and language impairments is minimal, but in clinically ascertained samples the co-occurrence of speech and language impairments is a potential issue and not always well documented. This is relevant to the nonword repetition tasks, because a correct response requires correct repetition of the phonemes. Corrections or adjustments for speech accuracy are seldom reported. As Gathercole (2006, pp. 531–532) acknowledges, low performance on nonword repetition tasks would be expected for children with speech/motor impairments. In the current literature this is a potential confound of unknown extent and may contribute to some of the differences across studies. She argues, however, that individual variation in speech skills cannot explain the consistent patterns of association of nonword repetition performance and language acquisition. The conclusion here is that although the interpretation of low performance on nonword repetition tasks remains to be fully worked out, the replicated finding of group differences is widely taken to be consistent with a memory limitation that creates problems for the ability of affected children to induce latent language structures.

Auditory/Input Processing Deficits

A great deal of research attention has focused on the possibility that children with SLI have difficulties with processing auditory information, a difficulty that contributes to their language weaknesses. Early on, this line of investigation focused on aspects of the speech stream which is rapidly changing and brief in duration (c.f. Tallal & Piercy, 1973; Tallal, Stark, Kallman, & Mellits, 1981). More recently, Tallal (2000) has argued that auditory processing difficulties interfere with encoding and producing speech, and ultimately lead to expressive and receptive language problems, as well as problems with literacy. This causal claim has been challenged by Bishop et al. (1999), among others, who concluded from their empirical study that there was "no evidence that auditory deficits are a necessary or sufficient cause of language impairments" (p. 1295).

Another approach to input processing limitations has been proposed by Leonard (cf. Leonard, 1989, 1998; Leonard, McGregor, & Allen, 1992). His approach is known as the surface account, which proposes that children with SLI have processing deficits in the form of reduced speed of processing. This account has focused on the tendency, particularly of English-speaking children, to omit final consonants

such as the *-s* in third person singular present tense (e.g., *she talks*). The surface account posits that such processing demands interact with the demands of discovering the grammatical functions of such forms, and as a result create particular difficulty for affected children. Under this model, affected children can perceive the acoustic properties, but they cannot overcome the limits of processing demands when they must simultaneously form grammatical categories. This model, too, has been of considerable debate. For example, Evans, Viele, Kass, and Tang (2002) report that the expected deficits in speech perception abilities of affected children were evident in synthetic but not natural speech, and the children's use of inflectional morphology in obligatory contexts was not correlated with their perception abilities. On the other hand, Montgomery and Leonard (1998) provide evidence supporting the surface account.

These two examples do not exhaust the current perspectives on how weaknesses in auditory processing mechanisms are implicated in the language impairments of children with SLI. What the various models share is the assumption that a fundamental source of the weakness in language acquisition is to be found at the initial point of input processing, at a step early in the process of inducing the latent structures of language. Differing perspectives focus on different places or in different steps along the way to linguistic induction in the input processing where weaknesses are thought to be operative.

Generalized Slowing

Other explanatory models have turned attention to more general limitations in nonverbal cognitive capacities that are proposed as the source of the problems in linguistic induction. A well formulated candidate of this perspective is the generalized slowing model put forth by Kail (1994). This model posits a generalized slowing of processing that affects linguistic and nonlinguistic tasks. Specific problems with language, such as the grammatical tense marker, are interpreted as localized consequences of more generalized, limited time-dependent linguistic input processing. Miller, Kail, Leonard, and Tomblin (2001) reported that SLI children and language-impaired children with below-normal nonverbal IQ levels—termed Nonspecific Language Impaired (NLI)—performed more slowly than age peers. They attributed the lower language performance of the NLI group to a deficit in speed of processing. This model, however, was not supported in a study of grammatical tense marking with the same sample of children. Rice, Tomblin et al. (2004) found lower performance on the grammatical tense marker for the SLI children relative to age controls, and the NLI children relative to the SLI group, but also reported results for a group of children with low nonverbal IQ (referred to as Low Cognition, at levels equivalent to the NLI group) who did not have deficits in the grammatical tense marker but instead performed at levels equivalent to the age controls. Performance IQ was not associated with tense-marking in the SLI or the Low Cognition group, and accounted for only a small amount of variance (about 6%) in the age controls and the NLI group. The general slowing account has also been challenged on methodological grounds (Windsor, Milbrath, Carney, &

Rakowski, 2001) and on findings that processing speed is not related to the severity of language impairment (Lahey, Edwards, & Munson, 2001).

A broader version of this perspective, evident in twin studies, is that language impairments are attributable to a general cognitive limitation, which is manifest in closely associated language and nonverbal ability, an association which shares a common genetic factor (Viding et al., 2003). As noted above, the lack of an association of nonverbal intelligence and performance on the grammatical tense marker is inconsistent with the general deficit view (cf. Rice et al., 2004), although a general cognitive deficit model seems to have widespread appeal.

Overall, a pattern of low performance of affected children, relative to age peers, on nonword repetition tasks, auditory processing tasks, and latency measures on cognitive tasks collectively contributes to the impression that affected children lack fundamental processing or cognitive mechanisms needed for the discovery of latent language structures. At the same time, there are significant caveats to this generalization. There are nontrivial methodological challenges to be overcome, as well.

COUNTEREVIDENCE OF ROBUST DISCOVERY OF LATENT STRUCTURES

Although attention has rightfully focused on the weaknesses in the linguistic systems in affected children and related abilities, this focus has deflected serious attention from the ways in which children with SLI indicate that they can and do discover abstract latent linguistic structures. Here I limit the observations to linguistic phenomena for which young affected children are surprisingly like their age peers, which sets a very high standard for considering the robustness of their acquisition mechanisms.

Some Elements of Morphology Are Robust

By 5 years of age, children with SLI are quite accurate in their use of plural *-s.* For example, Rice and Wexler (1996) found average plural use for the affected group to be 88%, which did not differ from the age control group. This finding is interesting because there are many similarities between the regular plural affixation and third person singular present *-s* on verbs, in that they share similar phonetic properties, involve affixation to lexical stems, show allophonic variants within class, require coordination of number marking in subject/verb contexts, and are constrained to particular lexical classes. Yet plurals are mastered at the same time that third person singular present *-s* is likely to be omitted (approximately 30% use in obligatory contexts as reported by Rice & Wexler, 1996; approximately 42% in the larger normative sample in Rice & Wexler, 2001). At the level of discovery mechanisms related to the likelihood of use in obligatory contexts, the conclusion is that such mechanisms are working quite well in one area of morphology but are strikingly weak in another.

A related example concerns past tense morphology versus participial morphology. This is evident in contexts such as *the boy kicked the ball* versus *the ball*

was kicked, where the surface morphology of the main verb *kicked* is the same although the underlying grammatical structures are different. Redmond (2003) found that 6-year-old affected children performed at high levels on participial *-ed* (all but one child were 100% accurate) at the same time as they were likely to omit past tense *-ed* (on average, 56% use in obligatory contexts). The affected children did not differ from age controls on participles but differed from both age and language-matched controls on past tense morphology. Thus, discovery works for obligatory use of participles but not for past tense.

This conclusion is modulated somewhat by the finding of Leonard et al. (2003) who examined participial use in longer, full passive utterances (e.g., *the frog got kissed by the kitty*) in a sentence completion task. Their affected children were younger than those of Redmond (2003), from 4;5 to 6;10. The affected children performed better on participles (approximately 55%) than on regular past tense (approximately 30%), although at lower levels than unaffected language or age controls (approximately 80% on participles for the younger controls and approximately 95% for the older controls). One possibility is that the different outcomes between the two studies are attributable to different ages of affected children, in which case the younger SLI children may still be in the discovery phase for participles, which is nevertheless more robust than for past tense. Another possibility is that the task demands of Leonard et al. (2003) introduced other performance factors that diminished the performance of the affected group to a greater degree than that of controls (cf. Redmond 2003 for discussion of full vs. truncated passives, among other issues).

Observations from French-speaking children provide further evidence of selective robustness of morphological acquisition for affected children. Jakubowicz, Nash, Rigaut, and Gérard (1998) reported that French-speaking children with SLI (ages 5;7 to 13 years) had high levels of accuracy in obligatory contexts for *la* and *le* as determiners, but their performance was much lower (and lower than the control group) when the same forms were pronoun clitics. Thus, young affected children acquiring French show robust acquisition of determiners but not clitics, even though the surface forms are the same.

Avoidance of Overt Errors

There is convergence across studies that children with SLI show strong avoidance of plausible errors of usage, even for the forms that are difficult for them. Let us begin with the forms they seem to do well on. Perhaps they achieve high levels of usage by relying on simplified rules, or they are likely to misuse the forms at the same time that they use the forms in obligatory contexts. With regard to plurals, Rice and Oetting (1993) examined lexical productivity (the extent to which children used different words with the plural affix), contrastivity (contrastive marking of singulars and plurals), and morphological productivity (overregularizations). They report that the affected children showed robust use of plurals under each of these criteria. Further, Oetting and Rice (1993) report that in a study of noun compounding, 5-year-old affected children did not differ from age peers—like

them, they compounded regular plural nouns ("rat eaters") differently from irregulars ("mice-eater"). Thus, they showed "a productive and differentiated plural marking system that is sufficiently robust to guide word formation processes" (p. 1245).

Let us now turn to the morphemes that are weak in English for affected children, focusing on the grammatical tense-marking morphemes of past tense, third person singular present *-s,* copula *BE,* and auxiliaries *BE* and *DO.* Recall the earlier observation that affected children distinguish past tense and participle functions (Leonard et al., 2003; Redmond, 2003), indicating that they distinguish the syntactic functions of similar surface morphology even when one of the morphological applications (i.e., past tense) is weak. So we can see that they are clearly drawing upon syntactic knowledge that coexists with morphosyntactic weaknesses.

A further way to investigate possible weaknesses is to examine other possible errors of usage. If the children are having problems discovering the latent properties of weak morphemes, we could expect them to make overt errors in spontaneous or elicited utterances. Yet the overwhelming conclusion from years of explicit data coding in my lab and in the labs of other investigators is that children with SLI are very unlikely to commit such errors of use. For example, Rice and Wexler (1996) report that when SLI children do use an inflected form,

> …the surface form of the morpheme is almost always correctly applied to the stem (in the case of an affix) or the correct form is chosen (in the case of suppletive forms such as for the *BE* paradigm) in the contexts where it is allowed by the adult grammar, and the choice of form corresponds to that required by the person and number marking on the subject. SLI children are unlikely to say "*they runs" or "*they am happy" or "*I is happy" or "*he is not want the cookie." This phenomenon shows that the children are able to enter the correct surface forms into their mental representations and to fit them into a paradigm of person and number distinctions. (p. 1253)

In the same study, although the SLI group was more likely to omit determiners (e.g., *a*, *an*, or *the*) than language equivalent controls were, they did not generate overt errors such as "*the runs" or "*boy the runs" but instead their errors were confined, with rare exceptions, to omissions.

Grammaticality judgment data confirm that children with SLI are sensitive to subject/verb agreement violations, such as *he are mad* at the same time as they are likely to omit copula or auxiliary *BE*. Rice, Wexler, and Redmond (1999) report that sensitivity to agreement violations are significantly better than sensitivity to omitted *BE*. Extensive data collection with elicitation of *BE* and *DO* questions documents only rare occurrences of confusion of forms of *BE* and *DO*; errors such as "*Is he want a cookie?" or "*Do they sleeping" are almost entirely avoided. Other possible errors, such as confusion of licensed sites for finiteness marking, are also avoided; errors such as "*he not is happy" or "*likes he the dog?" do not occur. Errors representing an insertion of regular past tense or third person singular present tense affixes into infinitival verb phrases, such as "you made him walked/

walks," appear rarely in either spontaneous or elicited productions (Redmond & Rice, 2001; Rice, unpublished data reported in Redmond, 1997; Rice, Wexler, & Cleave, 1995; Rice & Wexler, 1996).

Avoidance of errors is also apparent in the verb argument structures generated by young children with SLI. In an extensive study of 5,486 spontaneous utterances of three affected boys (approximately 4 years of age), Rice and Bode (1993) report some kind of error of lexical verb choice in only 2% of the utterances produced by the subjects. This 2% constituted all instances of non-adult-like lexical verb use. Further, most of these errors were in the use of the most frequently occurring verbs, such as "you get in that guy and it'll work" (meaning "you push that guy…") or "I'm going underhand" (meaning "I'm throwing underhand"). Verbs like *get* and *go*, referred to by Rice and Bode (1993) as "general all purpose" verbs, have very elastic semantic properties and were scored quite strictly in the analyses (i.e., we scored as an error anything that did not meet a dictionary definition, although some of the uses are quite likely to appear in adult utterances as well), so the low percentage of error in verb choice is all the more striking. As indicated by the examples, verb-argument structure was maintained despite incorrect verb choice. The overarching conclusion is that in the naturalistic setting in which the children's utterances were recorded (a preschool classroom, where the children were interacting with peers), there was a remarkably robust ability to generate well-formed clausal structures with regard to verb argument structures. Although these youngsters had the typical general lexical delays and problems with tense-marking, they seemed to have discovered much of the fundamental latent structure for the expression of meanings via clausal constituents.

A recent experimental elicitation study of *Wh*-questions also shows some rather solid performance by 5-year-old children with SLI (Deevy & Leonard, 2004). Questions of the form, *Who is washing the dog*? (requiring no movement of clausal constituents) and *Who is the dog washing*? (requiring movement of the object *wh*- word to the sentence-initial position) were well comprehended by the affected children (at 88% and 86% correct, respectively), who did not differ from lexically matched children about one year younger. When the sentence length was increased (e.g., *Who is washing the happy brown dog*? and *Who is the happy brown dog washing*?) the affected children's performance remained high for subject questions (89%) but decreased for object questions (77%), a decrease that was not observed for the control children. This was taken to indicate that the affected children's knowledge of clausal movement was evident but could be affected by increased linguistic processing demands. I include the study in this section as an indication of the affected children's knowledge of the underlying latent structures involved in question formulation at the relatively young age of 5 years.

Bilingual Children with SLI Do Not Show a Bilingualism Effect Relative to Monolingual Children with SLI

To return to the study of Paradis et al. (2003), it is relevant to note here that on both morphemes that mark grammatical tense and on control morphemes affected

children who are bilingual in French/English perform at levels equivalent to monolingual French- or English-speaking children with SLI. Thus, there is no apparent penalty or decrement attributable to the demands of acquiring two languages simultaneously. Not only can affected children discover the latent structures of their native language when exposed to a single language; apparently they can also do so under the increased demands of exposure to multiple languages. The symptoms are language-specific, but the performance levels are commensurate whether under monolingual or bilingual acquisition circumstances (cf. Genesee, Paradis, & Crago, 2004).

THE LOGICAL PROBLEM: HOW TO RECONCILE LATENT STRUCTURES OF LANGUAGE WITH WEAKENED ACQUISITION MECHANISMS?

The puzzle here is how to reconcile the fact that affected children are able to discover many of the fundamental latent structures of language at the same time as they show general language delays and selective disruptions in their grammatical systems. Although these youngsters are very likely to omit third person singular present *-s* from obligatory contexts, they have robust use of plural *-s*, clearly showing that they can discover (1) the mechanisms for morphological paradigm building, (2) the noun class of lexical items that take regular plural affixation, and (3) even rules for noun compounding. Likewise, affected youngsters are likely to omit forms of *BE* and *DO* at the same time as they avoid errors of use in the forms. Error avoidance, combined with the types of structures that the children attempt, reveals that they have a wealth of knowledge, (1) that *BE* is linked to progressive lexical verbs or to predicate adjectives, (2) that it appears in certain slots in clause structure, (3) that it must be marked for person and number agreement with the subject if in the matrix verb slot but if it follows *to* or a modal such as *gonna* in a verbal complement position it appears in the infinitival form, and (4) that it cannot appear with finite forms of *DO* in the same matrix clause. Also, they know many things about *DO*: (1) that it is linked to lexical verbs but not predicate adjectives or progressives; (2) that it must be inserted prior to negative forms in clauses, after WH forms in questions, but at the beginning of *Yes/No* questions; (3) that it must be conjugated for third person singular present tense subjects; and (4) that it cannot appear with finite forms of *BE* in the same matrix clauses.

Affected children know that past tense morphology cannot be applied to nonpast contexts; that there is site licensing for tense marking (errors such as "*he made him ate" or "*he made him walked" are rare); and although the surface morphology is homophonous with participial morphology, the two functions are distinct—past tense morphology is much more likely to be omitted in past tense contexts than in participial contexts.

Affected children know fundamental properties of argument structure and movement rules by 5 years of age, although this is a period when they are likely to

omit grammatical tense markers at a high rate. They produce thousands of well-formed utterances, with a rate of 2% of overt errors of verb choice in which their novel verb uses nevertheless are likely to honor argument structure requirements. They differentiate subject versus object-movement questions.

These examples, among others, suggest very strongly that children with SLI have access to mechanisms that allow them to discover important latent structures of their native language. So are these youngsters very limited in language acquisition, or are they very robust? Are their grammatical weaknesses due to limited abilities to discover latent structures, and, if so, why are significant latent structures nevertheless spared? How do they come to know what they know about language if their underlying acquisition system is generally weak? This would be tantamount to a flawed software program that nevertheless functions as efficiently as a well designed one. Somehow affected children would have to be able to solve the language discovery problems in spite of a limited system, in which case an argument could be made that they were even better at language acquisition than their unaffected peers were.

Consider that the ways in which unaffected children are able to discover latent structures of language are not yet well understood, some 40 years after Brown and Bellugi's elegant formulation of the problem. Much has been made of the richness of the cognitive abilities that unaffected children bring to the task, and indeed that the task demands a wide range of cognitive skills. These include auditory perceptual abilities at an early age, parsing of linguistic input, memory for linguistic input, algorithms for deducing grammatical regularities, co-occurrences and recurrences, ability to carry out simultaneous calculations, and the integration of perceptual and conceptual input. Presumably each and every one of these aptitudes, as well as others, is called upon for language acquisition, and therefore would be a possible point of breakdown for the language impairments of children with SLI. Given that there is not yet a fully satisfactory explanation of how unaffected children accomplish the discovery process, with robust auditory, perceptual, and processing abilities to bring to bear on the task, one can only imagine the complexities of trying to account for how affected children manage the task with putatively impaired or sluggish mechanisms of any one or any combination of these—of auditory perceptual abilities at an early age; of abilities to parse linguistic input; of memory for linguistic input; of algorithms for deducing grammatical regularities, co-occurrences, and recurrences; of an ability to carry out simultaneous calculations or the integration of perceptual and conceptual input; or any other such limitations. Only three such possible limitations have been discussed above—i.e., auditory processing deficits, memory deficits, and/or general slowing/cognitive function deficits. The challenge is overwhelming, I believe, for a full account of how the children with SLI manage to discover so much of the latent structure of language with such fundamental deficiencies, because such deficiencies surely would mislead them in multiple ways as they entertain all possible alternatives suggested by a faulty acquisition system. As noted above, if language acquisition requires cognitive software to manage the task, then the affected children would be operating with a program with multiple bugs, and yet this program would nev-

ertheless function as efficiently as a well designed one in many respects. This is surely an implausible scenario.

LESSONS TO BE LEARNED FROM SLI: MULTIPLE LINGUISTIC DIMENSIONS WITH DIFFERENTIATED TIMING MECHANISMS

One of the fundamental ways in which the language acquisition of children with SLI is different from that of unaffected children is that it is very protracted. This allows for a close observation of relative weaknesses and strengths in the emerging language structures. The rapid growth of language in unaffected children, in contrast, can create the strong impression, and empirical evidence, of an overarching discovery mechanism that amalgamates the linguistic dimensions discernible in adult linguistic systems. Under the perspective of such a discovery mechanism, language acquisition can be regarded as growth in a relatively unitary construct with collinear dimensions (Plomin, 1999; Plomin & Kovas, 2005). In contrast, documentation of the linguistic strengths as well as weaknesses of children with SLI strongly suggests that multiple, discernibly distinct linguistic dimensions are involved. Unlike typically developing children, children with SLI show that in certain ways morphosyntax can be disrupted—i.e., be out of synchrony with the rest of the linguistic system. This is the case even though much of the necessary infrastructure of morphosyntax is known (such as the architecture of clause structure with designated sites for finiteness, the phonetic properties of surface morphology, and related principles of constituent movement). General cognitive mechanisms, such as verbal memory, auditory processing, and speed of processing show a complex relationship to the discovery of latent linguistic structure. It is clear that such mechanisms can support the ways in which affected children show linguistic competency, and in these ways their presence in affected children appears to be at a level at which language acquisition could normally be expected to occur. Yet such apparent sufficiency is not enough to ensure uniformly robust language acquisition, because the affected children display selective linguistic weaknesses as well as general delays in language onset.

Further indication of differentiated linguistic dimensionality is evident in the growth patterns of affected and unaffected children. The parallels between affected and unaffected children become even more striking when we consider the timing mechanisms inherent in growth data. As demonstrated in Figures 10.1 and 10.2, growth varies depending upon the linguistic domain: linear for receptive vocabulary in the 3- to 8-year period, and nonlinear (with quadratic elements) for grammatical tense marking in the same age period.

For the linear trajectory of lexical acquisition, the affected youngsters follow the same linear path as the unaffected children, just offset by two years. Note that this holds even though the life experiences, amount of exposure to native language, and cognitive and social achievements of the two groups of children are quite different. One implication of the same linear path is that the affected children do not

"catch up" at some later time, an observation becoming more and more apparent as longitudinal investigations continue. The second implication is that the beginning of language acquisition, that is, the intercept for the growth curves, is delayed for affected children. As noted earlier, there is strong reason to suspect that children with SLI are among the Late Talker group of children at 2 years of age, although not all Late Talkers become SLI.

For the nonlinear trajectory of finiteness marking, the affected youngsters also follow the same path (although offset to a level below that of MLU-equivalent children and therefore not fully synchronized with the rest of the language system). In this case the path is more complex. Growth does not show a consistent rate but instead has points of change in the rate, where the acceleration increases toward the expected levels of near 100% use in obligatory contexts. There is also strong suggestion that the affected group of children may be more likely to plateau at a level of performance somewhat below that of unaffected children, as if the initial weakness in the grammatical system persists to prevent a fully robust end state. Note that the points of acceleration change—i.e., the places of curvature in the growth trajectory are benchmarked to elapsed time in the growth trajectory, not a particular age level. This is particularly striking given that the children's educational experiences, language exposure, social and cognitive development are also underway during this time and play out at different levels in the two groups. Nevertheless, it is as if the template for change in finiteness marking or the discovery mechanism is shared, although the onset of the mechanisms is timed differently.

Thus, this growth-timed perspective emphasizes the significant roles of onset, slope, and points of change in acceleration as vital elements in our understanding of the nature of language impairment. Growth is not the same across all elements of language, yet growth is parallel for affected and unaffected children. Of great clinical importance is the fact that because growth is parallel, the affected children are not able to "catch up" or "outgrow" the condition. Note that this "catch-up" model is actually a complex one in that there would have to be some way for the affected children to grow at a rate faster than unaffected children in order to close the gap. There is no evidence that such an accelerated rate comes into play.

Elsewhere, I have argued that the parallels in timing mechanisms, across the different linguistic dimensions, for affected and unaffected children, can be accounted for by strong underlying maturational timing mechanisms that include linguistic-specific elements (Rice, 2003, 2004a, 2004b, 2007, in press). Just as developmental mechanisms in other cortico-neurological domains are tied to inherited timing mechanisms (cf. Fisher, 2005), it is plausible that inherited timing mechanisms are also operative in the higher cognitive processes involved in language acquisition.

Maturational models have been out of favor since earlier writings on the topic of language impairment by Lenneberg (1967). Wexler (2003) has updated Lenneberg's perspective in the Unique Checking Constraint (UCC) model of optional infinitives. This model is based on checking theory of tense and

agreement features in the functional projections of underlying syntactic representations. The UCC model is formulated to capture the ways in which crosslinguistic similarities and differences are expected for this period of grammatical weakness. Essentially, the notion is that young children call upon a single-checking operation for an early period of time, which can serve them well if their native language requires only a single-checking mechanism (such as Italian) but can pose difficulties if their native language requires two checking operations, as is the case for English. In this case, children must resolve the single-checking default in order to move into the adult system, a resolution that requires additional time to put into place. Under this model, the affected children would be in an Extended Unique Checking Constraint (EUCC) for a much longer period, and may not completely resolve this limitation. At the same time, many other properties of their linguistic infrastructure would be sound, allowing them to avoid grammatical errors in ways consistent with the evidence described above.

With regard to the discovery of latent linguistic structure, the EUCC/EOI perspective brings a mixed view of facilitative and inhibiting mechanisms involved in language acquisition. On the one hand, children can draw upon a small set of grammatical principles to facilitate linguistic discovery, and on the other hand child-specific assumptions can be inconsistent with the discovery requirements for a particular language, such as English. Affected children can call upon many of the discovery mechanisms that they share with unaffected children to bring about change in their linguistic systems in the same way as unaffected children.

As a recently developed theory of children's grammatical development, the OI/UCC model is under extensive investigation. The idea of an EOI/EUCC period is even more recent, and the necessary empirical investigations are really just beginning. Although initial outcomes are strongly supportive, many details remain to be worked out. The scope of the model does not include all the symptoms of SLI, but to date it has been very helpful in the identification of a reliable and theoretically interpretable clinical marker for the condition (cf. Rice & Wexler, 2001). The model does not rule out other possible areas of grammatical disruption in affected children, nor possible (but as yet undiscovered) ways in which the language impairments of SLI are similar to or different from other conditions of language impairment (cf. Rice & Warren, 2004).

The EOI/EUCC perspective does, however, bring to the table a model that is mindful of linguistic details, linguistic coherence and continuity with the adult grammatical system, as well as the developmental trajectory as children move from an immature to a mature grammatical system. Although the technical properties of this model and subsequent models are expected to evolve and change, we can now see that any fully successful model of SLI must account for (1) robust as well as weak mechanisms for latent linguistic structure discovery, (2) strong parallels in growth trajectories of affected and unaffected children, and (3) delays as well as selective disruptions that interact with particular linguistic properties.

CONCLUDING COMMENTS

Revisiting the broad theme of children's ability to discover latent linguistic structures in terms of what we have learned about children with SLI has pointed again toward the need for precise attention to linguistic particulars and careful consideration of the ways in which language changes over time in young children. I believe these themes are key components of the legacy of Melissa Bowerman, who taught her students to respect these realities, and who demonstrated in her own work how to apply them to the deep puzzles of children's language acquisition. It has been my privilege to explore them in children with language impairments.

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