CHAPTER
2

Historical and Contemporary Views of Language Learning

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OBJECTIVES

- Explore the continuum of the traditional "nature–nurture" debate as it relates to the acquisition of language
- Understand the historical impact of the nature, nurture, and interactionist perspectives on the field of speech-language pathology
- Describe a contemporary model of language acquisition within the broader science of child development
- Propose a perspective on using theories of language acquisition to guide the assessment of and intervention for children with language disorders

INTRODUCTION

Traditionally, the theoretical approaches that are included in accounts of language acquisition occupy different positions on a continuum with regard to how much emphasis is placed on the internal wiring of the child (i.e., the child's given biological *nature*) versus the environmental input that the child receives (i.e., *nurture*). In contrast to these two views, an interactionist approach to language development focuses not only on the structures and mechanisms internal to the child, but also on the powerful influence that experiential and social factors have in concert with unobservable mental faculties.

The charge for this chapter is to review the continuum of nature, nurture, and interactionist perspectives and to discuss their impact on the world of speech-language pathology. By tracing the roots of and variations of the nativistic, behavioral, and interactionist approaches to the development of language, we can begin to understand how the trends in modern language science have affected the profession of speech-language pathology over the last 50 or so years.

As we consider the status of the nature–nurture debate, the contemporary science of child development informs this discussion in interesting new ways. In fact, this science suggests that the nature–nurture question

as it relates to child development is obsolete. As Siegel (1999) suggests, "There is no need to choose between brain or mind, biology or experience, nature or nurture. These divisions are unhelpful and inhibit clear thinking about an important and complex subject: the developing human mind" (p. xii).

Speech-language pathologists, whether they have articulated it or not, have always believed that experience has the power to shift the direction of development and, by inference, the child's developing neurological system. We now have evidence from contemporary science that supports the claim that experience affects brain architecture—which is welcome news to parents and educators alike. In fact, Siegel (1999) speaks of the neurobiology of interpersonal experiences and the way in which the structure and function of the brain are shaped by these experiences: "human connections shape the neural connections from which the mind emerges" (p. 2). Knowing the elements of experience that lead to further learning and healthy functioning translates immediately and significantly into the therapeutic interactions we facilitate with children who are experiencing atypical development.

As the science of the relationship between biology and experience becomes better defined, both new and seasoned students of speech-language pathology are obligated to periodically and frequently revisit what we know about the interaction between the contributions of the child's inborn capacities and the environmental influences that lead to the capacity to understand and produce language. We have come a long way from the unparalleled moment when Chomsky (1957) introduced the notion of the innate abilities that children bring to the task of learning language. As amazing as this moment was for students of child language, it was somewhat bewildering for those of us who wanted to help children who were not learning language naturally and/or easily. We wondered how to apply Chomsky's thinking, as we imagined what the implications of innate mechanisms were for language-disordered children. The question of how best to apply the science of language acquisition to the practice of speech-language pathology continues to be one of the most important academic and clinical issues in our field.

NATURE, NURTURE, AND INTERACTIONIST VIEWS

Theories of language acquisition are considered central to the information that speech-language pathologists must learn for several reasons. First, a descriptively adequate theory of language development will provide an outline of what is learned by a child when they acquire language. Secondly, theories of language development that have explanatory adequacy will account for not only the facts of language development, but also the mechanisms of language learning—that is, "how" language is learned (Bohannon & Bonvillian, 2005; Chomsky, 1965).

Different paradigms and their differing perspectives will be described as they relate to two questions:

What do children acquire when they acquire language?
Which processes account for how children acquire language?

Nature: Rationalist Paradigm

According to the rationalist philosophy, which gave rise to the nature perspective, the processes of the human intellect (e.g., sensation, perception, thinking, and problem solving) are characterized by principles of organization. These processes of cognition are qualitatively different from the fairly disorganized events that occur in the observable world. The organizing principles and processes that characterize cognitive structures are said to enable humans to make sense of events in the world. From this perspective, speaking and understanding language are considered fundamentally human traits that are biologically determined. In contrast, reading and writing require explicit teaching to develop these abilities and are learned with much more effort and repetition, typically in a school setting (Catts & Kamhi, 2005; Sakai, 2005).

Biological Bases

Although Chomsky was among the first to suggest that humans possess linguistic knowledge at birth, the psychologist Eric Lenneberg (1967) provided much of the groundwork for the view that language is biologically based. He argued that language, like walking but unlike writing, shows evidence of the following properties:

Little variation within the species. Lenneberg argued that all languages are characterized by a system of phonology, words, and syntax.
Specific organic correlates. Lenneberg argued that like walking but unlike writing, there is a universal timetable for the acquisition of language. He suggested that critical periods exist for second-language learning as well as for rehabilitation after language loss due to injury or insult to brain function.

Heredity. According to Lenneberg, even with environmental deprivation, the capacity for language exists—although it might be manifested in the use of signing, as seen in individuals with hearing impairment.

No history within species. Lenneberg argued that because we have no evidence for a more primitive human language, language must be an inherently human phenomenon. (Lenneberg, 1967)

Recent arguments for the biological basis of language typically refer to data in several related areas. These include cerebral asymmetries for speech and language; critical periods for speech and language development; speech perception processes in infancy; central nervous system development; and genetic evidence from speech and language disorders research (Sakai, 2005; Werker & Tees, 1984). Furthermore, over the last 30 years, investigators have combined basic research in first language acquisition with research in brain imagery to understand how children become multilingual (Lust, 2007).

Those who argue for the biological basis of language cite data on cerebral asymmetries that are present even at birth in areas of the brain that are critical for language functioning. For example, the Sylvian fissure is longer and the planum temporale is larger on the left side of the brain than on the right side in the majority of fetal and newborn brains. Furthermore, the degree of asymmetry appears to increase as the brain matures, whereas plasticity of the brain decreases over time (Sakai, 2005).

Evidence for a critical period for language learning has traditionally come from studies of individuals who have experienced cerebral damage and language impairments after puberty. Rehabilitating the loss of language that occurs prior to puberty has typically been found to be less challenging than when this loss occurs after puberty (Sakai, 2005). Similarly, a critical period for learning language is often cited as evidence that second languages are easier to acquire before puberty than after. Finally, in the unique case of a child named Genie who was not exposed to language early in life, great difficulties in the acquisition of morphology and syntax were noted (Curtiss, 1974).

Findings from now-classic studies in infant speech perception have lent tremendous support for the nature thesis. In the original work, Eimas, Siqueland, Jusczyk, and Vigorito (1971) demonstrated that the sucking patterns of infants were modified as speech sound stimuli were changed. Infants as young as 1 month old could perceive the distinctions between /b/ and /p/ in the syllables [ba] and [pa]. Interestingly, the studies that followed this seminal work demonstrated that babies can make finer phonetic discriminations at 6 months of age than they can at 10 months when their experience with their own language is more extensive (Trehub, 1976; Werker & Tees, 1984). At 6 months babies can discriminate between sounds that are not in the native language they have heard but at 10 months babies can only discriminate sounds in their own language.

The most recent and compelling evidence supporting a biological basis for language comes from findings that newborns adjust their high-amplitude sucking to preferentially listen to speech as compared to complex nonspeech analogues. In a study by Vouloumanos and Werker (2007), infants were presented with isolated syllables of human speech contrasted with nonspeech stimuli that controlled for critical spectral and temporal parameters of speech. With similar stimuli, it had previously been demonstrated that infants as young as two months of age preferred listening to speech. In the Vouloumanos and Werker (2007) study, newborn babies, who were 1 to 4 days old, demonstrated a similar bias for listening to speech when their contingent sucking responses to speech and nonspeech sounds were compared.

Arguments for the biological basis for speech and language also find support in the research on the growth and development of the central nervous system in the early years of life. These developments include massive increases in brain weight, the formation of myelin sheaths on the axons, and increases in the number of neuronal connectors in the cortex during the first years of life—all of which correlate with advancements in language abilities. Finally, data from genetic studies that show strong patterns of inheritance for family members of children with specific language impairment also provide support for proponents of a biological basis of language development (Sakai, 2005).

Transformational Generative Grammar—Chomsky

Within the nature perspective, the theory of Noam Chomsky is central. The early versions of Chomsky's Transformational Generative Grammar (1957, 1965) described the innate, generative knowledge that enables the native speaker to produce a potentially infinite number of novel utterances, utterances they have never heard before or spoken, and to understand an infinite number of utterances based on knowledge of the rule-system.

Chomsky's Transformational Generative Grammar (1957, 1965) and then Government Binding, also known as Principles and Parameters (Chomsky, 1982) were

elaborate descriptions of the native speaker–hearer's language knowledge of the components of language: syntax, semantics, and phonology. In the syntactic component, which was central to the Transformational Generative Grammar, the underlying level of meaning of an utterance was represented by the deep structure, whereas the superficial form of an utterance (the syntactic form that we hear or produce) was represented by the surface structure. Thus, for example, the spoken sentence "Wash yourself" would have as its Deep Structure all the important elements of meaning: YOU (which is the understood grammatical subject) + (Present Tense Marker) + WASH + YOU (the grammatical object). In the syntactic component, the deep structures and surface structures of particular sentences were linked through a series of transformations that were captured and represented by transformational rules. For example, the Deep Structure of the spoken sentence "Wash yourself" would look like this:

YOU + TENSE MARKER + WASH + YOU

To describe how the spoken form of a sentence was derived, Chomsky invoked the concept of *transformational rule*. The deep structure was said to undergo a series of transformations (called a *derivation*), which would yield the final form of the spoken utterance: "Wash yourself."

According to Chomsky's (1965) early view, the child brought a language acquisition device (LAD) armed with linguistic universals to the task of language learning. Each native speaker–hearer of a language appeared to possess a wealth of knowledge about his or her "grammar." Chomsky termed this knowledge *linguistic competence.* In his account of language acquisition, the LAD was said to enable children to develop a language system fairly rapidly. This language system was sufficiently complex and generative, allowing children to create a potentially infinite number of novel utterances. This capacity was termed *linguistic creativity,* an ability that every native speaker-hearer clearly possessed (Chomsky, 1957, 1965).

Chomsky's description of language acquisition, according to Transformational Generative Grammar, suggested that the child's innate LAD armed with language universals could explain not only the rapidity and uniformity of the language acquisition process, but also the complexity of the language knowledge that is acquired (Chomsky, 1982, 1988). Early formulations argued that children were endowed with formal and substantive linguistic universals, such as the three components of the grammar (e.g., syntax, semantics, and phonology) and categories or units of language (e.g., parts of speech or phonological features) (McNeil, 1970). Later accounts described the innate capacities as inherent biases or constraints that empowered children to treat linguistic input in particular ways (Wexler, 1999). Thus children learning English might be listening for word order to signal grammatical relations, whereas children learning Hungarian might be listening for noun inflections for that information (Berko-Gleason, 2005; Slobin, 1979).

In response to the early Chomskian accounts of language knowledge, researchers in the early 1960s studied the emerging grammar of the young child while focusing on syntactic rules. In the late 1960s and early 1970s, however, Semantic Generativists focused on the role of semantics in language and language learning (Fillmore, 1968). Thus developmental psycholinguistic research shifted from an interest in syntax to an interest in the semantic knowledge that supports the development of syntax. Young children's knowledge of underlying semantic relations (e.g., agent, action, and object) was viewed as the impetus for their developing grammar, because semantic relations typically occurred in predictable positions in sentences. For example, in the frequently used declarative sentence type, the agent occupies the initial position and is typically the grammatical subject of the sentence (Schlesinger, 1977).

With the advent of the work of developmental psycholinguists such as Lois Bloom (1970), semantics or the content of child language was considered key to determining the child's grammar. The importance of nonlinguistic context in interpreting the meaning of the child's language was emphasized. Further, the acquisition of semantic categories such as spatial terms, dimensional terms, and semantic features was investigated in an effort to understand the unfolding of the child's semantic knowledge (Clark, 1973).

A revised theory of language, called Government Binding Theory, was formulated in its most comprehensive form by Chomsky in 1982. This account of language described idiosyncratic parameters of particular languages as well as universal principles across different languages. The idiosyncratic patterns of particular languages were captured in the "parameters," which were set differently for different languages. For example, the fact that a particular language differs in the direction in which it embeds its clauses to form complex sentences (right or left branching) is captured in the parameter setting of the particular language (Leonard & Loeb, 1988).

According to Transformational Generative Grammar and Principles and Parameters accounts of language acquisition, the child operated as a mini-linguist. That is, the child utilized not only the universal features that languages have in common, but would ultimately establish the parameters that make his particular language unique. As the child accrued more and more examples of his own language, he could generate hypotheses about how his language works, and these hypotheses would eventually be either confirmed or disconfirmed. Ultimately, the child was said to intuit a finite set of generative rules—that is, rules with the capacity to generate and understand a potentially infinite number of novel utterances.

Research in language development was also influenced by Chomsky's theory of Principles and Parameters. For example, as noted by Leonard and Loeb (1988), the following three sentences appear to be superficially similar in that all three italicized forms have an antecedent. However, the forms in sentences 1 and 2 are anaphors and are bound by the governing category (they refer to the head noun), whereas the pronominal "they" in sentence 3 can refer to a noun outside of the governing noun.

1. The girls liked *each other.*
2. The boys hurt *themselves.*
3. The children knew *they* were naughty.

In language development, children's use of simple pronominals without antecedents (e.g., *Mark likes him*) precedes their use of anaphors or pronouns with antecedents. Sentences with pronominals, which refer to a noun outside of the head noun, are acquired later (Leonard & Loeb, 1988).

Cross-linguistic evidence in child language has been a rich source of data supporting Chomsky's theory, as discussed by Leonard and Loeb (1988). For example, unlike Japanese- and Mandarin Chinese–speaking children, English-speaking children find the following sentences to be of increasing difficulty:

1. David fell to the ground when he reached the finish line.
2. When David reached the finish line, he fell to the ground.
3. When he reached the finish line, David fell to the ground.

In English, the branching direction parameter is set for right branching, where subordinate material typically occurs after the main clause, as in sentence 1. In Japanese and Mandarin Chinese, a left branching setting is required, so that subordinate material will typically occur first, as in sentences 2 and 3. Thus speakers of Japanese and Mandarin Chinese will have little difficulty recognizing referentially dependent forms or pronominals that precede the referents for which they stand (as in sentences 2 and 3). By comparison, English-speaking children will be slower in acquiring left-branching sentences (Leonard & Loeb, 1988).

Pinker and Jackendoff (2005) suggest Chomsky has scaled down his Extended Standard Theory (Chomsky, 1972) and Government Binding Theory (Chomsky, 1982) to create a "parsimonious" and "elegant" theory that is truly minimalist in its description of what the language faculty is (p. 219). In this version of his theory, Chomsky has reduced the language faculty to its narrowest form and has excluded information that had previously been incorporated on semantics, morphology, phonology, and grammatical relations. The minimalist commitment to including only the barest of necessities in the theory dictates only the inclusion of a level of representation for meaning, a level of representation for sound, and a recursive element called "merge" that provides the mechanism for joining words or phrases. This element accounts for the linguistic novelty of productions for native speaker-hearers and young children.

A Contemporary View

Pinker and Jackendoff (2005) maintain that Chomsky Minimalist View is inadequate because it ignores 25 years of research in the areas of phonology, morphology, syntactic word order, lexical entries, and the connection of a grammar to language processing, all of which are critical for a theory of language acquisition.

Pinker and Jackendoff (2005) address more challenging questions, such as "What is included in the language faculty?" by arguing that the language faculty is an adaptation for the communication of knowledge. This specialized language faculty triggers the development of linguistic knowledge that uses at least four different mechanisms for conveying semantic relations: hierarchical structure, linear order, agreement, and case. According to these authors, the four mechanisms are sometimes used redundantly. In arguing against the Minimalist Program, Pinker and Jackendoff suggest that how the specialized language faculty is characterized must be based on existing research, not on a program or theory that is incompatible with the facts.

In the more recent incarnations of the "nature" paradigm, Pinker (2006) addresses the question, "What are the innate mechanisms necessary for language learning to take place?" Certain cognitive accomplishments,

such as the representational function (i.e., the ability to represent objects or ideas mentally), are known prerequisites for language to unfold. Furthermore, metacognitive control or executive functioning that serves to monitor the incoming stimuli, the motor output, and the learning that takes place must be accounted for as well. Finally, individuals must operate with an unfolding theory of mind (i.e., the ability to attribute mental states such as beliefs, intents, desires, knowledge, pretend, to oneself and others, and to understand that others have beliefs, desires, and intentions that are different from one's own) (Premack and Woodruff, 1978) as the "language instinct" or the language faculty does its work.

Despite the impact of nature arguments of language acquisition, the limitations of this view are worth noting. For example, contrary to earlier findings, recent evidence suggests that caretakers do respond to the language errors of youngsters, including the syntactic ones (Saxton, Galloway, & Backley, 1999). Furthermore, the assumption that language acquisition is essentially completed by four or five years of age has not been supported, nor has the critical period been clearly identified (Hulit & Howard, 2002). Finally, the notion that language is acquired through a species-specific LAD is controversial, as research into animal communication raises the question of whether language is fully unique to humans (Pinker, 1984).

Implications from a Nature Perspective: Understanding, Assessing, and Treating Children with Language Disorders

From the nature perspective, the assumptions about children who fail to develop language typically include the possibility that the child is experiencing deficits in the innate mechanisms that the child brings to the task of learning language and constructing grammar. In fact, these possibilities are considered most relevant to the discussion of children who are referred to as having a specific language impairment (SLI). Children with specific language impairment are characterized by their difficulties in the acquisition and processing of syntax and grammatical morphology in addition to delays in the acquisition of vocabulary, especially verbs (Seiger-Gardner, 2010). These children seem endowed with many of the developmental capacities that are necessary for learning language, yet fall behind their typically developing peers in the acquisition of a linguistic system, in particular, the acquisition of the morphosyntactic rules of the grammar. In fact, children with SLI often have less well-developed morphosyntactic systems than younger children with comparable mean length of utterance (MLUs), and these differences persist over time. Of interest here is the explanation that the grammatical limitations are based in the underlying grammatical representations. For example, the extended optional infinitive account (Rice, Wexler, & Cleave, 1995) suggests that the omission of finiteness markers, such as past *-ed* and third person *-s*, persists for a longer time in children with SLI than in typically developing children.

In terms of the assessment of and intervention with children with language impairments, the nature hypotheses led the way for many of the hallmarks of the clinical work of a speech-language pathologist. The use of samples of spontaneous language as the data from which to determine children's linguistic knowledge was an example of the methodology learned from linguistic inquiry. For example, assessing children's language to describe their knowledge of the rules of the grammar, particularly in terms of morphology and syntax, was clearly an outgrowth of the work of the linguists and psycholinguists of the time. Determining children's mean length of utterance and measuring their linguistic progress relative to this parameter (rather than relative to their chronological age) revolutionized our thinking about the stages and expectations of language acquisition. These assessment goals and procedures brought our clinical evaluations into a new era and have had a lasting impact on our evaluation protocols.

In reference to intervention for children with language challenges, following the introduction of the nature perspective, goals of therapy were written based on inferences about what children needed to learn about the rules of their language and what they were ready to learn given their stage of language acquisition. The focus of these goals was clearly on syntax and, less frequently, on the semantics of language. Typical intervention goals addressed the child's lexicon, morphological elements, and syntactic structures that represent the foundations of the linguistic system. Emphasis on expanding the child's length of utterance, the use of various sentence types, and the use of Brown's (1973) 14 grammatical morphemes took center stage in the intervention process.

In reference to strategies of language intervention, the notion of enhancing the processing of the informative elements in the linguistic signal also can be traced to our interpretations of the work of the nature perspective. For example, to increase the salience of the linguistic input a clinician might use prosodic and syntactic bootstrapping techniques. *Bootstrapping* is a term that refers to the child's ability to take information s/he knows to learn new information. Prosodic bootstrapping refers to the

placement of target elements at the end of the utterance for greater salience (e.g., a response such as *Yes, she is* might be used to emphasize the copula form). Syntactic bootstrapping refers to the child's use of grammar to learn new language forms. For example, teaching a particular verb form in several linguistic contexts heightens the child's awareness of varied syntactic uses of the form (e.g., *She is pushing me; Who pushed her?; Don't push*) (Nelson, 1998).

Despite the undeniable impact of linguistic theory on the field of speech-language pathology, a clear limitation that followed us into the present is this theory's more narrow focus on language form. Given that many children who experience difficulties in learning language are challenged in areas such as the development of the precursors to language (e.g., prelinguistic skills such as using gestures), cognitive development (e.g., object permanence), and social–affective development (e.g., eye contact and joint attention with a communication partner), interventions must often override attention to the structure of the language. Nonetheless, by embracing the thinking of linguists, the work of speech-language pathologists moved into the realm of linguistic science.

Nurture: Behaviorist Paradigm

Based on the evidence gathered so far, it appears that the nature argument alone is not sufficient to explain the child's accomplishment in developing language. Rather, the relative importance of an innate language faculty versus environmental influence continues to be viewed as controversial.

Historically, the impetus for the nurture argument in learning and language was the "blank slate" philosophy of John Locke (1960/1690). This empiricist approach eventually gave rise to behaviorism in psychology. According to this perspective, explanations of behavior rely only on observable phenomena; in the most radical version of this position, no inferences regarding internal, unobservable events are made. Thus researchers and theoreticians who focused on the impact of the environment targeted primarily observable and measurable events to explain development.

Classical Conditioning

Classical conditioning was associated with the twentieth-century Russian physiologist Pavlov (1902). In his most famous experiment, a dog was presented with food along with the ringing of a bell. After repeated pairings of the two, the dogs would salivate upon hearing the bell even before the meat powder was introduced. Through classical conditioning, an association (a conditioned response) was formed between the bell and salivation; this association had not previously existed. While the meat powder was termed the "unconditioned stimulus," the bell became the "conditioned stimulus." Salivation was the "unconditioned response" to the meat powder and the "conditioned response" to the bell. The phenomenon of stimulus generalization was observed as well. That is, although the conditioned response would fade or become extinguished with time, before its extinction, some salivation could be elicited by similar bells (Cairns & Cairns, 1975; Pavlov, 1902). Pavlov's classical conditioning paradigm introduced the world of psychology to the concepts of stimulus, response, paired association, and stimulus generalization, all of which are typically integrated into clinical practice with the paradigm of operant conditioning.

Operant Conditioning

The paradigm of operant conditioning, including the notion of a verbal operant such as "tacts" (naming behaviors) and "mands" (commands), was developed by B. F. Skinner (1957). Proponents of this nurture view argued that although environmental stimuli were not always identifiable, the frequency of certain behaviors or antecedent behaviors could be increased if positive reinforcers (or consequences) were contingent upon the targets.

The principles of operant conditioning were derived from and based on observations made and data collected in animal laboratories. For example, if a rat in a cage received reinforcement with pellets of food for its bar pressing (i.e., bar pressing that was initially accidental), the frequency of its bar pressing was found to increase. Also, the type of response could be shaped through a schedule of reinforcement of successive approximations to the target stimulus.

In these views, explanations for the acquisition of speech and language relied heavily on the role of imitation as well as paired associations between unconditioned stimuli (e.g., food or a bottle) and unconditioned responses (e.g., physiological vocalizations). Invoking principles of classical conditioning, phonological productions or vocalizations would be the conditioned responses to the caretaker's vocalizations (i.e., conditioned stimuli) that had been paired with the unconditioned stimuli (e.g., food or bottle).

The law of effect (i.e., the intensity and frequency of a response will increase with reinforcement, a principle of

operant conditioning) was utilized to explain the acquisition of the production of words. Language acquisition was viewed as the result of gradual or systematic reinforcement of desirable or target behaviors. Thus, initially, gross approximations of the target (e.g., any vocalization at all) would be reinforced. According to this view, parents would teach children language through both imitation training of words and phrases as well as the shaping of phrases and sentences through successive approximations of adult-like speech.

From the perspective of conditioning, the sentence was described as a chain of associated events. Each word would serve as the response to the preceding word and the stimulus to the following word. According to the argument, grammatical categories and various sentence types could be learned through contextual generalization. In this explanation, children would generalize grammatical categories based on word position (Braine, 1966).

As with the nature theories, nurture explanations had some limitations. Although selective reinforcement and paired associations could account for certain aspects of sound and word learning, relying solely on principles of behaviorism to explain the acquisition of language knowledge proved inadequate. Stimulus–response explanations could not begin to describe or explain the development of the complex system of language knowledge that the young child acquires in such a short amount of time. Behaviorists were challenged to account for unobservable meaning knowledge, utterance novelty and complexity, and the rapidity with which language was typically acquired. Critics argued that parents more typically would give children feedback about their inaccuracies in meaning rather than about their inaccuracies in syntax.

Implications from a Nurture Perspective: Understanding, Assessing, and Treating Children with Language Disorders

Given the constructs of the nurture theories, these concepts ultimately added little to our understanding of the underlying origins of language disorders in children. Nevertheless, the impact of the behavioral paradigm on assessment and intervention has been pervasive in our field.

In reference to assessment protocols, the emphasis on observation of behavior, data-driven descriptions, quantification, and measurement began to define speech-language pathologists' evaluation of language. The use of standardized, formal tests for identifying deficits in all areas of language became, and has continued to be, the anchor of speech and language evaluations. In addition, principles from this approach have been used in Individuals with Disabilities Education Act (IDEA) legislation and its amendments. For example, legal documents such as the individualized education plan and individual family service plan must be generated for children with special needs, including those with language disorders, to assure that these children receive the assessments and services to which they are entitled. These documents identify goals, which are written in terms of observable behaviors, specify mandates for treatment, indicate performance criteria for achieving goals, and clarify the context in which the target behavior is to be elicited. The primary concern is to quantify behavioral change so as to document the treatment efficacy of the intervention used. In this sense, the construct of assessment expanded to include not only the initial evaluation of the child, but also periodic, data-driven reevaluations to determine the extent of the child's progress and learning relative to previously established goals.

Turning to intervention, the use of behavioral programs such as applied behavioral analysis and variations of this methodology is reflected in a great deal of the work done within the speech-language pathology field. More than 40 years of research generated from this perspective has documented treatment efficacy in the training of children with communication and language impairments. During the 1960s and 1970s, language training programs were developed under the aegis of the stimulus–response psychology model (Gray & Ryan, 1973). Many of these programs were characterized by the use of constructs from classical and operant conditioning, including the identification of antecedent and consequent events, specification of the desired response, determination of effective reinforcers, implementation of schedules of reinforcement, and use of strategies such as imitation, shaping, successive approximations, prompting, modeling, and generalization. While behavioral approaches to intervention vary, their common characteristics include the use of structured contexts of learning, adult-directed operant conditioning procedures, and reliance on preset curricula.

Applied behavior analysis (ABA) introduced by Lovaas (1977) was an outgrowth of the operant conditioning paradigm and has continued to be a popular approach to enhancing language development, particularly for children on the autistic spectrum. In ABA, an individualized treatment program is developed for each child. Based on the child's strengths and weaknesses, a curriculum focusing on skills such as matching, imitation, play, and receptive and expressive language is developed.

Variations of Lovaas' ABA method include the Natural Language Paradigm and Pivotal Response Treatment (Koegel & Koegel, 2006), which addresses the child's motivation and self-initiations, such as requesting items that he wants.

Criticisms of behavioral approaches have often centered on the child's difficulty with generalization, that is, using his newly learned behaviors in the contexts of his daily life (e.g., using the utterance *More cookies* to request cookies during snack time at home in addition to during snack time at school where the utterance was taught.) Milieu or incidental teaching was designed to address this issue by using naturally occurring learning contexts and child-initiated topics in an attempt to enhance generalization (Warren & Kaiser, 1986).

As Nelson (1998) suggests, the irony of using behavioral approaches for language intervention was that "language seems to be too complex a system for some children to master on their own, but breaking it down into manageable pieces does not make it simpler so much as different" (p. 61). Nonetheless, the use of structured approaches to language intervention has held tremendous appeal for speech-language pathologists and policy makers who are attracted to the science underlying evidence-based practice, that is, treatment approaches that have been supported by well-designed research studies. The significant incongruity between the foundational principles of the nature arguments (role of the child's inborn capacities) and the nurture arguments (role of the child's environment) has presented a dilemma for clinicians who are looking to theoretical paradigms to govern their work. This need for rapprochement of conflicting ideologies has been, and continues to be, a frequently revisited theme in the clinical practice of speech-language pathologists.

Interactionist: Cognitive Interactionist Paradigm

Interactionist models of language development can be discussed relative to two paradigms: cognitive interactionist (Information Processing and Cognitive-Constructivist) and social interactionist (Social-Cognitive, Social-Pragmatic, and Intentionality Model). Within each of these paradigms, various perspectives can be described, all of which presume that the child brings some preexisting information to the task of language learning and that her environmental input plays a significant role in her language development. The specifics of what the child brings to language learning and how the environment interacts with these innate capacities varies within these views. While they are grouped together as interactionist views in this section, the implications of each perspective for speech-language pathologists are dealt with separately to reflect the unique contribution each has had on the discipline.

Information Processing Models

In a historical description of information processing approaches to language, Klein and Moses (1999) note that in the late nineteenth century and early twentieth century, Broca and Gall were among the first researchers to try to locate language functions in the brain. The connection between brain function and language was studied in victims of brain injury due to stroke, in patients with traumatic war-related injuries, and, ultimately, in children with language disorders and learning disabilities. Descriptions of brain function and modes of language processing as well as perceptual–motor aspects of childhood language disorders were described by Cruickshank (1967) and Johnson and Mykelbust (1967).

An information processing model of language was eventually developed by Osgood (1963). Osgood's model identified the modalities that were said to underlie language functioning—namely, visual and auditory memory, auditory discrimination, visual association, visual reception, and auditory closure. Traditional information-processing accounts of language development described language processing as a series of steps that were said to occur consecutively or serially, where the steps included attention, sensation, speech perception, lexical search, syntactic processing, and memory storage (Cairns & Cairns, 1975).

More recent information-processing accounts of language, which are sometimes referred to as "connectionist," describe parallel processing rather than serial processing of language. According to this view, networks of processors are connected and several operations or decisions may occur simultaneously (Bohannon & Bonvillian, 2005). These multilayered networks of connections function to interpret linguistic input from the exemplars provided to them. The statistical properties of syntactic forms determine their rate of acquisition, and cues that consistently signal particular meanings should be acquired first.

Research reported by Bates and MacWhinney (1987) and MacWhinney (1987) has offered support for this view by using data from the acquisition of several languages, including French, English, Italian, Turkish, and Hungarian. For example, Turkish children, whose language has an extremely reliable case-marking system, master case

considerably sooner than word order, which has often been considered a universal cue to sentence meaning over other cues (Bohannon & Bonvillian, 2005; Slobin & Bever, 1982).

Critics of the connectionist model include those who question the paradigm on theoretical grounds. While information processing networks might provide neat explanations for describing linguistic rules, they resemble biological systems only superficially (Berko-Gleason, 2005; Fodor & Pylyshyn, 1988; Sampson, 1987). Most importantly, these connectionist accounts omit any mention of social interaction.

Implications from an Information Processing Perspective: Understanding, Assessing, and Treating Children with Language Disorders

Clearly, the information-processing perspective supports the view that the origins of the language-disordered child's difficulties lie in the ability to successfully process the information necessary for learning a language. In fact, this perspective resonates in contemporary arguments that claim that deficits in information processing and executive functioning underlie language-learning disabilities.

In terms of language assessment, the models described earlier served as the impetus for the development of many tests that continue to be used widely by speech-language pathologists. For example, the Illinois Test of Psycholinguistic Abilities (ITPA) developed by Osgood (1963) reflected the notion of different levels of language functioning (e.g., receptive, expressive, and associative) and different modalities of language (e.g., verbal, auditory, and visual). The idea of discrete components of processing that can be isolated, tested, and ultimately remediated is a familiar construct in contemporary practice. Use of formal language testing continues to be the accepted protocol for securing speech and language services for children suspected of having language-learning difficulties. The proliferation of speech and language testing materials in the last 40 years speaks to this practice. In fact, the ITPA-3 (Hammill, Mather, & Roberts, 2001), a revision of the earlier test, suggests the continuing interest in this approach to language assessment.

In reference to treatment, many speech-language pathologists support the use of intervention programs that reflect the belief in processing mechanisms as the underpinnings for language learning. Consider the prevalence of auditory processing programs such as *Fast ForWord* and auditory integration training. The premise of these programs is that the child's difficulty in processing auditory signals has contributed to disruption in the child's comprehension and/or production of language. Viewed from a somewhat different perspective, language intervention programs designed to facilitate the child's development of executive functions such as organization, memory, and retrieval reflect the notion that discrete language functions underlie language learning and can be remediated if deficient, resulting in improved language performance.

Information-processing models have clearly had far-reaching effects on the field of communication disorders. Our clinical wisdom tells us that this is a productive approach to take with some children who have language-learning difficulties. However, the idea that this perspective describes the challenges faced by *all* children with language disorders and, therefore, represents the approach to be taken with *all* children would be criticized from within the clinical world of speech-language pathology as well as from more contemporary research findings about the relationship between processing and language acquisition (Gillam et al., 2008).

Cognitive-Constructivist Models

Jean Piaget, a Swiss biologist who referred to himself as a genetic epistemologist, became fascinated with the acquisition of knowledge and the "activity" of the body and mind that lead to intellectual growth (Flavell, 1963). His keen observations of children as they engaged in exploration, play, and problem solving provided the data for his model of functional invariants:

- *Schemas,* or mental structures, correspond to consistencies in the infant's or child's behaviors or actions (e.g. the child who frequently mouths and sucks objects after grasping them is said to be using his or her "sucking" schema).
- *Assimilation* occurs when a child applies a mental schema to an event; it embodies play, exploration, and learning about the environment. The young child will apply his or her sucking schema to the features inherent in the various objects that are grasped and will repeat the behavior over and over for the sake of play.
- *Accommodation* occurs as a result of the child's new experience with an object, event, or person, and embodies the child's ability to incorporate the new information, resulting in changes in the child's mental schemas. Each time the child applies his or her sucking schema to a different object, the sucking behavior will be slightly modified to incorporate features of the object.

- *Adaptation* consists of assimilation and accommodation (i.e., the mechanisms for the acquisition of knowledge) as described above. (Piaget, 1952)

From a Piagetian perspective, learning is accomplished throughout the lifespan by active participation of infants, children, and adults. For example, children pursue their goals and interests while their mental schemas are adapted to new experiences. Children were said to direct their own learning as they encountered new experiences and challenges during their ongoing interactions in the world (Flavell, 1963).

Piaget (1952) noted that there were qualitative differences in how children would respond to external events over time. These qualitative differences were captured in his account of developmental stages from birth until formal, scientific operational thought, the cornerstone of scientific inquiry.

In the realm of language development, the traditional Piagetian view maintains that a direct relationship exists between cognitive achievements and later linguistic attainments. More specifically, Piagetian theory predicts that cognitive prerequisites for early word learning, in the sensorimotor period (i.e., the first two years of life) include concepts of object permanence, intentionality, causality, deferred imitation, and symbolic play (Piaget, 1955).

Implications from a Cognitive-Constructivist Perspective: Understanding, Assessing, and Treating Children with Language Disorders

Given the relationship between language and other cognitive skills presented by Piaget (1955), the notion that children with language disorders might be exhibiting language delays because of their cognitive deficits was a direct outgrowth of interest in the cognitive-constructivist views. The nature of language disorders was reconsidered from this perspective with an eye toward identifying the cognitive prerequisites to language, from birth through early childhood, as the potential source of the disruption in language learning. In addition, the fact that language was just one of a number of symbolic behaviors (i.e., the ability to use a word, or an object to stand for or represent something else) paved the way for considering language impairments as a reflection of a symbolic disorder rather than a language disorder alone. In fact, this period marked the beginning of a new line of inquiry relative to the cognitive abilities of children with specific language impairment. The possibility that these children might have unrecognized cognitive deficits led to a reconsideration of what was meant by "normal" cognition and to a new arena for studying the relationship between aspects of cognition and linguistic development (Johnston, 1994).

This view of the cognitive underpinnings to language found a place in the assessment protocols used by speech-language pathologists in a number of ways. First, assessment of the sensorimotor stages of development was now included in language evaluations as clinicians began to assess children's abilities in areas such as object permanence (i.e., the ability to understand that an object exists even if it is not present, seen when children search for a hidden object), means-end behavior (i.e., the ability to execute a series of steps to reach a goal, such as pulling a string on a toy to retrieve it), and causality (i.e., the ability to understand the connection between a cause and an effect such as hitting the mobile to start the music). Second, children's play itself was seen as a rich source of information about their ideas and schemas as well as their overall cognitive achievements. The use of developmental paradigms to systematically assess stages of play became a central component of language evaluations and is considered by many to be the heart of the assessment process (Westby, 1980, 2000). The interest in children's symbolic capacity, rather than language alone, moved the assessment process beyond children's rules of language to the potential foundations for their thinking and, therefore, talking.

In reference to intervention, Piaget's theories and the subsequent applications of these theories to the study of language acquisition had a tremendous impact on both the goals and the contexts of language intervention. For example, the repertoire of goals typically began to include cognitive behaviors such as the sensorimotor developments mentioned earlier. The notion that children must acquire a broad foundation of ideas and world knowledge prior to talking gave speech-language pathologists license to facilitate development in areas other than language.

The importance of children's developmental stage, rather than just their chronological age, was emphasized as intervention was planned according to what was developmentally appropriate for each child's cognitive stage. Furthermore, the emphasis on play as both a goal and a context of therapy represented another distinct shift in focus away from linguistic goals and structured, adult-directed interactions. The view that children were active learners in their developmental processes led speech-language pathologists to encourage children to interact more freely with toys and objects as they

explored the world and learned through this exploration. Although the relationship between certain types of cognitive achievements and language was delineated, the exact nature of this relationship—including the particular cognitive prerequisites to language—was not necessarily agreed upon. Nonetheless, the idea that cognitive foundations support language acquisition and that the two are integrally related throughout the developmental process shifted and broadened the work (and play) of the speech-language pathologist.

Interactionist: Social Interactionist Paradigm

Social-Cognitive Models

Other developmental interactionists who have influenced the language learning research include Vygotsky (1986) and Bruner (1975, 1977). Vygotsky believed that children's cognitive development resulted from interaction between children's innate skills and their social experiences with peers, adults, and the culture in general. In addition, Vygotsky is well known for his description of the "zone of proximal development"—that is, the area between what a child can accomplish independently and what he can accomplish with another person who has greater knowledge, experience, or skill in the area and who provides some scaffolding (i.e., help). When collaborating on a task, the child and the adult engage in a dialogue that is then stored away by the child for future use as "private speech" (e.g., self-directed talk or when a youngster is "talking to himself") According to Vygotsky, when language emerges in the form of private speech, it can be used as a tool to guide and direct problem-solving and other cognitive activities.

Similarly, Bruner's work (1975, 1977) was pioneering relative to social interactionist theories of language acquisition. Bruner (1977) suggested that when caregivers and their infants engage in joint referencing, they share a common focus of interest that ultimately contributes to language acquisition. Three mechanisms (indicating, deictic terms, and naming) serve to establish joint reference between a caregiver and baby, essentially laying the groundwork to enter the language acquisition process. According to Bruner, the caregiver that uses an "indicator" is using gestural, postural, or vocal means to get the baby's attention. With time, these indicators become more conventional symbols as the caregiver adjusts his or her communication to the level of the child. If the child reaches for an object that the caretaker is holding or if the child looks at the caretaker, the child is likely to receive an enthusiastic response from the adult. When the child begins to use gestures and vocalizations to show, point, or give objects, the caregiver will typically respond verbally, vocally, or gesturally to the child. When using "deictic terms" (e.g., *here, there, this, that, you, me*) with changing referents, caregivers incorporate spatial and contextual cues to assist children in comprehending this terminology. "Naming" occurs when the child can associate a label with a referent, which is accomplished receptively before it is accomplished expressively.

Bruner also introduced the notion of scaffolding as one way in which caregivers facilitate language learning and dialogue. Caregivers are said to adjust the degree of linguistic and nonlinguistic support that they offer to children as they are learning language. For example, as the young child becomes more verbal, the caretaker will typically need to provide less nonverbal cuing during conversation (Bruner, 1975, 1977).

In contemporary social-cognitive research, children are said to possess a unique capacity that enables them to learn language by interpreting the intentions of those who interact with them. Social cognitive views, such as that advocated by Paul Bloom (2000), suggest that children learning language need at least a primitive theory of mind to enable them to adequately interpret the intentions of others. Children's requisite cognitive abilities allow them to process information, while their preformed concepts for entities in the world serve as the basis for word learning and language development. While helpful adults might accelerate or assist in the process of word learning, as long as children can infer the referential intentions of others, no other social support is necessary. Tomasello, Carpenter, and Liszkowski (2007) support the view that children's inference of intentionality is critical for word and language learning.

According to Tomasello (2003), pointing gestures are an important part of the system of shared intentionality. Prior to language use, pointing not only establishes joint attention, but also serves to influence the mental states of others by attempting to influence how another thinks, feels, and acts (Tomasello et al., 2007; Goldin-Meadow, 2007). In support of this view, Goldin-Meadow (2007) suggests that pointing at 14 months is a better predictor of lexical vocabulary than the speech of the caretaker. Pointing serves the child by not only drawing attention to the self, but also to the objects that she finds interesting enough to communicate about. The child's use of pointing or gesture with words also helps her segue into syntax. For example, "children combine pointing gestures with words to express sentence-like

meanings ('eat' + point at cookie) months before they can express the same meanings in word + word combination ('eat + cookie')" (Goldin-Meadow, 2007, p. 741).

From the perspective discussed here, language use originates from shared attention and the interpretation of intentionality. The basic processes that explain language learning in this view are the understanding of intentions and children's general cognitive abilities, including pattern abstraction and category construction. Owing to their unique social capabilities, human infants learn to interpret the communicative intentions of others, communicate their own intentions, and utilize their cognitive resources to create language knowledge that is both interpersonally driven and intrapersonally developed.

Social-Pragmatic Models

Pragmatics in linguistic theory has traditionally been concerned with the functions of language, speaker–listener roles, conversational discourse, and presupposition. Research in the pragmatics of language originated in the work of Austin (1962) and Searle (1969). In terms of the functions of adult language, linguists identified three types of speech acts: perlocutions, illocutions, and locutions. *Perlocutions* referred to how listeners interpreted the speaker's speech acts; *illocutions* referred to the intentions of the speaker; and *locutions* referred to the meanings expressed in the utterance.

In describing how intentionality develops in young children, Bates, Camaioni, and Volterra (1975) used this paradigm of functional categories. During the perlocutionary stage, which was said to extend from birth to 9 months, the child's actions and behaviors are given communicative intent by the caretaker. For example, the caretaker might interpret a baby's cooing as a sign of happiness or contentment. The illocutionary stage (8 to 12 months) marks the period of time when children first produce their truly intentional behaviors, either vocally or gesturally. Gestures such as showing, giving, or pointing, perhaps accompanied with vocalizations, are typically used. During this time, children are said to produce the nonlinguistic precursor to the declarative referred to as the *protodeclarative* (e.g., gesturing or vocalizing to point out an object or event) as well as the nonlinguistic precursor to the imperative referred to as the *protoimperative* (e.g., gesturing or vocalizing to request an object or an event). The third stage, referred to as the locutionary stage (12 months of age), is characterized by the use of words produced with gestures to convey specific meanings and intentions.

A pragmatic approach to child language was taken by Halliday (1975) who described the functions of his son Nigel's nonlinguistic communication. These functions included satisfying needs, controlling the behaviors of others, interacting, and expressing emotion and interest. With his first words, Nigel could explore and categorize things in his environment, imagine or pretend, and inform others of his experiences.

John Dore (1974, 1975) identified the primitive speech acts of children at the one-word stage of language (e.g., labeling, answering, requesting an action, requesting an answer, calling, greeting, protesting, repeating/imitating, and practicing) as well as the speech acts of children at multiword stages of language development. Beyond such speech acts, research in the area of pragmatics addressed the child's knowledge of presupposition (Greenfield & Smith, 1976) and the child's understanding of conversational protocol, including topic control and conversational turn-taking (Bloom, Rocissano, & Hood, 1976).

One of the research topics that grew out of social-pragmatic views of language was the nature of the adult input to babies and young children. Since the 1970s, researchers in child language have noted that adults speak differently to very young children than they do to other people. These patterns, which have been referred to as "motherese," are characterized by utterances that are shorter in length, simpler in grammatical complexity, and slower in rate of speech. Also typical of motherese is the use of fewer verbs, fewer tense markers, and vocabulary that is less diverse and more concrete (Phillips, 1973; Snow, 1973, 1978, 1999).

In a similar vein, more recent studies have described child-directed speech (CDS) as contextually redundant and perceptually salient. Because most CDS refers to the here and now (i.e., codes an ongoing action or activity within the child's view), it is contextually redundant (Akhtar, Dunham, & Dunham, 1991; Tomasello, 1988). In terms of perceptual salience, CDS typically has an overall higher fundamental frequency, exaggerated stress, a wider range of intonation, more distinct pausing, and, as noted earlier, an overall slower rate (Lund & Duchan, 1993). Researchers suggest that the vocal and grammatical parameters of the primary linguistic data that are provided by the caretaker make semantic, syntactic, phonological, and pragmatic information more accessible to the young infant, who is innately wired to receive this information. Findings from a number of studies have suggested that infant-directed speech facilitates segmentation of the speech stream, which in turn leads to the discovery of phonemes and words (Kuhl, 2004; Saffran, Senghas, & Trueswell, 2001; Thiessen, Hill, & Saffran, 2005).

It should be emphasized that although CDS has been found in many different cultures and languages throughout the world (e.g., Chinese, Arabic, Spanish, Marathi, and Comanche), CDS is not used to the same extent in all communities (Golinkoff & Hirsh-Pasek, 2000). For example, in the findings reported by Brice-Heath (1983), child-directed speech was not as prevalent in one of the Carolina Piedmont communities studied.

Implications from a Social-Cognitive and Social-Pragmatic Perspective: Understanding, Assessing, and Treating Children with Language Disorders

Some theories of language acquisition have had a profound impact on the study of specific populations of language-impaired children. For example, social-cognitive and social-pragmatic theories, which clarified the relationship between children's capacity for interaction and their capacity to learn to comprehend and produce language, spoke directly to the profiles of children with autistic spectrum disorders (ASD).

Children with autism often present challenges in intentionality, both in their own communication and in their understanding of others' communication. In fact, the difficulty in reading these children's intentions set them apart from typically developing children and from other groups of children with language impairments. Based on social-cognitive and social-pragmatic views of language acquisition, speech-language pathologists working with children on the autistic spectrum began to broaden their understanding of why these children experienced such severe difficulties in the acquisition and use of language. Atypical behaviors, such as echolalia, were reconsidered. Using taxonomies of communicative intentions, the ground-breaking work of Prizant and Duchan (1981) as related to the functions of echolalia and delayed echolalia opened the door for considering that the "inappropriate" behaviors of children with ASD were, in fact, communicative and intentional, albeit in unconventional ways.

Many taxonomies of pragmatic development that focused on nonlinguistic aspects of communication also contributed to expanding the understanding of the nature of communication impairments in children whose deficits went far beyond their linguistic systems. The emphasis on gesture, facial expression, body language, eye gaze, presupposition, and listener perspective as foundations of communicative competence helped us to more accurately describe many children's disruptions in language. These taxonomies were eventually adapted for use in assessment as the functions of language and the forms that were used to express these functions (nonlinguistic and linguistic, conventional and unconventional) were analyzed. Simultaneously, taxonomies of conversational skills that addressed speaker–listener roles, topic control, and topic expansion (Prutting & Kirchner, 1987) were included in the battery of assessment tools as the evaluation of language expanded beyond vocabulary, morphology, syntax, and semantics.

These theories of language also had a dramatic effect on the interventions used with children with language disorders. Expanding the repertoire of language intervention goals to prelinguistic and nonlinguistic domains of communication and recognizing all the categories of pragmatics as potential targets of therapy marked a shift that allowed speech-language pathologists to more accurately address the nature of many children's language and communication impairments. Intervention programs such as *It Takes Two to Talk* (Pepper and Weitzman, 2004) and *More than Words* (Sussman, 1999) are excellent examples of applications of the social-pragmatic theories to the goals and strategies of language development for children with language challenges. In both of these programs, the emphasis on parent training reflects one of the hallmarks of social-pragmatic models.

Over time, it became clear that there were a number of groups of language-disordered children who demonstrated problems in pragmatic abilities, including children with SLI and children with language-learning disabilities. As a consequence, speech-language pathologists began to more frequently generate intervention goals that embraced prelinguistic precursors to language, functions of language, conversational skills, adjacency and contingency, discourse genres, communication repair, listener adaptation, and, to some extent, the social-emotional underpinnings of the pragmatics of language. Finally, an interest in addressing the language and conversational skills needed for successful peer interactions emerged primarily as a result of our deeper understanding of social-cognitive and social-pragmatic models of language.

Intentionality Model

We end this section on interactionist views of language acquisition with a contemporary model that reflects an integrated perspective on the developmental language process. This model has particular resonance and relevance for understanding, assessing, and treating children with language disorders. Models of this type hold great promise for the discipline of speech-language pathology

because they provide the kinds of expansive paradigms that anchor our clinical work in the breadth and depth of typical development.

In 1978, Bloom and Lahey proposed a model of language acquisition that revolutionized the work of speech-language pathologists. This view of language as the integration of form (phonology, morphology, syntax), content (semantics), and use (pragmatics) was subsequently translated into assessment and intervention paradigms (Lahey, 1988). The resulting "map" of language development, which traced the child's expression of ideas from single words to complex sentences, provided speech-language pathologists with developmental information that was at once organic, dynamic, and grounded in what was known about typical development.

More recently, Bloom and Tinker (2001) have enhanced the original model, embedding the development of form, content, and use into two broader developmental domains, *engagement* and *effort*. These authors suggest that the study of language has often resulted in the isolation of a particular aspect of language in an effort to investigate and study it. They remind us that "we need to consider what it means when we take the units of language out of the very fabric of the child's life in which they are necessarily embedded" (p. 4); "Somehow the child has to be kept in the picture as the major player, as the agent of the practices that contribute to the acquisition process" (p. 5). These concerns resonate with speech-language pathologists, who have the awesome task of isolating units of language so as to increase their saliency during the intervention process and, at the same time, trying to connect this process to "the very fabric of the child's life" (p. 4).

Bloom and Tinker's model suggests that a child's intentionality (i.e., the child's goal-directed action, as well as her representations of objects, wishes, feelings, and beliefs), contributes to her development in two ways. First, the child's actions in the world (sensorimotor actions, emotional displays, play, and speech) as well as her acts of interpretation and expression of language lead to the development of new representations of the mental contents of her mind. Second, the child's participation in a social world depends on and is promoted by these acts of expression and interpretation between the child and her caregiver.

The child's agency (i.e., what he has in mind or his intentional state) is a central theme in this model. In this formulation, the child perceives, apprehends, and constructs intentional states. As the child expresses these states and interprets others' intentional states from their actions and their words, new intentional states and representations are formed. Intentional states include *psychological attitudes* (e.g., beliefs, desires, feelings) directed toward *propositional content* (e.g., persons, objects, and events in the world). Thus, the intentionality model speaks to the interaction between two domains of development, affect (i.e., feelings and emotions) and cognition, in the young child. The child's expression of his intentions is realized through emotion, play, and speech.

Although the intentionality model might be envisioned as a psychological model, Bloom and Tinker (2001) suggest that it embraces the social and cultural world of the child as well. Their treatment of the social world resides in the child's representations of others in his mind. The interaction of the child with the physical and social world and the effects of these interactions on his development lead us to consider this model as one example of the interactionist view of development.

One component of the intentionality model (**Figure 2-1**) is *engagement,* which refers to "the child's emotional and social directedness for determining what is relevant for learning and the motivation for learning" (Bloom & Tinker, 2001, p. 14). Here, Bloom and Tinker are referring to the intersubjectivity that develops between the child and her parent, which serves as the foundation for the child's relatedness to other persons throughout life. The relationship between the child and her caregivers, the child's relationships to objects and events, and her relationships in the physical world all contribute to the child's development of engagement.

The component of *effort* refers to the cognitive processes and the work it takes to acquire language. Early discussions of language acquisition emphasized the ease of learning to talk, as evidenced by the fact that children had accomplished most of this task by age 3 years. In contrast, Bloom and Tinker (2001) underscore the effort

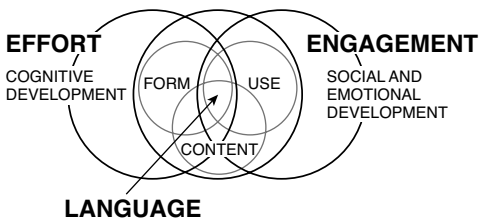

Figure 2-1 The intentionality model.

Source: Intentionality Model appearing in Bloom, L. & Tinker, E. (2001). The intentionality model and language acquisition. *Monographs of the Society for Research in Child Development, 66*(4), 267.

and resources that are required to integrate the various dimensions of expressing (producing) and interpreting (understanding) language. The complexity of these tasks is captured when considering that

> expression, at a minimum, requires the child to construct and hold in mind intentional state representations, retrieve linguistic units and procedures from memory, and articulate words and sentences. For interpretation, at a minimum, the child must connect what is heard to what is already in mind, recall elements from memory that are associated with prior experiences of the words, and form a new intentional state representation. (Bloom & Tinker, 2001, p. 15)

Effort can also be understood in terms of the complexity of what children are learning simultaneously. For example, children are learning to interpret and express intentions at the same time that they are learning about the world, their emotional lives, and the emotional lives of significant others. In this view, the child's cognitive resources are a very real part of the acquisition process and will help us to understand what he can and cannot do at different points in time. The implications of this concept for thinking about children with challenges in speech, language, and communication are immediately apparent as we imagine the additional taxing of resources that would result from neurological, psychological, and emotional disruptions.

Implications from the Intentionality Model: Understanding, Assessing, and Treating Children with Language Disorders

By using Bloom and Tinker's (2001) Intentionality Model, disorders of language can be addressed relative to the area or areas of language that are compromised, rather than from a categorical or etiological framework. The advantage of using Bloom and Tinker's perspective is that we can begin to view challenges in language from two overarching developmental domains—effort (cognitive development) and engagement (social-emotional development) in addition to the linguistic domains of form, content, and use. Children with primary problems in effort and those with primary problems in engagement can be considered relative to these underlying challenges, and the resulting impact of these derailments on the development of form, content, and use can be addressed. In the spirit of Bloom and Lahey (1978) and Lahey (1988), language-disordered children would be classified on the basis of the areas of language and language-related developments that might be considered strengths and challenges, rather than using etiological categories such as specific language impairment, intellectual disability, autistic spectrum disorders, and so forth.

For individual assessments of children, Bloom and Tinker's (2001) intentionality model is invaluable. Developmental models of language, which are both broad and integrated, offer speech-language pathologists a rich paradigm from which to assess language in a way that will lead directly to intervention. Using the Intentionality Model, developmental areas such as social, affective, and cognitive domains can be assessed. Assessment based on this thinking leads to more holistic intervention goals and procedures, as the interrelationship between and among the developmental components is recognized and the use of developmental sequences and processes is prioritized (Gerber, 2003). Clearly, for some children, assessments of all the components of the Bloom and Tinker (2001) model will lead to the formulation of intervention priorities in areas such as engagement rather than the more traditional focus on form.

Although Bloom and Tinker's (2001) model does not offer a packaged set of intervention plans, it anchors the work of speech-language pathologists in a perspective that embraces many of the models of language acquisition that have been discussed in this chapter. The clinician who begins the treatment of any particular child with an integrated understanding of the processes and products of typical language acquisition and then combines this knowledge with an inherent understanding of the interpersonal relationships within which these processes and products unfold will be ready to meet the challenges and joys of facilitating each child's comprehension and production of language. Here again, the parent-child relationship will be seen as a key intervention context and more traditional views of the parent as an observer during the therapy session will be discouraged.

Intervention goals that focus on the cognitive precursors and co-cursors to language, such as symbolic development, and the social-emotional precursors and co-cursors to language, such as affective engagement, reciprocity, and joint attention, will more closely match the developmental needs of many children with language disorders. For some children with language and communication impairments, such as children with autism spectrum disorders, social-emotional goals including joint attention and reciprocity will be addressed prior to facilitating language production. Interestingly, some language-impaired children who have relatively well-developed linguistic systems continue to be compromised in social-emotional development, suggesting that this area will be addressed over time in the child's language

intervention program. For those children who are ready to move into the learning of a linguistic system, such as children with specific language impairment, the developmental map of form, content, and use can be used as a guide for determining which language targets to address when. Once again, depending on the child's linguistic profile, priorities will be determined relative to whether form or content or use or some combination of the three domains should be targeted in intervention.

A similar emphasis on emotional development, symbolic capacity, the caretaker-child relationship, and developmental process is a hallmark of the Developmental, Individual Differences, Relationship-based approach (DIR) developed by Greenspan and Wieder (1998). Although this model of development, assessment, and intervention does not address the acquisition of language specifically, the focus on social-emotional, interpersonal foundations of all development, and the interest in intentionality and communication are consistent with the Bloom and Tinker (2001) model. Unlike the Bloom and Tinker (2001) model, DIR is a well-developed intervention approach that integrates developmental threads from many disciplines (mental health, occupational therapy, speech-language therapy, education) into an assessment and intervention approach that is quite unique. This in combination with the interest in the individual processing profile of the child (e.g., sensory and regulatory challenges) embeds the development of speech, language, and communication into the broadest perspective of the child and his family and is completely in sync with contemporary views of child development (Gerber, in press).

THE SCIENCE OF CHILD DEVELOPMENT: BROADER PERSPECTIVES

A contemporary review of the science of language acquisition would not be complete without a discussion of the most recent perspectives on the science of early child development. Since 2000, a number of reports have been published that reflect the work of the National Scientific Council on the Developing Child. This interdisciplinary team of scientists and scholars has addressed what the biological and social sciences "do and do not say about early childhood, brain development, and the impact of intervention programs" (National Research Council & Institute of Medicine, 2000, p. 2). The status of the nature–nurture debate comes across loud and clear in the findings and recommendations of this group, as the interactionist view is presented in the most contemporary framework.

The council's analysis of decades of data from a small number of intensive child development programs supports the assumption that it is possible to improve many outcomes for "vulnerable children"; however, it also demonstrates that many programs have not yielded beneficial results. Several of the findings from this analysis of cutting-edge neuroscience, developmental-behavioral research, and program evaluation are particularly relevant to the nature–nurture issue in language acquisition. The review presented in this section puts the topic of language acquisition into a broader scientific and developmental context and serves as another source for intervention implications.

Early experiences determine whether a child's developing brain architecture provides a strong or weak foundation for all future learning, behavior, and health (National Research Council & Institute of Medicine, 2000, p. 3).

Among the many conclusions that have been drawn from this finding is that a need exists for earlier intervention programs for children at risk. Early intervention has the potential to influence the child's brain circuitry—once again speaking to the interaction between nature and nurture. For speech-language pathologists, this finding supports the benefits provided by early, finely tuned adult input and well-designed interactive experiences and sets the stage for honing the experiences that the young child with language difficulties will receive. For vulnerable children, the plasticity of the brain and the windows of opportunity in early childhood are the keys to ensuring intensity of services and parental participation in the intervention plan.

In fact, the world of communication disorders has a long history of supporting early and intensive intervention for children with developmental delays. Contemporary studies aimed at identifying prelinguistic markers of language and communication disorders speak to the urgency of earlier identification, which will then lead to earlier intervention (Wetherby et al., 2004). Similarly, our growing awareness of the role of the parent–child relationship will, hopefully, result in paradigm shifts relative to determining who the participants are during language intervention sessions (Longtin & Gerber, 2008).

The interactive influences of genes and experience shape the architecture of the child's developing brain (National Research Council & Institute of Medicine, 2000, p. 8).

In this view, genes dictate when specific brain circuits are formed, while experiences shape their formation. Children's inborn drive toward competence and their

experience with responsive relationships motivate the developmental process and lead to healthy brain architecture. Early interactions are key to children's development because they are comprised of mutual and reciprocal exchanges. Therefore, these interactions are key to the construction of intervention goals and strategies. In typical development, a parent or caretaker can provide these opportunities for mutuality and reciprocity to the child, who is an eager and active participant in the process. For children who are developing atypically, the same interactive dance, which may be much harder to choreograph, must nonetheless be prioritized as a step toward shaping the architecture of the child's developing brain.

Brain architecture and the skills that come with development are built "from the bottom up," (National Research Council & Institute of Medicine, 2000, p. 8) *with simpler developments serving as the foundations for more advanced ones*.

Here, the take-home message for speech-language pathologists interested in language acquisition speaks to the importance of a developmental approach when facilitating language learning. It is important to remember that more complex skills build on simpler ones. While this hierarchy may seem self-evident, the implication of this multilayer structure for professionals developing intervention programs clearly sets the direction of the program content. An extensive understanding of the steps in development within any particular domain (language, affect, cognition) and a commitment to developmentally expanding the child's repertoire of skills is the logical implication of this finding.

Cognitive, emotional, and social capabilities are inextricably intertwined throughout the life course, and their interactive relationship develops in a continuous process over time (National Research Council & Institute of Medicine, 2000, p. 10).

This finding presents one of the greatest challenges for professionals working with children who have developmental derailments. The implication here is that to provide the best experiences for promoting development, clinicians must think not only about their particular area of expertise, but also about the relationship and interrelationship of that area with other developmental domains. In fact, the most promising intervention programs are likely to be those that keep the interactive flow between and among developmental threads in view and that plan for each goal with an eye toward the prerequisites and co-requisites of that specific development. Prioritizing a particular area of development, such as language, while honoring the simultaneity and interconnectedness of the child's development in social, affective, cognitive, and regulatory domains, presents an ongoing learning opportunity for clinicians.

CONCLUSION: HOW TO USE THIS INFORMATION AS A LIFELONG STUDENT OF LANGUAGE DISORDERS

In this chapter, we started the discussion with our shared interest in the amazing moment when a child says his first word or, in the case of children with language delays and disorders, the disappointing and unexpected moment when he does not. This is a defining time in the child's life, and in the life of his parents. The child who begins to talk at 12 months or so sees in the delighted faces of his caretakers that he has accomplished something extraordinary in this ordinary achievement. The parents of this child, in turn, experience the magic of knowing what their baby is thinking and feeling through his use of words.

The scenario is quite different for the child and his family when the first word is not spoken when expected; again, life will change. The child may experience the anxiety or frustration that naturally arises when there is a disconnect between what one knows and what one can express; the child may also sense his caretakers' concern as they wonder what has happened to the precious first words and perhaps begin to question, in worrisome ways, if their child is "normal."

Who are these children who do not speak when we might expect them to? In reality, they represent a continuum, including those children who are initially indistinguishable from their peers, aside from their late start in talking, and who will ultimately move on to typical functioning. The continuum also includes those children who will struggle throughout their lives with developing a linguistic system and with communicating. Distinguishing those children at the extreme ends of the continuum is not difficult; however, our understanding of the developmental components that have been affected in any particular child and the interplay between and among these components can be a challenge to disentangle.

While students of speech-language pathology traditionally begin their study of language development with an exploration of the nature–nurture debate, for many of the children they will work with, there is little debate. Most often, the parents we meet have provided the "good enough" input that we assume is needed to

activate language learning. Given this fact, we turn to the possibility that this child has come to the world with some disruptions in the biological endowments that lead to talking.

As an example, one of the authors of this chapter saw an 18-month-old child who had many developmental concerns. Timmy was experiencing delays in the following areas:

- Motor development, including difficulty standing, walking, and holding his body upright when sitting
- Emotional development, including a restricted range of affect and few reciprocal interactions
- Language development, including no single words, few sounds, and questionable comprehension
- Social-communication development, including few intentions expressed and minimal responsiveness to others
- Play development, including a limited range of interests in toys and objects

In Timmy's case, the absence of words was merely one of a rather complex composite of developmental derailments. Naturally, the questions Timmy's parents asked were the logical ones: Why wasn't he talking? How could they help him begin to talk? What would Timmy be like when he was 5?

For those of us interested in helping children and parents experience the joys of shared communication, we begin our assessment and subsequently develop an intervention plan by trying to discover what separates the talking child from the nontalking child or, in some cases, the communicating child from the noncommunicating child. As we observe the child's interactions, we typically pose a first set of global diagnostic questions that will help us understand the underpinnings of the child's delay:

- Does the child have the sensory abilities to learn language?
- Does the child have the motor coordination skills needed to produce speech?
- Does the child have the range of ideas and knowledge that serve as the foundations for language?
- Does the child have the social interactive and affective capacities that lead to language?

If the answer to certain questions is "no"—for example, "She doesn't hear well enough to learn language"—we can begin the intervention process by providing the child with what she needs (e.g., hearing aids or a cochlear implant) and be confident that this is an appropriate starting point for accelerating the child's process of language learning. When the challenges are more pervasive—for example, limited social-affective capacities—the intervention process becomes less clearly defined. Nonetheless, our starting point for any child is our understanding of her developmental needs and the formulation of an initial program, which will require time and collaboration on the part of the child's educators, therapists, and, to a great extent, her parents.

Although some children we see will have identified biological, neurological, or sensory deficits, Timmy did not. His hearing was within normal limits, his neurological evaluation was unremarkable, and his genetic testing was negative. The possibility that his difficulties had biological underpinnings was inferred from the developmental derailments described previously and the absence of any environmental explanations for his delays.

How can a "student" of speech-language pathology embrace the most current thinking about language development and, at the same time, benefit from the long history of contributions made to our understanding of language acquisition and the influences of these contributions on the field of speech-language pathology? More specifically, how will we determine how to work and play with Timmy and what to encourage as a sound and scientific approach to facilitating his linguistic and communication development?

At this point, we should remind ourselves of the diversity in individual profiles of the children we have seen or will see over our careers. Although the authors of this chapter have seen many children with autism, language impairment, cognitive delays, and language-learning disabilities in their more than 35 years (each!) as speech-language pathologists, they would definitely say they have never seen the same child twice.

This diversity in and of itself gives us a first clue to answering the question, "How do I know when to use which theory or model of language?" "It depends" would have to be the honest and informed answer.

Understanding that each child's profile of strengths and challenges is a natural result of his biology and experience and the interplay between the two suggests that the possibilities are endless relative to the areas of development in which to support, enhance, facilitate, or teach. Perhaps for one child, the inability to learn the linguistic rules of the language will be the roadblock to further language learning; in such a case, understanding and addressing the perceptual, psycholinguistic, and pragmatic aspects of rule learning will be the charge to his speech-language pathologist. For another child, whose

ideas about the world seem to be standing in the way of his development of greater comprehension and production of language, the notions of the child as an active learner of the sensorimotor, symbolic, and ideational underpinnings of language should be reviewed. For a third child, whose social–emotional affective development is derailed, emphasizing caretaker–child interactions, shared attention, reciprocity, and co-construction of meaning would be an excellent starting point.

In the end, what would we advise the new or seasoned speech-language pathologist relative to the question of theories of language acquisition? For sure, each theory has some relevance to the larger puzzle of determining how it is that typically developing children come to comprehend and produce novel utterances with social savvy and an understanding of the interpersonal customs and constraints of their language. Given that reality, plus the fact that no one really knows why a particular child is having difficulty with language and communication, wise speech-language pathologists will keep their eyes and ears open and consider this topic to be a work in progress. Interestingly enough, although speech-language pathologists often think about borrowing from what is known about children who are typically developing, clinical findings about children with challenges in language acquisition and the paths to their progress will inform theories and models of language as well.

For Timmy, considering the range of delays and disruptions that he was experiencing, the speech-language pathologist would do best to encourage his parents to provide support in all aspects of development that relate to language and to find the kind of intervention that speaks to a cohesive, interdisciplinary, broad view of the factors that influence the ability to learn a linguistic system and the pleasures of communication. In fact, this is just what Timmy's parents did. For this child, the result was a very good one: Timmy progressed in his comprehension and production of language, his affective engagement and reciprocity, his social interaction, and his development of ideas. This comprehensive approach fit well with the parents' own philosophy of how to help their son, an aspect of intervention that should not be minimized. Today, Timmy is a 3-year-old with lots to say and a growing sense of the joys of interacting. But should he meet additional challenges along the way, his speech-language pathologist would do well to go back to the theories of language acquisition and look yet again for clues to the nuances and mysteries of development and disorder.

KEY TERMS

Empiricist theories
Intentionality model
Interactionist perspective
Language acquisition theories
Language assessment
Language intervention
Nature perspective
Nurture perspective
Rationalist theories

STUDY QUESTIONS

- How does the traditional nature–nurture debate relate to the study of language acquisition?
- Describe how empiricist theories have influenced the field of speech-language pathology.
- Describe how nativistic theories have influenced the field of speech-language pathology.
- Describe how interactionist theories have influenced the field of speech-language pathology.
- Describe the components of Bloom and Tinker's (2001) intentionality model.
- With reference to a particular child, describe how this discussion of specific theories would affect your approach to assessment and/or intervention.

REFERENCES

Akhtar, N., Dunham, F., & Dunham, P. (1991). Directive interactions and early vocabulary development: The role of joint attentional focus. *Journal of Child Language, 18*(1), 41–49.

Austin, J. (1962). *How to do things with words.* London: Oxford University Press.

Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill Palmer Quarterly, 21*(3), 205–216.

Bates, E., & MacWhinney, B. (1987). Competition, variation, and language learning. In B. MacWhinney (Ed.), *Mechanisms of language acquisition* (pp. 157–194). Hillsdale, NJ: Erlbaum.

Berko-Gleason, J. (2005). *The development of language*. Boston: Pearson Education.

Bloom, L. (1970). *Language development: Form and function in emerging grammars.* Cambridge, MA: MIT Press.

Bloom, L., & Lahey, M. (1978). *Language development and language disorders.* New York: John Wiley & Sons.

Bloom, L., Rocissano, L., & Hood, L. (1976). Adult–child discourse: Developmental intervention between information processing and linguistic knowledge. *Cognitive Psychology, 8,* 521–552.

Bloom, L., & Tinker, E. (2001). The intentionality model and language acquisition. *Monographs of the Society for Research in Child Development*, *66*(4), 267.

Bloom, P. (2000). *How children learn the meaning of words*. Cambridge, MA: MIT Press.

Bohannon, J. N. III, & Bonvillian, J. D. (2005). Theoretical approaches to language acquisition. In J. Berko Gleason (Ed.), *The development of language* (pp. 230–291). Boston: Pearson Education.

Braine, M. D. S. (1966). Learning the positions of words relative to a marker element. *Journal of Experimental Psychology, 72*(4)*,* 532–540.

Brice-Heath, S. (1983). *Ways with words.* Cambridge, UK: Cambridge University Press.

Brown, R. (1973). *A first language: The early stages*. Cambridge, MA: Harvard University Press.

Bruner, J. (1975). The ontogenesis of speech acts. *Journal of Child Language, 2*(1)*,* 1–19.

Bruner, J. (1977). Early social interaction and language acquisition. In R. Schaffer (Ed.), *Studies in mother–infant interaction* (pp. 271–289). New York: Academic Press.

Cairns, C., & Cairns, H. (1975). *Psycholinguistics: A cognitive view of language.* New York: Holt, Rinehart & Winston.

Catts, H., & Kamhi, A. (2005). *Language and reading disabilities*. Boston: Pearson Education.

Chomsky, N. (1957). *Syntactic structures*. The Hague: Mouton.

Chomsky, N. (1965). *Aspects of a theory of syntax*: Cambridge, MA: MIT Press.

Chomsky, N. (1972). *Studies on semantics in generative grammar.* The Hague: Mouton.

Chomsky, N. (1982). *Lectures on government and binding.* New York: Foris.

Chomsky, N. (1988). *Language and the problems of knowledge*. Cambridge, MA: MIT Press.

Clark, E. (1973). What's in a word? On the child's acquisition of semantics in his first language. In T. E. Moore (Ed.), *Cognitive development and the acquisition of language* (pp. 65–110). New York: Academic Press.

Cruickshank, W. M. (1967). *The brain-injured child in home, school, and society.* New York: Syracuse University Press.

Curtiss, S. (1974). *Genie: A psycholinguistic study of a modern day "wild" child*. New York: Academic Press.

Dore, J. (1974). A pragmatic description of early language development. *Journal of Psycholinguistic Research, 4,* 343–350.

Dore, J. (1975). Holophrases, speech acts, and language universals. *Journal of Child Language, 2*(1)*,* 21–40.

Eimas, P., Siqueland, E., Jusczyk, P., & Vigorito, J. (1971). Speech perception in infants. *Science, 171,* 303–306.

Fillmore, C. (1968). The case for case. In E. Bach & R. Harmas (Eds.), *Universals in linguistic theory* (pp. 1–90). New York: Holt, Rinehart, & Winston.

Flavell, J. H. (1963). *The developmental psychology of Jean Piaget*. New York: D. Van Nostrand Co.

Fodor, J., & Pylyshyn, Z. (1988). Connectionism and cognitive architecture: A critical analysis. *Cognition, 28,* 3–71.

Gerber, S. (in press). A contemporary model of assessment and intervention: The integration of developmental language models and the Developmental Individual Difference Relationship Based approach. In P. Prelock & R. Mac McCauley (Eds.), *Treatment of autism spectrum disorders: Evidence-based intervention strategies for communication and social interaction*. Baltimore, MD: Brookes Publishing.

Gerber, S. (2003). A developmental perspective on language assessment and intervention for children on the autistic spectrum. *Topics in Language Disorders*, *23*(*2)*, 74–95.

Gillam, R. B., Loeb, D. F., Hoffman, L. M., Bohman, T., Champlin, C. A.,Thibodeau, L., Widen, J., Brandel, J., Friel-Patti, S. (2008). The efficacy of Fast ForWord language intervention in school-age children with language impairment: A randomized controlled trial. *Journal of Speech, Language, and Hearing Research*, *51*, 97–119.

Goldin-Meadow, S. (2007). Pointing sets the stage for learning language—and creating. *Child Development, 78*(3), 741–745.

Golinkoff, R. M., & Hirsh-Pasek, K. (2000). *How babies talk.* New York: Plume.

Gray, B. B., & Ryan, B. (1973). *A language training program for the non-language child.* Champaign, IL: Research Press.

Greenfield, P., & Smith, J. (1976). *The structure of communication in early language development.* New York: Academic Press.

Greenspan, S., Wieder, S., & Simons, R. (1998). *The child with special needs: Encouraging intellectual and emotional growth*. Reading, MA: Addison Wesley Longman.

Halliday, M. A. K. (1975). *Learning how to mean: Explorations in the development of language*. London: Edward Arnold.

Hammill, D., Mather, N., & Roberts, R. (2001). *Illinois Test of Psycholinguistic Abilities* (3rd ed.). Austin, TX: Pro-Ed.

Hulit, L. M., & Howard, M. R. (2002). *Born to talk* (3rd ed.). Boston: Pearson Education.

Johnson, D. J., & Mykelbust, J. R. (1967). *Learning disabilities: Educational principles and practices.* New York: Grune & Stratton.

Johnston, J. (1994). Cognitive abilities of children with language impairment. In R. Watkins & M. Rice (Eds.), *Specific language impairments in children* (vol. 4, pp. 107–121). Baltimore: Paul H. Brookes.

Klein, H., & Moses, N. (1999). *Intervention planning for children with communication disorders.* Boston: Allyn & Bacon.

Koegel, R., & Koegel, L. (2006). *Pivotal response treatments for autism.* Baltimore: Paul H. Brookes.

Kuhl, P. K. (2004). Early language acquisition: Cracking the speech code. *Neuroscience*, *5*(11), 831–843.

Lahey, M. (1988). *Language disorders and language development.* New York: Macmillan.

Lenneberg, E. (1967). *Biological foundations of language.* New York: Wiley.

Leonard, L., & Loeb, D. (1988). Government-Binding Theory and some of its implications: A tutorial. *Journal of Speech and Hearing Research, 31,* 515–524.

Locke, J. (1960/1690). An essay concerning human understanding. In Staff of Columbia College (Ed.), *Introduction to contemporary civilization in the West* (pp. 1010–1069). New York: Columbia University Press.

Longtin, S., & Gerber, S. (2008). Contemporary perspectives on facilitating language acquisition for children on the autistic spectrum: Engaging the parent and the child. *The Journal of Developmental Processes*, *3*(1), 38–51.

Lovaas, O. I. (1977). *The autistic child: Language development through behavior modification.* New York: Irvington.

Lund, N. J., & Duchan, J. F. (1993). *Assessing children's language in naturalistic contexts* (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Lust, B. (2007). *Child language: Acquisition and growth*. Cambridge: Cambridge University Press.

MacWhinney, B. (1987). *Mechanisms of language acquisition*. Hillsdale, NJ: Erlbaum.

McNeil, D. (1970). *The acquisition of language: The study of developmental linguistics.* New York: Harper & Row.

National Research Council & Institute of Medicine. (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press.

Nelson, N. (1998). *Childhood language disorders in context: Infancy through adolescence* (2nd ed.). Boston: Pearson Education.

Osgood, C. (1963). On understanding and creating sentences. *American Psychologist, 18,* 735–751.

Pavlov, I. P. (1902). *The work of the digestive glands.* Trans. W. H. Thompson. London: Charles Griffin.

Pepper, J., & Weitzman, E. (2004). *It takes two to talk: A practical guide for parents of children with language delays* (3rd ed.). Toronto: The Hanen Center.

Phillips, J. R. (1973). Syntax and vocabulary of mothers' speech to young children: Age and sex comparisons. *Child Development*, *44*, 182–185.

Piaget, J. (1952). *Origins of intelligence in children*. New York: International University Press.

Piaget, J. (1955). *The language and thought of the child*. Translated by M. Gabain. Cleveland, OH: Meridian.

Pinker, S. (1984). *Language, learnability, and language development*. Cambridge, MA: Harvard University Press.

Pinker, S. (2006). The blank slate. *General Psychologist, 41*(1), 1–8.

Pinker, S., & Jackendoff, R. (2005). The faculty of language: What's special about it? *Cognition, 95*(2), 201–236.

Premack, D. G., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*(4), 515–526.

Prizant, B., & Duchan, J. (1981). The functions of immediate echolalia in autistic children. *Journal of Speech and Hearing Disorders, 46,* 241–250.

Prutting, C., & Kirchner, D. (1987). A clinical appraisal of the pragmatic aspects of language. *Journal of Speech and Hearing Disorders, 52,* 105–119.

Rice, M. L., Wexler, K., & Cleave, P. (1995). Specific language impairment as a period of extended optional infinitive. *Journal of Speech and Hearing Research*, *38*, 850–863.

Saffran, J. R., Senghas, A., & Trueswell, J. C. (2001). The acquisition of language by children. *Proceedings of the National Academy of Sciences, 98*(23), 12874–12875.

Sakai, K. L. (2005). Language acquisition and brain development. *Science, 310,* 815–819.

Saxton, M., Galloway, C., & Backley, P. (1999). *Negative evidence and negative feedback: Longer term effects on the grammaticality of child speech.* Paper presented at the VIIIth International Congress for the Study of Child Language, San Sebastian, Spain.

Sampson, G. (1987). Review of *Parallel distributed processing: Explorations in the microstructure of cognition, vol. 1: Foundations,* by D. Rummelhart, J. McClelland, and PDP Research Group. *Language, 63,* 871–886.

Schlesinger, I. M. (1977). *Production and comprehension of utterances*. Hillsdale, NJ: Lawrence Erlbaum.

Searle, J. R. (1969). *Speech acts*. Cambridge, UK: Cambridge University Press.

Siegel, D. (1999). *The developing mind: How relationships and the brain interact to shape who we are*. New York: Guilford Press.

Seiger-Gardner, L. (2010). Children with language impairment. In B. Shulman & N. Capone (Eds.), *Language development: Foundations, processes, and clinical applications* (pp. 379–406). Boston: Jones & Bartlett Learning.

Skinner, B. F. (1957). *Verbal behavior*. Upper Saddle River, NJ: Prentice Hall.

Slobin, D. (1979). *Psycholinguistics* (2nd ed.). Glenview, IL: Scott Foresman.

Slobin, D., & Bever, T. (1982). Children use canonical sentence schemas: A crosslinguistic study of word order and inflections. *Cognition, 12*(3), 229–265.

Snow, C. (1973). Mother's speech to children learning language. *Child Development, 43,* 549–565.

Snow, C. (1978). The conversational context of language acquisition. In R. Campbell & P. Smith (Eds.), *Recent advances in the psychology of language* (vol. 4a, pp. 253–269). New York: Plenum Press.

Snow, C. (1999). Social perspectives on the emergence of language. In B. MacWhinney (Ed.), *The emergence of language* (pp. 257–276). Mahwah, NJ: Erlbaum.

Sussman, F. (1999). *More than words: Helping parents promote communication and social skills in children with autism spectrum disorders*. Toronto: The Hanen Center.

Thiessen, E. D., Hill, E. A., & Saffran, J. R. (2005). Infant-directed speech facilitates word segmentation. *Infancy*, *7*(1), 53–71.

Tomasello, M. (1988). The role of joint attentional processes in early language development. *Language Sciences*, *10,* 69–88.

Tomasello, M. (2003). *Constructing a language: A usage based theory of language acquisition.* Cambridge, MA: Harvard University Press.

Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development, 78*(3), 705–722.

Trehub, S. (1976). The discrimination of foreign speech contrasts by infants and children. *Child Development, 47,* 466–472.

Vouloumanos, A., & Werker, J. F. (2007). Listening to language at birth: Evidence for a bias for speech in neonates. *Developmental Sciences, 10*(2), 159–171.

Vygotsky, L. S. (1986). *Thought and language.* Trans. A. Kozulin. Cambridge, MA: MIT Press.

Warren, S. F., & Kaiser, A. P. (1986). Incidental language teaching: A critical review. *Journal of Speech and Hearing Disorders*, *51*(4), 291–299.

Werker, J. F., & Tees, R. C. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant Behavior and Development, 7,* 49–64.

Westby, C. (1980). Assessment of cognitive and language abilities through play. *Language, Speech and Hearing Services in the Schools, 11*(3), 154–168.

Westby, C. (2000). A scale for assessing development of children's play. In K. Gitlin-Weiner, A. Sandgun, & C. Schaefer (Eds.), *Play diagnosis and assessment* (pp. 15–27*).* New York: Wiley.

Wetherby, A., Woods, J., Allen, L., Cleary, J., Dickenson, H., & Lord, C. (2004). Early indicators of autism spectrum disorders in the second year of life. *Journal of Autism and Developmental Disorders*, *34*(5), 473–493.

Wexler, K. (1999). Maturation and growth of grammar. In W. Ritchie & T. Bhatia (Eds.), *Handbook of child language acquisition* (pp. 55–110). New York: Academic Press.