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Interrelationship of Language and Cognitive Development (Overview)

For decades, researchers have debated and investigated the relationship between language and cognitive development, especially in infancy and early childhood. Modular perspectives posit that language development is controlled by specialized mechanisms, much like the olfactory system evolved to detect, learn, and process airborne particles. In this perspective, language learning might be quite independent of other cognitive abilities. By contrast, constructivist and biologically based perspectives tend to emphasize the progressive, experience-dependent emergence of complex skills, including language. These theories postulate that domain-general cognitive capacities and processes are recruited to develop language. The frameworks make distinct predictions: Modular theories expect language-specific learning processes and products. Constructivist and neuroconstructivist approaches expect language-learning processes and products to show deep commonalities with nonlinguistic learning.

A profound challenge in adjudicating between these views is that many capacities and skills change with age: Perceptual sensitivities change with practice, everyday experiences provide a ballooning data set for inductive inference and pattern detection, and incremental practice leads to improvement of all sorts of actions and cognitive skills. Another challenge is that methods and instruments for measuring linguistic and nonlinguistic cognitive skills are completely different between infancy and early childhood and also between early childhood and late childhood and adolescence. Thus, behavioral data cannot easily be compared across ages. Nevertheless, there is ample evidence of robust relations between language abilities and cognitive development, dating from the earliest research on child language in the 1970s.

A distinct but complementary question has been addressed for over a century by anthropologists, psychologists, and educators: How does language affect cognition? How, for example, does language processing facilitate attention, learning, memory, and reasoning?

Both questions raise an ancillary question about whether specific cognitive or learning abilities evolved on the coattails of language evolution or whether language emerged as a coevolutionary by-product of hominin cognitive capacities and social structures. The former implies that some general cognitive abilities, such as music, are evolutionarily subordinate to language ability. The latter suggests that language, music, mathematics, and writing systems are diverse products of a set of cognitive and sociocultural traits common to humans. However, this question is a subject of speculation and not amenable to direct investigation.

The following sections review, first, how cognitive capacities relate to language development (broadly construed) and, second, how language development supports learning and cognition.

Theoretical and Historical Trend

Linguistics from the 1950s to the 1980s mostly followed Noam Chomsky's assertion that language is a specialized or modular faculty. This hegemony, though still represented by some child-language researchers, has gradually yielded to evidence that language processing is cognitive processing of language information and that language learning is continuous with learning of other sorts of information, such as gestures or sound patterns. There remains considerable debate about what sorts of processes might be specialized for language and how. Cases of children showing early sensitivity to nonobvious syntactic or phonological constraints, with no apparent nonlinguistic parallel, support the idea of specialization. However, in these cases it is possible that, even if one cannot readily identify nonlinguistic analogues of the constraint, children could equally well learn invented, logically equivalent, nonlinguistic patterns. This possibility is seldom tested, however.

Modeling studies have, in recent decades, provided increasing evidence that linguistic patterns and principles are learnable by cognitive agents that are imbued with only general learning mechanisms. Numerous studies have investigated whether simple artificial systems, ranging from simple neural networks to embodied robots, can acquire simulated, simplified systems of quasi-linguistic symbols. The learning mechanisms in these studies represent a variety of approaches including machine learning,

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simple Hebbian learning, recurrent networks, genetic algorithms, Bayesian and other probability-based algorithms, reinforcement learning models, Hidden Markov models, and others. These studies have contributed to a growing consensus that biologically inspired learning systems can, from limited experience, induce the abstract patterns in language. Such work challenges the traditional hegemony of linguistic modularity. However, any simulation must be evaluated in terms of (1) the assumptions manifested in the model, (2) the structure of the quasi-linguistic input corpus, and (3) the biological and psychological plausibility of the learning process. Often, these factors limit the conclusions that can be drawn from the results. Nevertheless, some studies have provided provocative proof of possibility—that is, results indicating that a simple, unspecialized, unsupervised system can readily acquire patterns once believed by linguists to be unlearnable without specialized linguistic constraints.

Neural Specialization for Language Learning?

There are expanding efforts to explore how neural resources might become specialized or dedicated to language processing. For example, it was initially suggested from electroencephalographic (EEG) evidence that 1-year-olds' brains had not yet undergone cortical regionalization (i.e., specialization of certain areas) for word knowledge. Most adults show reliable, maximal processing of words by parts of the left inferior frontal and superior anterior temporal cortex. Early studies of 1-year-olds suggested that hearing words activated widely distributed, bilateral areas of cortex. However, methods at that time did not permit good localization of cortical activity sources from EEG data. A more recent study using magnetoencephalography (MEG) revealed left fronto-temporal cortical specialization for word processing as early as 14 months. This suggests that whatever processes cause cortical specialization for word processing begin by an infant's first birthday. This does not explain how regional specialization emerges. However, the cortex in this region is not congenitally (i.e., at birth) specialized for word learning: Infants who lose this region of cortex to perinatal (i.e., around birth) stroke can eventually develop largely normal language, suggesting that other cortical tissue is plastic enough to take over word-learning and word-retrieval functions.

Adults show cortical specialization for a broader range of language. For example, left inferior parietal cortex plays an important role in generating semantically appropriate speech, and some right-hemisphere regions are important for processing pragmatic information. However, perinatal stroke studies also show that these language abilities can become functionally allocated to atypical cortical areas. Thus, there is some pluripotentiality of cortical tissue for language functions, suggesting that developmental learning processes, not a priori properties of the infant brain, yield cerebral organization of language faculties.

How Language Development Relies on Cognitive Development: Congenital Specificity of Speech–Sound Processing?

It has been hypothesized that human audition is evolutionarily adapted for language. In fact, neonates discriminate changes in human speech sounds. However, neonates also discriminate differences in the pitch, amplitude, and timing of nonspeech sounds. These acoustic features are important in phoneme discrimination. It is unclear whether infants are more sensitive to these features in speech sounds than nonspeech sounds. It is true that young infants prefer listening to human speech than to nonspeech sounds matched for some basic acoustic properties. The basis of this preference is unknown, but it might rest partly on prenatal exposure to maternal speech, despite the acoustic filtering of speech through the uterine aqueous environment. Notably, prenatal auditory learning is not limited to speech; there is some limited evidence that neonates respond differently to nonvocal music heard repeatedly during pregnancy than to novel music. Thus, there is no compelling evidence that infants' earliest auditory responses are specifically adapted to speech stimuli.

Early Learning of Speech Patterns

By midway through the first year, infants are sensitive to a variety of native-language speech patterns. These include native phonemes (consonants and vowels), sequences of phonemes, patterns of word stress, and prosodic markers of speech boundaries. For example, Thai-learning infants divide bilabial stop consonants into three phoneme categories based on continuous differences in voice onset time (VOT), that is, the time from vocal fold vibration to exhalation). English-learning infants, by contrast, divide the VOT continuum into two categories (/b/ and /p/). Also, German-learning infants expect words to have a primary (i.e., trochaic) stress pattern rather than a secondary (iambic) pattern; French-learning infants do not have the same expectation. Infants learn many such experience-driven distinctions within the first year.

The mechanisms by which infants learn these distinctions are not well understood. However, there is some evidence that those mechanisms are not exclusively used for language learning. For example, although infants can rapidly learn that some phoneme sequences are more likely than others, they can also learn that some tone sequences (i.e., two-note melodic motifs) or sequences of colored shapes are more common than others. Also, chinchillas (desert rodents with unimpressive linguistic abilities) are, like humans, sensitive to phonemic differences based on VOT. Thus, language ability is not necessary for phoneme discrimination.

Auditory Temporal Acuity

Other studies have asked whether individual differences in audition, such as the ability to perceive small changes in sounds, might contribute to individual differences in language learning. This question is relevant because some theorists had speculated that language impairment disorders are due to genetic abnormalities of a specialized language-learning module. However, many children and adults with language delays and reading disabilities show a lower-level auditory processing problem: specifically, hearing fast sound changes. Even infants who have a relative with language impairment show reduced sensitivity to fast tone changes. Possibly their auditory systems cannot update pitch information quickly enough to assimilate the fast-changing sound patterns in normal speech. More recent studies show differences in cortical responses to simple sounds in typical versus language-impaired children and in infants with or without a language-impaired relative. The differences occur in brain responses to sounds that are processed even when we are inattentive. Although the results are complex, they point to individual differences in efficiency of sound processing within the primary or secondary auditory cortex. At one extreme, these individual differences predispose children to language impairment.

There is other evidence that efficiency (i.e., speed) of auditory processing is critical for normal language development. For example, both children and adult second-language learners have more difficulty understanding sped-up speech, and adults who learned a second language later in life show slower neural unexpectedness responses than adults who learned the language earlier in response to hearing grammatical errors. This suggests that language processing becomes faster with practice, even in childhood and adolescence. Studies of linguistic plasticity further support the processing-speed hypothesis. Several studies have trained adolescents and adults with reading or language disabilities to perceive basic speech sound distinctions. It is not obvious that phoneme discrimination training should improve a complex language process such as reading. Nevertheless, the results suggest that phoneme discrimination-speed training improves reading scores more than traditional reading interventions used in schools. Pre- and post-studies of brain activity suggest that the former training causes persistent changes in brain metabolism in regions most activated during reading and other language-related processes. This shows that experience-driven plasticity for language learning persists into adulthood, and neural bases of auditory language processing are not fixed.

In sum, although there are limited studies of the neural bases of language specialization, existing data suggest that cortical specialization begins within the first 14 months. This suggests that specialization for language processing follows similar processes and is similar to specialization for other kinds of skills and information (e.g., reading or math, which obviously depend on specific experience). Also, individual differences in auditory processing speed predict language development. This suggests that speed of processing low-level acoustic information is critical not only for speech perception, but also for the gradual emergence of higher-level language comprehension, and that phonological processing is plastic and trainable even in adults.

These conclusions indicate a relation of language and cognition. Notably because processing speed is a significant factor in many nonlinguistic tasks, and because individual differences in processing speed correlate across a wide variety of tasks (linguistic and nonlinguistic), general neural properties that contribute to general processing speed differences will influence the development of both linguistic and nonlinguistic skills.

Working Memory in Language Learning and Processing

Once children are old enough to form and process utterances (usually 18 to 30 months), limitations on working memory will affect comprehension, production, and learning. In preschool and school-aged children, verbal working memory predicts word learning and reading comprehension. Interpretation of this correlation is difficult, however. Verbal working memory seems to be a specialized resource for language processing, as proposed by Alan Baddeley. However, there is some evidence that working memory for musical sequences and for nonnative speech correlates with language abilities including word learning. Interestingly, musical sequence processing by children activates overlapping brain regions and elicits similar EEG phenomena as some language processing tasks. However, there are few studies of how learning and memory for linguistic sequences is distinct from learning and memory of nonlinguistic sequences. In sum, there is some relation between working memory resources and language abilities, including language learning, but the nature of the relation is not well specified.

Cognitive Control for Language Learning

There has been recent interest in how language development relates to cognitive control or executive functions, including inhibitory control, selective and strategic attention, cognitive flexibility or switching the mental set, and working memory control and coherence. These processes are critical for problem solving, planning, and reasoning. However, their role in language processing, for example, understanding and producing discourse, was until recently unexplored. Although several findings suggest relations between executive functions and developing language skills, the data are not cohesive. A pervasive but seldom acknowledged problem is that most executive function tasks recruit language skills. Those skills include word and sentence comprehension, pragmatics, and discourse processing, and sometimes knowledge of written symbols. Few studies have adequately controlled for the language-processing demands of executive function tasks. Another problem is that the executive functions themselves are poorly defined or measured in unspecified ways across tests.

Despite these problems, there are suggestive lines of evidence. One suggests that children's flexibility in switching between tasks depends on their ability to represent and update changing task cues or instructions. In task-switching tests, participants must attend to and understand alternating cues or commands to switch from one response criterion to another opposing criterion (e.g., from sorting cards based on shape to sorting based on colors when these properties call for opposing responses). Some researchers have suggested that young children's difficulties with task-switching tasks (e.g., switching errors) are due to their difficulty inhibiting prior responses. Others have suggested that their difficulties relate to an inability to represent multiple nested rules. However, growing evidence indicates that cue-processing demands, including working memory for the current cue, comprehension of the cue, and speed of cue processing all predict children's performance on task-switching tests.

Several other studies have not found strong relations between executive functions and language processes. For example, many studies assess children's inhibitory processes with alternate-naming tasks, wherein children must reverse naming associations (e.g., say *day* when shown a sun picture or *night* when shown a moon picture). Although these tasks are convenient and they elicit age differences, there is no evidence that the results relate to receptive language ability or, indeed, that they relate robustly to other tests of executive functions. Thus, inhibition of lexical associations is not a clear predictor of other language or cognitive skills. In sum, although there is abundant circumstantial evidence of relations between cognitive control and language development, there is not yet a coherent pattern of evidence or comprehensive theoretical account.

Issues of Interpretation

A general limitation of the aforementioned evidence is that much of it is correlational. The problem is that, in psychological research, good things go together: Positive traits or outcomes are usually correlated. For example, although verbal IQ (vIQ) subscale scores are more strongly correlated with each other than with performance IQ (pIQ) subscales, vIQ and pIQ scores are nevertheless moderately correlated in children as well as adults. There is also evidence that processing speed in infants—even visual processing speed—predicts later language development. Such evidence calls to mind the historical idea of *g*, a single global factor of intelligence. Whether or not that concept is valid, it is nevertheless the case that a small number of cognitive variables might explain some variability in a wide array of language skills as well as executive function and other cognitive tasks.

Specialized Word-Learning Processes

A contentious question is whether children have specialized word-learning biases. There were claims in the 1980s and 1990s that children and even infants do have such biases. These claims were buttressed by findings that suggested that young children learn words significantly faster than other kinds of information. However, more recent evidence has eroded that idea. Children from 1 to 4 years of age learn novel spoken words from very few exposures, but they also learn novel gestures, melodic patterns, facts, and pictograms from few exposures. In a recent study, children age 3 to 5 years learned words not faster but actually slower than facts and pictorial symbols, partly, it seems, because they require several repetitions to form a representation of novel phonological strings (lexemes). Moreover, children did not apply biases in inferring meaning—so-called taxonomic and mutual exclusivity biases—more to novel words than to sentences or pictograms.

Another set of studies in the 1990s suggested that words selectively draw infants' attention to objects or categories of objects or that infants preferentially expect words to refer to categories. However, subsequent studies showed that stimuli such as melodic tones similarly draw infants' attention and that children readily generalize facts and pictorial symbols, as well as words, to novel categories.

Finally, much attention has been paid to infants' ability to utilize social contextual cues to facilitate word learning. However, infants utilize the same cues to learn and interpret nonverbal events. For example, infants, by 18 months, assume that whatever an adult was looking at when he or she said a word is the referent of that word. This suggests that 1-year-olds are learning about the social context of people's language use. However, infants also use adults' gaze direction to redirect their own attention, to form emotional associations with objects, and to learn how to use objects. Thus, infants use these social cues for a variety of functions, suggesting a general kind of utilitarian cue-learning function (e.g., learning to attend to whatever social events are useful). In sum, it is unclear what, if any, learning processes are specialized for word learning.

Conceptual Knowledge and Language Growth

A clear connection between cognition and language is the accrual of words related to new conceptual knowledge. In some studies, vocabulary is actually used as a measure of content knowledge in a given domain. In studies of children acquiring expert knowledge, learning domain-specific words (e.g., names for types of birds) has been both a measure of expertise and part of what is learned. In children and adults, expertise within a domain typically entails learning finer-grained distinctions, suggesting that word learning will focus on subordinate labels and rare words or words for atypical categories.

Very little is known about how conceptual knowledge relates to accuracy and richness of word meanings. An old debate concerned toddlers' over-extension of labels (e.g., calling all men *daddy*). One theory is that this was due to conceptual blurring—that is, not distinguishing between subtypes (e.g., different men). Although toddlers probably do not subdivide highly similar and less-familiar subtypes (e.g., squirrels and gophers or falcons and hawks), it is unlikely that over-extension is mostly due to conceptual limitations. Some over-extension errors are apparently due to pragmatics: Because toddlers' productive vocabulary is so limited, they may use some word they can produce that has a similar meaning to whatever they wish to label. It is unlikely that a toddler who calls unfamiliar men *daddy* cannot discriminate her father from other men. Thus, over-extension does not necessarily indicate conceptual blurring. Less clear is whether some words are learned before others simply because some concepts are easier to understand than others. There are arguments that various kinds of words, like color words, number words, or verbs in general, are learned later because they offer some general conceptual or perceptual difficulty in acquiring the related concept. At some level, this point is trivial: For example, *sum* is easier to understand than *second derivative,* and more people comprehend the former than the latter. In young children, however, these differences might be more pervasive and less obvious. For example, children know few superordinate words (*vehicle, action,* and *shape*). Superordinate words might be harder to learn because they are so abstract. Yet, superordinate words also are fairly infrequent in the words children hear, so it is not clear that the late acquisition of superordinate words is strictly due to children's conceptual difficulty with abstractness. Moreover, some words that arguably could be very confusing indeed, like deictic pronouns (*you, me, this,* and *that*), are used correctly by 2-year-olds. Thus, it is not clear that conceptual difficulty determines when children learn a word.

How Language Development Facilitates Cognition: Does the Lexicon Structure Perception?

A centuries-old question is how language influences perception of the world. The hypothesis that our perceptions are indelibly shaped by our language, historically associated with the linguists Edward Sapir and Benjamin Lee Whorf, has been a topic of renewed interest among cognitive linguists. Developmental studies have most vigorously investigated this question with respect to spatial predicates. These words vary across languages: for example, in situations where English speakers would use *on* (e.g., __ *a table*, __ *your finger*, __ *your head*, and *hanging* __ *the wall*), Korean, Dutch, or Mandarin speakers would use different words. Other languages use the same predicate for relations that English divides into *on* or *in*. Does the division of spatial relations by predicates affect how children come to perceive those relations? Studies suggest that, well before they are fluent, infants and toddlers tend to generalize (i.e., perceive as similar) spatial relations based on the spatial predicate assignments in their native language. For example, Korean-learning toddlers begin to notice differences between events that English-learning children do not readily notice as these events are classified by different spatial predicates in Korean but not in English.

Aside from a handful of studies such as these, most research on how language affects perception or cognition has tested adults or, increasingly, preschool-aged children. Several studies have investigated classifiers: inflectional markings or words (often articles) that imply, often loosely, noun categories. Mandarin, for example, has classifiers for superordinate categories of animal types, artifact types, things with certain shape features, things found in different set sizes (e.g., pairs), and so on. Children learn their language's classifiers by 3 to 4 years, and researchers have investigated whether classifiers affect their perception—for example, their expectations about meanings of novel nouns following a known classifier. Results suggest that some familiar and conceptually clear classifiers might guide children's attention to category-relevant features and affect their inferences about the objects denoted by the classifier. However, it is not clear that these effects are pervasive. That is, if children have no information about a word's meaning except a classifier that commonly refers to long, thin things (e.g., the Mandarin *tiao4*), it stands to reason that children (or any rational agent) would use that cue to select a long, thin test object rather than, say, a round thing or a bag-like thing, both of which take other classifiers. However, in languages with few classifiers, like English, superordinate words might serve similar roles, though they are syntactically distinct from classifiers. For example, understanding the word *shape* might help a child learn *oval* from a sentence like *Eggs are shaped liked ovals.* In short, to the extent that children can use contextual semantic elements within networks of meaning, both classifiers and related nouns and predicates might help children acquire new words and word meanings.

Does Verb Syntax Affect Event Construals?

Any event can be described any number of ways, and verbs and their inflectional elements (e.g., tense markers) allow speakers to place a different perspective, or construal, on an event. Nevertheless, different languages have different prototypical ways to capture event information in verb phrases. For example, Spanish tends to encode the path of motion in movement verbs, whereas German and English tend to encode manner of motion in verbs (e.g., *jogging* versus *loping*) and use prepositions or other satellite morphemes to encode path. Adults are sensitive to these distinctions, although children seem to slowly learn them: For example, English- and Spanish-learning 2- or 3-year-olds do not differ much in their construal of novel verbs (i.e., generalizing path or manner). The problem does not seem to be that children cannot detect differences in path and manner of movement in events. Rather, it might be that because the languages are only probabilistically different in this regard, it takes several years for children to notice the distinction. In short, children notice various possible relations among their language patterns and various distinctions in the world, but how long it takes them to make these associations might depend on the strength or predictive regularity of the semantic relations.

Language Routines and Cultural Learning

Cognition is not an individual, solipsistic achievement but a process of distributed learning in an environment of other people, objects, and culturally structured events. Speech acts in social events reflect how interacting individuals or groups conceptualize and prioritize those objects and events. Children learn patterns of social interaction based on how language is used. For example, middle-class parents talk differently to preschool daughters and sons about past events, often framing similar events differently, for example, using more emotion-state descriptors with girls (e.g., "You felt sad about that, didn't you?"). Later, girls and boys may use emotion words differently. One interpretation is that adults' sociocultural beliefs about gender inform conversations with children and are assimilated and reflected in children's own descriptions. Language becomes a mediating medium for socializing children's construal of events and shaping their autobiographical memory. This interpretation, however, assumes that adult conversational patterns are powerful causal forces, which has not been established.

Learning Multiple Languages

There is evidence that bilingualism is associated with better performance in other cognitive abilities. Some studies have compared mono- and bilingual children on executive function tasks. When socioeconomic (SES) status is controlled, some bilingual children perform better on these tasks. One theory is that bilingual children must regularly switch between languages or rapidly activate different codes based on their interlocutor's language, and this demand accelerates the development of executive functions. Other evidence suggests that bilingual children perform better on tests of understanding other people's divergent beliefs. Perhaps bilingual children must frequently make inferences about other people's meaning or communicative intent, with the added demand of inferring what code they are using. Whatever the reason, learning multiple languages might help children master complex cognitive skills slightly earlier than same-aged peers. However, a general difficulty in interpreting these results is that, in any community, there are multiple differences between monolingual and multilingual families. These include cultural practices (e.g., educational attitudes and how children are spoken to), SES, history of experiences, and biological factors (e.g., diet, medical care, and genetic differences). Some studies control for SES, and this is important, but many other potentially important factors are left uncontrolled. Thus, the available evidence is suggestive, but it remains unclear exactly how significant and general are the cognitive benefits conferred by learning two languages.

Conclusion

A voluminous body of research points to many interrelations between language development and cognition, including others not mentioned here. Available evidence does not permit any uniform, simplistic conclusions. Every language skill that has been systematically investigated recruits general, nonlinguistic cognitive capacities and processes. There remain many achievements of childhood language, however, that have not been compared to nonlinguistic analogues. In these cases, no conclusion can be drawn. Regardless, in the last 40 years, language development research has moved steadily toward recognizing that language processing is cognition, language use is distributed cognition, and understanding children's capacity for language means understanding the development and recruitment of general learning and cognitive processes.

Gedeon O. Deák
University of California, San Diego

See Also: Associative Processes; Auditory Processing and Language Impairments; Bilingualism: Effects of Cognitive Development; Computational Models of Language Development; Domain Specificity; Event Perception and Language Development; Executive Functions and Language Development/Processing; Gender Differences in Language Development; Labeling Effects on Cognitive Development; Neonatal Speech Perception; Neural Basis of Language Development; Over-Extension and Under-Extension in Word Learning; Processing Deficits in Children With Language Impairment; Semantic Development; Spatial Cognition and Language Development; Verbal Working Memory.

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Intervention for Child Language Impairments

Child language impairment (CLI) is a term covering a diverse range of developmental impairments in childhood. The DSM-V A02 definition is that a diagnosis of language impairment is made when a child has language abilities in one or more areas that are below age expectations. Although children with neurodevelopmental disorders such as autism spectrum disorder or Williams syndrome may present with features of language impairment, these are comorbid with other developmental problems. A developmental language impairment in the absence of neurological, physiological, emotional, social, or cognitive conditions is commonly known as a specific language impairment (SLI). The term used here is *child language impairment.* This entry broadly focuses on language intervention for children with the most common characteristics of a language impairment involving grammar and morphology and reduced ability with vocabulary. The nature of intervention for CLI is diverse, varying according to theoretical perspective and the resulting purpose of and goals for the intervention. Contemporary intervention approaches tend to converge on a common set of core principles that are appropriate for young children.

Theoretical Perspectives

CLI is founded on the clinician's beliefs about language development and language learning. L. Abbeduto and D. Boudreau, as well as G. H. Poll, outline the three most widely held views of language development. These are the nativist approach, the social-interactionist approach, and the emergentist approach. Adoption of any one of these theoretical perspectives generates a particular view of the purposes, goals, and strategies of intervention. The nativist approach, advocated most strongly by Noam Chomsky, claimed that children are born with a language acquisition device that enables children to recognize the frames and constructs of languages (the principles and parameters) such that a child can identify what is common across languages and what is specific to their own language, enabling the child to establish the relevant word-order (syntactic) patterns and ways of encoding morphological markers, such as plural, tense, and possession, for their input language. The theory holds that children do not respond to variability in the input but need only a few exemplars in order to fine-tune the relevant principles and parameters. In this view, the language faculty is a domain-specific ability—the language-learning faculty is modular and not related to other cognitive abilities. The child learns the language by mapping the input vocabulary onto language rules.

Children vary in language ability because of deficits in learning the rules of language. Application of this theory to language intervention results in a focus on learning syntax, including word order and morphology. Therapy is highly structured to focus the child on recognition of correct versus incorrect syntactic constructions. The idea is that once the child has worked out the relevant parameter (e.g., the correct word order), then the target rule is generalized across the child's language system. Language learning is rule based, and therapy requires that the child learn the right rule.

The social-interactionist theory claims that language development is driven by the child's need to become an effective communicator and that language development is closely linked to other cognitive processes used in nonverbal communication, joint attention, and goal achievement. The child and significant others, such as parents, engage in shared social interactions that determine the rate and route of language development. Children vary in language ability because able language users in the child's environment vary in the learning experiences they provide for the child. Application of this theory to language intervention results in contexts in which learning is deliberately incremental. Learning can be effectively controlled by the parents' use of scaffolding, with effective scaffolding requiring that the parent is aware of the level or stage that the child is currently at in order to pitch the input language that occurs within shared activities at a level slightly higher than that used by the child. This ensures that the language environment is not too complex for the child but is sufficiently advanced to show the child how increased communicative needs can be met by increased language complexity.