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This series of 10-year updates in child and adolescent psychiatry began in July 1996. Topics are selected in consultation with the AACAP Committee on Recertification, both for the importance of new research and its clinical or developmental significance. The authors have been asked to place an asterisk before the 5 or 6 most seminal references.

M.K.D.

Language Disorders: A 10-Year Research Update Review

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ABSTRACT

Objective: To review the past 10 years of research in child language or communication disorders, which are highly prevalent in the general population and comorbid with childhood psychiatric disorders. **Method:** A literature search of 3 major databases was conducted. The child language literature, describing the domains of language development—phonology, grammar, semantics, and pragmatics—is reviewed. **Results:** Disorders of grammar, semantics, and pragmatics, but not phonology, overlap significantly with childhood psychiatric disorders. Receptive language disorders have emerged as high-risk indicators, often undiagnosed. Language disorders and delays are psychiatric risk factors and have implications for evaluation, therapy, and research. However, they are often undiagnosed in child mental health and community settings. The research has focused mostly on monolingual English-speaking children. **Conclusion:** Awareness of basic child language development, delay, and deviance is crucial for the practicing child and adolescent psychiatrist, who must diagnose and refer relevant cases for treatment and remediation. Future research needs to address the growing language diversity of our clinical populations. *J. Am. Acad. Child Adolesc. Psychiatry,* 2000, 39(2):143–152. **Key Words:** child language, language disorders/delays, specific language impairment.

Domains of Language Development

The study of language has focused on (1) its sounds, (2) the organizations within and between words, (3) the organization of concepts, and (4) language use. Each of these 4 domains—phonology, grammar, semantics, and pragmatics—has its own units and involves reception and expression, encoding and decoding, comprehension and production, and underlying competencies and manifest performances, and each is marked by a predictable, expected developmental course. Some domains particularly involve the form of language (phonology and grammar), others mostly its content (semantics) or its use (pragmatics) (Bloom and Lahey, 1978).

Language development is studied by several disciplines. While pure linguists, following the teachings of Noam Chomsky, originally focused on grammar and phonology, other authors, such as Jerome Bruner and Roger Brown, called attention to the contents (semantics) and the use (pragmatics) of language. Developmental psychologists and psycholinguists furthered the integrative studies, and research on pragmatics has recently dominated developmental studies. Chomsky's argument centered around evidence that language sound and grammar were organized according to innate rules common to all languages that were not taught (an innate Universal Grammar), while semantics and pragmatics were learned. Two decades of research support the idea of rule-governed semantics and pragmatics and attest to the powerful role of the environment (referred to as input and interaction) (Snow,

1994) in shaping outcome in all domains including phonology and grammar. All 4 domains of language (phonology, grammar, semantics, and pragmatics) are relatively dissociable and "linguisticized," i.e., governed by rules. However, they are also strongly interdependent and they mutually constrain each other, as suggested by the tight sequence in which the component elements of language emerge (Gleason, 1997; Rollins, 1994). What follows is a succinct description of each of these 4 domains.

Phonology refers to the ability to produce and discriminate the specific sounds of a given language. Its unit, the phoneme, is characterized by distinctive features. For instance, the /p/ and /b/ phonemes are distinguished by the "voiced" quality of /b/, i.e., vocal cord vibration that ensues after the initial sound versus the lack of vibration in /p/. Babies start discriminating phonemes during the first few months of life, and they produce them soon after. Phonological receptivity is pluripotential at birth, but it starts to decay at around 10 months, reaching a rather general inability to acquire native phonology by preadolescence (Jackendoff, 1994; Stoel-Gammon and Menn, 1997). Stress and prosody, also aspects of phonology, may determine meaning in Chinese or emotional tone in English.

Grammar refers to the underlying rules that organize any specific language. In linguistics, it comprises the combinatorial rules that most native speakers of a language recognize as acceptable for that language and that allow a native speaker an infinite array of generative possibilities. Grammar is composed of both morphology and syntax. Morphology focuses on the within-word structure, syntax on the between-word structure. Morphology studies the smallest word unit that impacts on meaning, the morpheme. The different types of morphemes can be illustrated by an example: the word *autos* is constituted by 2 morphemes, *auto* (base morpheme) and *-s* (inflectional morpheme denoting plural). Another morpheme type is seen in words such as *autism* in which the base morpheme *auto* (denoting "by oneself") is joined by a derivational morpheme *-ism* (denoting "typical qualities"). Syntax is the set of rules that governs the types of words (e.g., subject, verb, object), their order (e.g., subject-verb-object— SVO—in English, Spanish, and most languages; SOV in Japanese), the rigidity of this order (e.g., highly rigid in English, flexible in Spanish), the way to formulate a question or a negation (using auxiliary verbs or not), etc. Growth in grammatical or morphosyntactic complexity is measured by counting the morphemes contained in the average utterance—mean length of utterance (MLU)

(Brown, 1973). After toddlerhood, it is measured by assessing mastery of specific grammatical forms. There is evidence suggesting that regular verbs are processed by grammar, rule-governed instances, while irregular ones may be the result of highly practiced associative memory (Pinker, 1991). Mastery of rule-governed competences may be demonstrated in young children acquiring language when they produce regular forms when irregular forms are expected, e.g., *runned* for *ran*. This "overregularization" shows that the child has mastered the rules, but it might be absent in a child with a grammatical language disorder. Although the core grammatical rules seem to be the result of the interaction between Universal Grammar and the environmental language, more complex grammatical development, such as appreciation of the passive voice, appears to be highly correlated to the quality and quantity of input and interaction.

Semantics, the study of meaning, includes the study of vocabulary (lexicon). Lexical entries are organized in the mental dictionary according to well-defined rules, which allow the young child to acquire a peak average of 10 new words per day. By 24 months the average child knows 50 words. The subsequent exponential growth makes it difficult to determine vocabulary size with exactitude. The acquisition of morphology makes the combinatorial possibilities much larger, i.e., through derivation and inflection. Preschool children's vocabularies are more precisely measured through parents' surveys. One such instrument, the MacArthur Communicative Development Inventories, surveys the parents about the child's knowledge of several hundreds among the 1,000 most common words. Vocabularies of older children are better evaluated by individual language tests. In a psychiatric interview the clinician may estimate the child's lexicon. Vocabulary size is the best known predictor of school success. Environmental factors that predict large vocabularies include (1) reading and discussing children's stories, (2) the quality of dinner table conversations, (3) large mother-produced number of words and MLUs, (4) higher socioeconomic status (SES), (5) being the firstborn (Hoff-Ginsberg, 1998), and (6) quantity and sophistication of mother's vocabulary (Snow, 1998).

Pragmatics comprises a number of subdomains reflecting communicative competence. Rules of conversation (turn-taking, topic maintenance, conversational repair), of politeness, of narrative and extended discourse, and of the implementation of communicative intents have distinct developmental trajectories. Basic pragmatic development,

such as of communicative intents and mother–child conversational turn-taking, constitutes the scaffolding for the emergence of lexicon, then grammar, and eventually narrative (Ninio and Snow, 1996; Snow, 1998). High-level pragmatics such as narrative competence presupposes adequate functioning of basic language domains, such as grammar and lexicon.

In this review, we will apply the 4-domain partition to the study of language disorders. Voice disorders, stuttering, and acquired aphasia (such as secondary to brain injury) are not addressed. Dyslexia and other learning disorders, although often language-based, are the focus of another review (Beitchman and Young, 1997) and are not discussed here.

Developmental Trajectory

According to the tri-city MacArthur foundation study (Bates et al., 1992), based on parental report of 1,800 normally developing children using the Communicative Development Inventory, (1) canonical babbling typically begins between the ages of 6 and 10 months, (2) word comprehension arises by 8 to 10 months, (3) word production begins modally at 12 to 13 months, and (4) word combinations emerge between 14 and 24 months, with a very strong relationship between vocabulary and word combination development (Rapin et al., 1992). Telegraphic speech appears first, i.e., 2 or 3 content words without grammatical elements (e.g., "Daddy car" instead of "Daddy's car"); between 24 and 30 months, grammatical development accelerates, and all the basic grammar words emerge (Brown, 1973; Fenson et al., 1994). Grammar starts its growth around the initial content words about objects, people, and actions, "like an intricate sort of ivy" (Brown, 1973). By age 3, most normal children have mastered the basic morphosyntactic structures of their native language. The uniformity and rapidity by which this happens challenges previous notions that language acquisition is simply learning and supports the hypothesized existence of innate, genetically determined Universal Grammars (Pinker, 1991). Pinker (1991) recently proposed a combination of traditional learning and innate language modules. However, Fenson and colleagues (1994) found that the order of acquisition is firm, but there is a great range of variability in the timing of the sequence in large populations. The broad range of variation in language achievement poses significant problems to clinicians and teachers in their search for criteria-based definitions of abnormal development and disorder (Fenson et al., 1994).

Among the 1,800 children in the cohort, only some of the late talkers, particularly those who were also late comprehenders, qualified for a diagnosis of specific language impairment at follow-up. Language growth in all domains continues beyond childhood and into late adulthood.

METHOD

Literature Search and Review

Using the Ovid search engine, we conducted 3 literature searches for the past 10 years on the databases *Medline* (National Library of Medicine), *ERIC* (U.S. Department of Education), and *PsycINFO* (American Psychological Association). Subject headings and key words included *language disorders* and some equivalent terms. After eliminating duplicates, we identified approximately 1,100 articles, of which 22 were reviews. Fifteen major texts on child language development and disorders were consulted. A number of original research articles were selected from the journal reviews and books. In addition, a few prominent references from the field of child language were reviewed. The authors also contributed from their own incidental searches.

RESULTS

Diagnostic Nomenclature and Related Conceptual Issues

Problems in language are among the most common issues in the clinical presentation of children between ages 3 and 16 years, regardless of diagnosis (Shapiro, 1989). The *DSM-IV* (American Psychiatric Association, 1994) defines language disorders without chronological criteria (both in terms of minimal age of diagnosis and of duration). As language-delayed children may fall below the diagnostic cutoff for variable periods of time and/or at different periods of their lives, they may qualify for the diagnosis only at certain points. Because of the large variability in language development, this is not a rare occurrence, although many of these children may still develop normal language. Alternatively, children who test slightly above may be indistinguishable from others who test clearly below the cutoff and may equally benefit from special services. As the most common language tests measure only some language skills (typically phonology, grammar, and semantics) and not others (pragmatics), clinicians' evaluations about communicative competence, i.e., the ability to use communication effectively in real-life situations (e.g., sustain extended narration, maintain a conversation, and make a point), will be crucial to determine the need for speech/language services. Categorical definitions (presence/absence of disorder) may not reflect the underlying dimensional continuum of language abilities, particularly considering error and random factors in test-

ing (Shaywitz et al., 1992). Delayed language (resembling patterns seen in younger, typically developing children) is found in most children who have mental retardation and/or language-disorders, while deviant language (patterns of uneven abilities never seen in normal development) is common in children with pervasive developmental disorders (PDD) and some language disorders (Shapiro and Hertzig, 1991) (Bernstein Ratner, 1997). The clinician should have a working knowledge of the dimensions of language outlined as recorded in various competencies compared to known norms: comprehension/production, vocabulary/grammatical complexity, and retardation (delay)/deviance (Shapiro, 1982).

Specific Language Impairment or Developmental Language Disorder

According to Leonard, specific language impairment (SLI) is the prevailing term, in coexistence with developmental language disorder (DLD) (*DSM-IV* and *ICD-9*). Other less used but current terms are developmental dysphasia or aphasia. DLD as a category describes disorders of grammar and vocabulary and does not encompass abnormal phonology or abnormal pragmatics (addressed below under "Phonological Disorders" and "Pragmatic and Semantic-Pragmatic Deficits"). Children with DLD, however, often present with pragmatic or phonological deficits and meet criteria for the respective disorders (Leonard, 1998). The diagnosis of DLD generally requires standardized global language test scores at least 1.25 SD below the mean, i.e., 81 or lower. These scores typically reflect poor performance in receptive and/or expressive vocabulary and in receptive and/or expressive syntax and morphology. The *DSM-IV* and other research diagnostic criteria require that the standard test scores for language development be "substantially below" the nonverbal IQ scores (criterion A), usually 15 points (Leonard, 1998). Other *DSM-IV* criteria require functional impairment (criterion B), the exclusion of a diagnosis of PDD (criterion C), and a language deficit greater than would be usually expected with mental retardation, speech-motor or sensory deficits, or environmental deprivation, if these problems are present (criterion D).

The definition of DLD based on a discrepancy between language and IQ scores partially originated from the landmark Isle of Wight study's categories, specific reading retardation and general reading backwardness (Rutter, 1989). The discrepancy-based definition has been increasingly questioned (Francis et al., 1996). It is likely that the combined depressed language and IQ scores are associated with a poorer outcome than is depressed language only (Beitchman et al., 1996b). These cutoffs justify certain services for some children while denying them to others who would also benefit from language intervention (Leonard, 1998). In addition, normal children with high IQs and average language scores (e.g., 125 and 105, respectively) may meet the discrepancy criterion. In one study, 18% of normal 8-year-olds met this criterion (Aram et al., 1991). When the academic expectations for these children are excessive, *DSM-IV*'s functional criterion B may be met too, artificially justifying the diagnosis. Subtyping DLD into domains has identified lexical deficits such as anomia (a difficulty retrieving words for objects known to the child) or specific morphological deficits such as overusing the base verb form, e.g., "David like milk" or "Tomorrow he go play" (Rice et al., 1995). Subtyping according to modality includes expressive, receptive, and mixed deficits. Some authors argue that the delay-deviance dichotomy in DLD is an oversimplification and that at least 5 patterns can be observed (Leonard, 1998).

A recent epidemiological study (Tomblin et al., 1997) that sampled 7,218 rural, urban, and suburban kindergartners in the upper Midwest reported overall DLD prevalence of 7.4% (6% girls, 8% boys). The study diagnostic criteria showed good sensitivity (85%) and excellent specificity (1%) when compared with clinicians' judgments. Inasmuch as approximately one third of the children identified by this study were previously diagnosed, it is likely that children with DLD are severely underdiagnosed in the community.

Phonological Disorders

Phonological disorders are characterized by failure to achieve developmentally appropriate phoneme production or discrimination. The older terms, speech/articulation disorders, are consistent with the traditional view that the difficulties may be simply attributed to the anatomical or articulatory apparatus. With the growing contribution of developmental phonology, some "pure speech" problems are increasingly recognized as language problems, i.e., involving a representational system, even in cases in which the anatomical involvement is clear, e.g., cleft palate (Ingram, 1976; Yavas, 1991). The basic form, termed speech delay, is a delay in producing age-expected phonemes or a persistence of phonemic errors typical of a younger age. Speech delay is usually followed by speech-sound normalization by age 6 (short-term normalization) and in fewer cases by age 9 (long-term normalization)

(Shriberg, 1994). Speech delay shows significant family aggregation in one fourth to one half of the cases and is frequently accompanied by DLD. Receptive DLD in children with speech delay is strongly associated with long-term normalization. Residual errors persistent beyond a conventional age of 9 are the most common phonological disorder, present in approximately 5% of the population, while speech delay affects approximately 2% of children. Speech delay associated with otitis media with effusion may cause fluctuating hearing loss resulting in gaps in the development of phonological discrimination (i.e., receptive problems) (Shriberg, 1994).

Metalinguistic awareness, a child's knowledge about the linguistic rules of the language, is deficient in children with language disorders as a group (Gleason, 1997; Magnusson, 1991; Magnusson and Naucler, 1993). A subtype of metalinguistic awareness, phonological awareness, is highly correlated with success in literacy. Phonological awareness aids in the segmentation of the speech stream into its subunits. Phonological awareness deficits are found in children with phonological disorders, DLD, and language-based learning disorders (dyslexia) and in poor readers in the absence of a disorder (Beitchman and Young, 1997; Magnusson, 1991). Speech delays, when associated with DLD, are important to the child clinician because of the correlation with receptive and processing deficits, literacy failure, and high-risk populations. Isolated speech delays with short-term normalization and residual articulation errors show no clear research evidence of their association with psychopathology.

Pragmatic and Semantic-Pragmatic Deficits

Marked impairments in social interaction and communication are part of the core features of PDD including autism and Asperger's disorder (American Psychiatric Association, 1994) and are known in language research as pragmatic or semantic-pragmatic deficits (the latter for the frequent oddities in the understanding of contextual meaning). Shapiro and coworkers noted that children with autism and children with PDD showed deviant language that could be distinguished from simple language retardation (Shapiro and Hertzig, 1991). Moreover, the feature that segregated this deviance was the poorly contextualized utterances that marred the pragmatics. In the 1980s, Rapin and Allen proposed the existence of a "semantic-pragmatic syndrome" in the absence of autism, a concept furthered by Bishop into a "semantic-pragmatic disorder" (Bishop, 1989). According to the authors (Bishop and Adams,

1989), these children misunderstand implicit or explicit verbal messages and violate rules of conversational exchange, interrupting too frequently and providing the listener with too much or too little information. Both the authors and others have advocated for the view that core deficits in autism constitute a continuum rather than a rigid category (Bishop, 1989; Brook and Bowler, 1992). However, the study of the linguistic line of development without its social complement may be misleading and suggests the primacy of the language fault, which is unwarranted.

Research on the Mechanisms and Nature of Language Disorders

From a neurofunctional perspective, some children with language disorders have a developmental deficit in processing brief components of information presented in rapid succession, within the tens of milliseconds range, and a concomitant deficit in organizing rapid sequential motor output. This difficulty in processing quick tonal changes, it has been argued, is responsible for the deficient phonemic discrimination and low phonological awareness associated with poor reading skills (Tallal et al., 1993).

As reviewed by Semrud-Clikeman (1997), structural studies of DLD are limited to few postmortem reports and 4 magnetic resonance studies that have consistently shown loss of the normal left-right brain asymmetry in perisylvian and planum temporale regions. A more recent magnetic resonance study comparing 11 children with DLD and 19 age-/sex-matched controls demonstrated a significantly smaller left pars triangularis and high likelihood of inverted brain asymmetry (right > left) in DLD (Gauger et al., 1997).

Research on Familial and Genetic Aspects

Language disorders cluster in families. Familiality of DLD and phonological disorders has been found in more than 7 studies in the past 10 years (see Gilger, 1992). The only exception is a study comparing 2- to 3-year-old children with expressive language delay to controls, but expressive language delays ("late talkers") is considered a risk factor, not a diagnosis, and only a minority of these children have DLD at follow-up (Whitehurst and Fischel, 1994). In DLD, differing family patterns have been identified: higher prevalence in siblings (Tomblin, 1989); higher in fathers, brothers, and sisters (around 29%) than in mothers (7%) (Rice et al., 1998; Tallal et al., 1989); and a higher but not sex-biased distribution (Gilger, 1992). These differences may be due to DLD's heterogeneity. In

phonological disorders, 24% to 46% of a clinic sample of basic speech delay presented family aggregation (Shriberg, 1994). Pragmatic deficits are common among the first-degree relatives of autistic children (Piven et al., 1997), but no researchers have addressed whether similar aggregation is found in children with semantic-pragmatic disorder.

This clustering in families does not secure etiology, either in heritability or environmental transmission. From the perspective of maternal and family factors, research in developmental psycholinguistics has documented the impact of maternal and family input and interaction on the development of the child's linguistic structures (Snow, 1994). Hu (1994) used the CHILDES language database (MacWhinney and Snow, 1990) to show how the number of different words used by mothers increases as their children get older, and Huttenlocher et al. (1991) found that the amount of maternal talk was the best predictor of children's vocabulary growth. Children of working-class families hear significantly less maternal and adult talk than their middle-class peers and learn fewer words more slowly (Hart and Risley, 1995; Hoff-Ginsberg, 1991). Their vocabulary variation is mostly accounted for by maternal MLU (Hoff-Ginsberg, 1998) and by parental language diversity, emphasis, and responsiveness (Hart and Risley, 1995). Three-year-olds who have extended conversations with adults at meal times and in shared book-reading acquire larger vocabularies and perform better on comprehension and production tasks in kindergarten (Beals et al., 1994). Although language acquisition is a robust biological attribute in its core features, it is dependent on input in the domains of vocabulary and pragmatics. Snow (1994) hypothesized the existence of "buffering" that guarantees basic, core language acquisition in most children in varied settings. However, this buffering may be limited in those whose development is abnormal, requiring greater input.

From a genetic perspective, the study of language disorders needs to proceed through a series of related steps addressing familiality, heritability, mode of transmission, and gene location (Plomin, 1986, as quoted by Gilger, 1992). Familiality is discussed above. Two twin studies have shown heritability of DLD. Concordance was compared in 63 monozygotic (MZ) and 27 dizygotic (DZ) same-sex twin pairs where at least one twin met *DSM-III-R* criteria for DLD. When broader phenotype definitions were used, the concordance was close to 1 in MZ and 0.5 in DZ twins (Bishop et al., 1995). In another study (Tomblin and Buckwalter, 1998), DLD concordance was 0.96 for MZ and 0.69 for DZ twins aged 4 to 16 years. In language scores, DZ siblings were more alike than singleton pairs. Studies on the mode of transmission are even fewer and more tentative. A segregation analysis of 45 children with DLD and 888 family members evidenced family transmission but was unable to distinguish between a multifactorial and a single-gene model (Lewis et al., 1993). When one family that presented with numerous cases of dysphasia was thoroughly studied from a linguistic point of view, evidence of single dominant gene transmission was found (Gopnik and Crago, 1991). No gene location (linkage analysis) studies have been published to date.

Research on Socioeconomic, Cultural, and Minority Factors

Sociolinguists have alerted us to the artificiality of postulating a standard language. Language is a moving target over time. We speak regional and culturally based dialects. Perhaps the most rapidly moving target is the language of adolescents, to which new lexical and grammatical forms are added daily (Shapiro, 1985; Shapiro and Kalogerakis, 1997). Language varies greatly according to socioeconomic, minority, and educational status (Seymour and Bland, 1991). Population-based studies have consistently found higher concentrations of children with language disorders in lower socioeconomic groups (Beitchman et al., 1996a; Tomblin et al., 1997). In one study, lower parental education accounted for the high concentration of DLD in racial-cultural minorities (Tomblin et al., 1997).

Different dialectal groups may show significant differences in standardized testing results because of less familiarity with the dialect used in standardizing the test. Thus, tests based on Standard American English tend to underestimate competence of other dialectal minorities, such as speakers of Black English Vernacular or Latino English. This may lead to academic failure, as argued by the Oakland, California, schools, whose Ebonics recommendation triggered a national controversy in 1996. Thus, the overrepresentation of low SES and African-American students in special education classes may have to be reconsidered (Gopaul-McNicol et al., 1998). In bilingual populations, language assessment also has the potential for standardization bias. Bilingual may acquire first and second language simultaneously or consecutively. The degree of mastery of each individual language varies as the result of time of acquisition or intensity of exposure. Therefore, bilingual children should be assessed with well-normed tests in both languages, now available for the 2 most common languages—English and Spanish.

Bilingualism and limited English proficiency have enormous relevance for the child clinician for their high frequency, impact on child development, and interaction with psychiatric, language, and learning disorders in clinical populations. Limited English proficiency also affects help-seeking patterns and diagnostic evaluations (Toppelberg, 1997, 1998). In spite of the high proportion of dialectal and language minorities, practically all the research cited in this report was conducted in monolingual English speakers.

Comorbidity of Language Disorders With Child Psychiatric Disorders

The comorbidity of developmental language and psychiatric disorders was first studied in clinical settings. Children seen in speech/language pathology clinics have high rates of psychiatric disorders. Cantwell and Baker studied 600 consecutive English-speaking child referrals to an urban community speech/language pathology clinic. The psychiatric prevalence was 50% for any diagnosis, 26% for behavioral disorders, and 20% for emotional disorders, respectively. The most common individual psychiatric diagnoses were attention deficit disorder (19%), oppositional defiant and conduct disorders (7%), and anxiety disorders (10%). Psychiatric prevalence varied according to type of speech/language problem. The highest prevalence (around 70%) was associated with the presence of a language disorder and particularly with receptive language disorder (81%), the lowest prevalence (30%) with isolated speech disorder. Data from the 4-year follow-up of 300 of the children revealed a significant increase in psychiatric prevalence to 60% ($p < .0001$). The authors plead that pediatricians and speech/language therapists should be aware of this very high comorbidity (Cantwell and Baker, 1991). In another longitudinal study (Benasich et al., 1993), 56 DLD and 43 normal SES- and IQ-matched children from an English-monolingual background were evaluated at ages 4 and 8 years. Total Child Behavior Checklist psychopathology scores in the clinical range were more common in the children with DLD (11% versus 2%) at age 4 and increased significantly in the DLD (from 11% to 32%) but not in the normal group at age 8. This increase was associated with a drop in IQ. DLD was associated with hyperactivity and, in the girls, also with social withdrawal, both findings in the clinical range.

Children seen in psychiatric settings have high rates of language disorders. These disorders often go undiagnosed. Cohen et al. (1993) studied 399 English-speaking children consecutively referred to 3 mental health centers in Toronto. They found DLD in 53%, and in almost half of these the language problems were undiagnosed (unsuspected language impairment). The children with DLD had greater psychiatric morbidity including significantly higher internalizing and externalizing scores. Compared with the children with previously diagnosed DLD, the ones with unsuspected DLD had significantly fewer problems with expressive syntax (putting together grammatical sentences), less severe language problems, and more delinquency. The authors argue that both parents and professionals are misled by the relative absence of expressive problems and that the externalizing behaviors become the focus of attention, rather than the underlying receptive language deficit (Cohen et al., 1993).

Population-based studies helped establish the true comorbidity of child psychiatric and language disorders, avoiding the problem of referral bias. The Dunedin birth cohort study, published before the 10-year period of our focus, had also reported the association of receptive problems with psychiatric outcomes. Among 1,037 children in New Zealand, comprehension delays at age 3, either with or without expressive delays, predicted significantly higher behavioral problems at ages 7, 9, and 11, compared with expressive delay only or normal language (Silva et al., 1987). These data confirm an earlier study (Stevenson et al., 1985).

More recently, Beitchman and collaborators have followed a 1 in 3 sample of all kindergartners in Ottawa-Carleton ($n = 4,965$) for more than 14 years. The original sample included 1,655 English-speaking children, aged 5 years. The study identified 4 empirical language-ability clusters when the children were 5 years old: low overall, poor articulation and poor comprehension (impaired clusters), and high overall (normal). This classification system is the closest to that offered by the *DSM-IV*, although IQ discrepancy and functional impairment (both required by *DSM-IV*) are not part of the cluster definition. Low overall corresponds to *DSM-IV*'s mixed receptive-expressive disorder and poor articulation to *DSM-IV*'s phonological disorder. The authors argue that a category of pure receptive disorder (whose existence the *DSM-IV* denies) is justified and that it might be masked by the behavioral manifestations with which it is often associated (Beitchman et al., 1996a). Age 5 behavioral scales revealed high prevalence of attention-deficit/hyperactivity disorder (ADHD) (59%) in the low overall, increased aggressiveness in the poor comprehension, and few behavioral problems in the poor articulation group. The low overall group was the highest-

risk group, associated with unmarried parents, low SES, impaired hearing, visual-motor deficits, and behavioral problems. Subsamples of this cohort were followed at ages 12.5 and 19. At age 12.5, children who were impaired at age 5 (1) were impaired in 75% of the cases; (2) were impaired in 81% of the cases if the initial impairment was more pervasive, e.g., low overall; (3) had a psychiatric diagnosis in 43% of the cases; and (4) had an increase in risk of more than 11 times for emotional disorders in girls and of 2 times for ADHD in boys when compared with unimpaired children. Age 5 clusters differed significantly on age 12.5 reports of social competence (mothers), adaptive functioning, hyperactivity, anxiety, and externalizing and internalizing symptoms (teachers) and conduct problems and problems with lying (child self-report). The lower overall group fared the worst, followed by the poor comprehension (receptive impairment) group. Children with receptive impairment had much worse social competence (mothers) and hyperactivity (teachers) after 7 years, compared to stability or improvement in the other 3 clusters. Thus early detection of receptive impairment is critical. Because the subjects retained were less impaired than the ones lost to follow-up, age 5 impairment may be an even stronger predictor of negative psychosocial outcome than is reported. Significant SES differences between the language clusters may explain part of the risk variability. Preliminary data from the 14-year follow-up suggest that age 5 impairment predicts ADHD, antisocial personality disorder, and criminal behavior at age 19 (Beitchman et al., 1997; Beitchman et al., 1996a,b).

Pragmatic Deficits in PDD, Childhood Schizophrenia, and ADHD

Pragmatic and other language deficits in autism appear to be closely linked to deficits in so-called "theory of the mind," the ability that allows children to understand how minds work in others and themselves (Baron-Cohen et al., 1993; Tager-Flusberg, 1992). Tager-Flusberg compared 6 children with autism and 6 age- and language-matched children with Down syndrome. She found deficits in the use of mental state vocabulary (e.g., think, know), in the development of the ability to maintain a conversation topic, and in highly specific aspects of syntactic development (e.g., sentences in which someone's perspective is expressed, such as John thought that Mary went shopping) (Tager-Flusberg and Sullivan, 1994). Nonetheless, although these findings correlate, a causal link has not been established. Discourse and conversational deficits also have been identified in children with schizophrenia (Baltaxe and Simmons, 1995; Caplan, 1996). This linkage was suggested earlier but not systematically demonstrated in Benders' designation pseudodefective schizophrenia (Shapiro and Hertzig, 1991). Pragmatic deficits are also prominent in children with ADHD (Tannock, 1998).

DISCUSSION

Language disorders are common but underdiagnosed in community and psychiatric settings. It is hard to imagine a single aspect of psychiatric evaluation, treatment, and intervention that would not be affected by the presence of a language disorder and its high familial clustering. The child clinician's basic acquaintance with the language domains, their developmental pathways, and available resources to assess them is essential to good practice.

Early detection of language problems may be crucial in psychiatric prevention. Conversely, in speech/pathology clinics, psychiatric problems are common but often overlooked. Research on comorbidity over the past 10 years has replicated and confirmed the following important points: early language disorders are risk indicators for concurrent and future psychiatric problems and predict disruptive behavior disorders, particularly ADHD, and anxiety disorders; language functioning should be explored in externalizing behavior problems; and general language impairment (low overall, with mixed expressive/receptive and phonological deficits) predicts worse emotional/behavioral outcome. In general, girls with DLD tend to become socially withdrawn and emotionally disordered, and boys and girls with DLD become hyperactive and behaviorally disruptive. The presence of receptive or comprehension language disorders has proven to be the single most important consideration, as they are a high-risk indicator of more phonological, pragmatic, and psychiatric comorbidity, worsening social competence, and hyperactivity over the years and they are often not suspected or detected.

Most of the studies are limited to English-speaking children. It is unclear whether their results are generalizable to the bilingual and language minority populations, and further research in this area is clearly needed. Research questions for the next decade should focus on the following: What specific language domains are predictive of what outcomes? Is poor expressive vocabulary more relevant to anxiety or poor morphology to disruptive behaviors? What is the impact of treatment and remediation on the psychopathology–language interface? Is there a

role for complementary psychopharmacology in the treatment of language disorders? The work in progress points to the significance of language evaluation and to the need to have language evaluation services closely integrated with child mental health services. By including better evaluations in this area, we will help more children and advance our knowledge.

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Amitriptyline-Associated Seizures in a Toddler With Munchausen-by-Proxy. Michael E. Mullins, MD, Cynthia B. Cristofani, MD, Craig R. Warden, MD, MPH, James F. Cleary, MD

We describe an unusual case of a toddler diagnosed with an idiopathic seizure disorder that later was proved to be caused by deliberate administration of amitriptyline by his custodian. In spite of seizures associated with widened electrocardiographic wave (QRS) and right axis deviation on the electrocardiogram (EKG), the correct diagnosis eluded clinicians through a series of hospital admissions. Unfortunately, clinicians are quite accustomed to the fact that patients previously diagnosed with epilepsy have seizures and may not investigate other causes of seizure. This allowed classic signs of cyclic antidepressant poisoning to go unrecognized. **Pediatr Emerg Care** 1999;15:202–205. Reproduced with permission from Lippincott Williams & Wilkins.

Duration of Breast-Feeding and Bayley's Mental Developmental Index at 1 Year of Age. B.J. Paine, M. Makrides, R.A. Gibson

Objective: To examine the association between duration of exclusive breast-feeding and developmental indices in initially breast-fed infants at 1 year of age. *Methodology:* A cohort of 96 healthy term infants, aged between 10 and 14 months, were recruited from public immunization clinics and child care centres in southern metropolitan Adelaide. Infants were assessed using the Bayley Scales of Infant Development (Mental and Psychomotor Developmental Indices) within 2 weeks of enrollment. Information regarding duration of breast-feeding was provided retrospectively by the mothers of the infants. Duration of exclusive breast-feeding and sociodemographic variables were used as independent variables to determine their effects on development. *Results:* Due to a significant interaction between duration of breast-feeding and gender on mental development scores, separate regression models for boys and girls were explored. Duration of breast-feeding significantly predicted mental development scores for boys (partial $r^2 = 0.14$, $P < 0.005$), but not for girls. Duration of breast-feeding did not predict psychomotor development scores. *Conclusions:* These findings deserve further examination in large, prospective studies. **J Paediatr Child Health** 1999;35:82–85.

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