LANGUAGE DISABILITIES DEFINED

Children and adolescents with language disabilities form a large, heterogeneous group, accounting for from 10% to 20% of children (Tallal, 2003). Other prevalence reports for language impairments (LI) indicate a range from 6% to 8% of school-age children (Gilger & Wise, 2004) and an estimated 50% of children with LI later experience reading difficulties. The heterogeneity in this group results from the fact that language and communication disorders can originate in a variety of etiologies, express themselves as different types and be associated with different comorbidities. Furthermore, the nature of language and communication disorders changes with age as cognitive and linguistic demands associated with academic curricula, vocations and professions, and social interaction increase in complexity and diversity (Ratner & Harris, 1994; Lord Larson & McKinley, 2003). Language and communication disabilities are also a part of genetic syndromes such as Down, Fragile X and Tourette Spectrum syndromes (Jung, 1989; Dornbush & Pruitt, 1995; Prestia, 2003). They also exist as comorbidities in developmental disorders such as Autism, Attention Deficit/Hyperactivity Disorder (ADHD) and executive function disorders (EDF) (Singer & Bashir, 1999; Mirrett et al., 2003), or as a result of Traumatic Brain Injury (TBI) (Barkley, 1997, 1998; Brown, 2000; Culatta & Wiig, 2002; Ottinger, 2003; Wetherby, 2002).

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (American Psychiatric Association, 2000) defines language and communication disorders as being either of the Expressive or Mixed Receptive–Expressive type. Expressive language and communication disorders are identified by four criteria, three of which relate to inclusion and one of which specifies exclusion. The four criteria are: (1) Expressive language development is significantly below receptive
language development and nonverbal intellectual ability; (2) deficits interfere with academic, vocational, and professional achievement and/or social communication; (3) the language difficulties are in excess of those usually observed in cases with cognitive, sensory or motor deficits or environmental deprivation; and (4) symptoms do not meet criteria for Mixed Receptive–Expressive Language Disorders or Pervasive Developmental Disorders (DSM-IV-TR, pp. 58–61). Mixed Receptive–Expressive Disorders are defined against three diagnostic criteria, two of which are inclusive and one exclusionary. The criteria are: (1) Both receptive and expressive language development are significantly below measures of nonverbal intellectual ability; (2) deficits interfere with academic, vocational, and professional achievement and social communication; and (3) symptoms do not meet criteria for Pervasive Developmental Disorders (DSM-IV-TR, pp. 62–64).

Language disabilities can be the primary or secondary source of a student’s exceptionality, and the impairments can involve different modalities (e.g., listening/receptive, speaking/expressive), modes (e.g., reading, writing) and dimensions of the language system (e.g., phonology, morphology and syntax, semantics, or pragmatics). Depending on which modalities and components of the language system are involved, the symptomatic manifestations, severity and impact of a language disability on language learning, academic achievement, social competence and emotional stability will vary (Bashir et al., 1987; Culatta & Wiig, 2002; Wetherby, 2002).

The term Specific Language Impairment (SLI) is often used to label school-age children, adolescents and young adults in whom language disability is of a primary nature, do not result from emotional disorders, cognitive delays, sensory impairments or language differences (Leonard, 1991; NJCLD, 1994). Recent research has provided evidence of connections between SLI, speed of processing and verbal working memory deficits (Weismer, Evans & Hesketh, 1999; Montgomery, 2002; Weismer, et al., 2005; Leonard et al., 2007). Furthermore, other learning disabilities in these children and youth may be explained with reference to the nature of existing LI (Ratner & Harris, 1994; Culatta & Wiig, 2002; Lord Larson & McKinley, 2003).

COGNITIVE REFERENCING IN LANGUAGE DISABILITIES

There is an ongoing debate of how to identify language disabilities and differentiate SLI and language differences, and whether or not cognitive referencing is essential or even relevant in the comprehensive assessment of children and adolescents for language disabilities (Paul, 2000). One point of view follows the DSM-IV-TR diagnostic criteria and looks to identify discrepancies between language and nonverbal cognitive abilities on standardized measures. This position has been termed a neutralist perspective, as it does not account for ethnic, cultural or social norms or expectations (Fey, 1986). The second depends on evaluating and
observing how a child or youth performs in contexts with different demands and constraints (e.g., academic, family, community, and broader social). This perspective is referred to as the normative position (Fey, 1986; Merritt & Culatta, 1998; Dornbush & Pruitt, 1995; Nelson, 1998, 2000). The controversy of whether to adopt a neutralist perspective or a normative position for the assessment and identification of language disabilities extends into all branches of special education. Thus, a normative position with Responsiveness-to-Intervention as the focus for identifying children with language-learning impairments or differences is advocated by numerous professional organizations and concept papers abound (Fuchs et al., 2003). The normative position received national support with the 2004 reauthorization of the Education for All Handicapped Children Act (PL 94-142). It stated that schools will “not be required to take into consideration whether a child has a severe discrepancy between achievement and intellectual ability…” (Section 1414(b)) (Wrightslaw: IDEA, 2004, p. 88). For children with language disabilities this represents progress, because many children with syndromes, such as Tourette Spectrum Syndrome, previously were unable to meet discrepancy criteria to receive services or accommodations for, for example, expressive language disorders with executive function comorbidities (e.g., attention and working memory deficits, inflexibility in set-shifting and dysnomia).

The Responsiveness-to-Intervention movement is often considered to be of recent origin, however, this is not exactly the case. As an early move toward assessing responsiveness-to-intervention, the Ohio Department of Education, Division of Special Education (1991) issued a handbook for the use of intervention assistance teams (IT) as part of the identification and evaluation of children with language problems. The handbook outlined an assessment and IT process and provided suggestions for teacher accommodations with strategies to use in the classroom with students suspected of having language problems. The IT processes were initiated by using language- and communication-specific behavioral checklists, teacher and student interviews, and other background information. Designating facilitators involved in implementing classroom-based intervention and a monitor of student progress, and specifying educational outcomes and setting timelines for intervention followed this. If stated outcomes were not achieved, students were referred for a multifactor evaluation to determine a least-restrictive special education placement. One model proposed for naturalistic assessment through Responsiveness-to-Intervention provides a three-tiered structure for implementation (Mellard, 2005). In Tier I, teachers provide quality academic instruction and supports as part of the general education program. If a student fails to meet set educational objectives after tracking progress during a specified time period, often of 9 weeks duration, she/he is referred to a study team for possible Tier II invention. At this tier, students receive evidence-based intervention that is supplemental to the core-curriculum, often in small groups. If expected progress cannot be documented by curriculum-based evaluations, a student is referred to Tier III for intensive individualized and research-based intervention or assessment followed by intervention. The expectations are
that from 5% to 10% of students will be referred for services or evaluation at this tier. Monitoring of progress is suggested to use curriculum-based evaluations (Bennet & Davis, 2001; Howell & Nolet, 2000) and there are few discussions of how to integrate norm-referenced language and/or cognitive or neuropsychological assessments in the implementation process. The main issue in special education now centers on whether or not norm-referenced testing, including assessment of cognitive or neurocognitive abilities, will have a place in the future.

As a researcher and practitioner in the field of speech–language pathology, I acknowledge the validity of the discussion and the pros and cons of each position. In this context, I shall assume the stance that norm-referenced evaluations of language and cognitive abilities can contribute significantly in a multi-dimensional assessment and identification process. After decades of practice, I have seen many “babies thrown out with the dirty bath water,” experienced cycles of fads and fancies in speech–language pathology and education and seen reversals to previously vilified methods and procedures (e.g., phonological awareness testing and training). With this, and recent research of processing speed and working memory capacities as they relate to LI, as backgrounds, I will express and support my views of the relevance of cognitive and neuropsychological referencing in a comprehensive, multi-dimensional assessment of children with potential LI or with syndromes, which include language disabilities.

First, using cognitive and intellectual referencing as an integral aspect of multi-dimensional language assessment does not contradict the current IDEA mandates to describe a student’s strengths and weaknesses, relate these to potential for academic achievement or to curriculum objectives which may be compromised. As an example, if norm-referenced language and cognitive assessments indicate significant verbal working memory or word-finding (dysnomia) deficits and/or processing speed deficits, this knowledge contributes to a broadened understanding of contributing factors to the student’s LI (Berninger, 2001; McGregor et al., 2002; Montgomery, 2002; Semel et al., 2003; Weiler et al., 2000). The test results can also explain how these deficits may influence performance on academic tasks such as note taking, early and later literacy development, and oral and written presentations of narrative or dialog or study skills acquisition and can indicate needed classroom accommodations (Ratner & Harris, 1994; Storkel & Morrisette, 2002; Lord Larson & McKinley, 2003; Montgomery, 2002).

Secondly, with exclusively “normative” or authentic assessment procedures and without cognitive referencing, the group of students identified to have LI or disabilities will be of high incidence and unmanageable heterogeneity. It would include children with any variety of language and communication problems that may not have underlying neurological or neuropsychological bases. This heterogeneous group cannot be expected to respond similarly to classroom intervention, precision teaching or programmatic language intervention procedures. Furthermore, services which target the deficit areas and foster compensatory strategies may not be provided for students with specific neuropsychological
deficits that interfere with language and communication in increasingly complex academic contexts as is the case in, for example, the Tourette Spectrum Syndrome (Dornbush & Pruitt, 1995; Prestia, 2003).

Thirdly, there are educational and theoretical issues that are not addressed by the normative position, Response to Intervention (RtI) or exclusively curriculum-based assessments. Among these issues are the nature-versus-nurture conundrum, the relations considered to exist between the biological basis of language and other cognitive systems, and the practice of treating symptoms in isolation from underlying causal and functional systems. Thus, in the normative position and its implementation, nurture and context appear to take precedence over nature and existing neuroscience-based knowledge of brain–behavior relationships (Gazzaniga, 2004). It also promotes symptomatic intervention over in-depth consideration of the interplay between language, cognition, and neurobiological factors. With rapidly increasing understanding of the biological bases of language and communication and the impact of neurocognitive deficits, attention to underlying causes and neuropsychological bases of disorders should become mandatory. This would assure that specialized services are provided for children, who may otherwise show temporary symptomatic progress, but later experience regression as the demands on language and cognition increase with age and education. The normative position and RtI also appear to be based on the theoretical position that language is a modular system and that language and cognition are dissociated (van der Lely et al., 1998; Marcus & Rabagliati, 2006). This position implies that language can be evaluated and improved within isolated linguistic, pragmatic, or contextual frameworks. An opposite position holds that language is a joint product of hereditary and domain-specific factors and is therefore a reflection of domain-general cognitive systems (see Marcus & Rabagliati, 2006). This theoretical construct is supported by research-based evidence that language disorders, such as SLI, often co-occur with impairments of cognitive functions such as motor control, general intelligence, working memory and other executive function deficits (Hill, 2001; Kovas & Plomin, 2006; Leonard et al., 2007). The following discussion of the role of WISC-IV in the assessment of students with language disorders assumes the position that language is a reflection of domain-general cognitive systems.

**WISC-IV AND LANGUAGE DISABILITIES**

The third edition of the Wechsler Intelligence Scale for Children (WISC-III) (Wechsler, 1991) provided relevant data about intellectual and neuropsychological abilities in multi-dimensional assessments of student's with language and communication difficulties. With cognitive and intellectual referencing, students with Mental Retardation or Pervasive Developmental Disorders (DSM-IV, 1994) were identified and comprehensive educational and psycho-educational supports, including language stimulation and/or intervention, were provided. Similarly,
LI and learning disabilities with neuropsychological bases and comorbidities (e.g., ADHD, EFD) could be differentiated from language disabilities related to deprivation, language differences or interactions between language codes (e.g., English–Spanish bilingualism) (Payne & Taylor, 2002; Langdon, 2007).

Relationships between WISC-III measures of intellectual ability (Wechsler, 1991) and performances on norm-referenced receptive and expressive language tasks was explored during standardization of the *Clinical Evaluation of Language Fundamentals—3rd Edition* (CELF-3) (Semel et al., 1995). Correlations between the CELF-3 Total Language standard score and WISC-III Full Scale (r = .75), Verbal Scale (r = .75) and Performance Scale IQs (r = .60) were all significant (p < .01), but moderate in degree. The CELF-3 and WISC-III Verbal Scale relationships underscored that the measures shared a general language construct. However, the moderate size of the correlation indicated that the WISC-III Verbal Scale alone did not adequately identify aspects of the expressive or receptive–expressive language syndromes described in DSM-IV–TR.

**WISC-IV STUDIES OF CHILDREN WITH LANGUAGE DISABILITIES**

The WISC-IV (Wechsler, 2003) and CELF-4 (Semel et al., 2003) were administered concurrently during standardization and the respective manuals report the results from different perspectives. The WISC-IV technical manual reports findings from a comparison of performances by 27 children in the age range from 6 to 16 years with primarily expressive language disorders, as defined by DSM-IV-TR criteria, and 27 age-matched controls. The group mean differences between the WISC-IV Verbal Comprehension and Working Memory Index scores were highly significant (p < .01), indicating large negative effects of the expressive language disorder syndrome. There was also a significant, but moderate negative effect of expressive language disorders on WISC-IV Full-Scale IQ. Among subtests, Comprehension and Information showed large negative effects for expressive language disorders (p < .01), and Vocabulary and Arithmetic showed significant, but moderate effects.

Performances by a group of 41 children with mixed receptive–expressive language disorders ranging in age from 6 to 16 years and identified according to DSM-IV-TR criteria and 41 age-matched controls were also compared. There were large and significant differences between groups for Verbal Comprehension, Perceptual Reasoning, Working Memory, and Processing Speed, as well as Full-Scale IQ (p < .01). Group differences were substantial and significant for all Comprehension and Working Memory subtests, two Processing Speed subtests, and one Perceptual Reasoning subtest (p < .01). These findings support that children with mixed receptive–expressive language disorders show global deficits in cognitive functioning, as well as in linguistic aspects of language and communication, working memory and visual-verbal processing speed (e.g., rapid
automatic naming, RAN) (Beitchman et al., 1996; Semel et al., 2002; Wiig et al., 2000, 2001).

RELEVANCE AND APPROPRIATENESS

The statistical and clinical properties of WISC-IV and controlled studies of clinical populations support the relevance and appropriateness of its use for cognitive referencing in a multi-dimensional and multi-perspective assessment of language disabilities. From the perspective of the clinical or educational diagnostician, the performance patterns on those subtests that contribute to the Verbal Comprehension and Working Memory Index scores are of immediate relevance. Congruency in language test and WISC-IV Verbal Comprehension measures can serve to validate a diagnosis of a language disorder. Working Memory measures further serve to validate language test results, and identify a potentially critical component of SLI (Montgomery, 2002). Performances on subtests that contribute to the Perceptual Reasoning Index are relevant and appropriate for assessing nonverbal cognitive and reasoning strengths and weaknesses to complete the diagnostic profile. These measures can identify strengths that can be employed in selecting language intervention strategies, such as conceptual mapping with cognitive mediation and determining the use of media to enhance language learning (Hyerle, 1996; Wiig & Wilson, 2001; Lord-Larson & McKinley, 2003). They also contribute to determining “appropriate accommodations,” as mandated by IDEA 2004.

Each of the subtests that form the Verbal Comprehension Index can provide specific information relevant for identifying strengths and weaknesses and relating performances to social or academic learning content and tasks. Thus, the Similarities subtest probes verbal, semantic abilities that reflect concept formation and the development of semantic networks. Here the student is required to respond to two related words or concepts by referring to shared-meaning features and semantic class membership. This task is often difficult for students with Mixed Receptive–Expressive Language Deficits and the spontaneous responses may indicate a focus on differences in meaning rather than on similarities. Responses may also focus on shared secondary, concrete characteristics (e.g., physical attributes) rather than essential abstract meanings (e.g., class membership). As examples of these response patterns, the student with a language disability may respond to the stimuli “cat” and “mouse” by saying either that they are not alike “because a cat eats a mouse” or that they are alike “because they are both brown, and have fur and a long tail.” For the astute clinician, the nature of error responses is as important as the standard score earned on this subtest, as the error pattern points to objectives and procedures for intervention (e.g., developing semantic classification and superordinate naming strategies and skills (Nippold, 1991).

The Picture Concepts subtest reveals information that is similar to that obtained from the Similarities subtest. It requires the student to identify one item
from each of two or three rows of pictured stimuli to form a semantic group, and then to explain why the items go together. Students with primarily expressive language disabilities generally perform well on the picture-matching task, but may have problems expressing the reasons for their choices succinctly with, for example, superordinate names. Students with pervasive receptive–expressive language disabilities may show inadequate performance on both the nonverbal pointing and the verbal explanation tasks. Again the nature of the student’s error patterns is relevant to the clinician by pointing out strengths and weaknesses and developing a focus and selecting strategies for intervention.

The Vocabulary subtest uses two stimulus-response formats. In response to the picture items, the student is required to name the featured instance. In response to the verbal reasoning items, the student is required to formulate a definition by giving a synonym, major use, primary feature, or category membership. Frequently, students with mixed-receptive expressive language disabilities respond to the Verbal Reasoning items with circumlocutions, vague or terse responses, or concrete interpretations, therefore earning primarily part scores. Students with expressive language disabilities may exhibit word-finding difficulties and substitute words. If the student self-monitors and corrects substitute responses, this should be noted as a positive. In all instances the speech–language pathologist should be informed of error patterns so that appropriate follow-up evaluation of naming and word-finding abilities can be provided (German, 1986, 1990, 1991; German & Newman, 2004).

The Comprehension subtest requires students to give reasons, state the importance, advantages or disadvantages of actions, characteristics or features, or social expectations for behavior. Students with mixed receptive–expressive language disabilities generally have difficulties expressing cause–effect relationships and moral judgment. They typically earn part or no scores on this type of Comprehension test, and it may be difficult to establish basals and ceilings. Their response and error patterns can indicate inadequacies in critical thinking, verbal reasoning, and moral judgment that are important for speech–language pathologists to be aware of. When these deficits are present, intervention procedures that develop critical thinking, abstract reasoning, and moral judgment through cognitive mapping and mediation, guided questioning, scaffolding, or other procedures are appropriate (Hyerle, 1996; Nippold, 1991; Wiig & Wilson, 2001).

The Working Memory and Processing Speed Index scores are also of importance and relevance to the understanding of language deficits and disorders. Processing and naming speed deficits for highly familiar visual stimuli are prevalent among monolingual English and bilingual English–Spanish speaking students with mixed receptive–expressive language disabilities, who earn language scores in the low to very-low educational range (Wiig et al., 2000, 2001). These rapid naming speed deficits are indicative of inadequate processing speed, implicit (visual) working memory and verbal automaticity, validated by neuroimaging to be mediated by the temporal-parietal regions of the brain (Wiig et al., 2002). They are also predictors of dyslexia and difficulties in literacy.
acquisition (Wolf et al., 2000). The WISC-IV Working Memory Index provides important validation of the presence of verbal Working Memory and retrieval deficits for academically important materials (e.g., digits, letters, and other familiar sequences). Working Memory and RAN tests, featured in current, comprehensive language assessment tools (e.g., CELF-4), can assist in identifying underlying clinical (neuropsychological) symptoms, such as deficits in attention, working memory, cognitive set shifting, and verbal automaticity. These can have negative effects on language and communication development and the attainment of mature competencies in language, communication, and literacy and in later professional development. The results from these tests can also serve to differentiate students with SLI from those with language differences caused by cultural, ethnic, parental education and socio-economic factors. This differentiation will become increasingly important as funding for language intervention and English as a Second Language (ESL) services must be separated so that students can be assigned to appropriate services immediately following identification and differential diagnosis.

Last, but not least, it is relevant for the clinician to have information about a student’s strengths and/or weaknesses in nonverbal cognitive and reasoning abilities. The WISC-IV Perceptual Reasoning Index provides this information. If a student shows relative strength in Perceptual Reasoning, this translates to potential success for using cognitive approaches to language intervention such as visual tools for conceptual mapping and cognitive meditation (e.g., Nippold, Esrskine & Freed, 1988; Hyerle, 1996; Wiig & Wilson, 2001) to support development of concepts, linguistic rules, narrative structure, and other organizational strategies.

TESTING CONSIDERATIONS

There are several aspects of WISC-IV administration and interpretation of results that must be considered when testing students with probable language disabilities. First, the psychologist must satisfy that the student understands the test tasks and expectations for responding. This may mean asking direct questions about task characteristics and expected responses. Students with language disabilities of the mixed receptive–expressive type often develop non-adaptive strategies for responding to tasks. They may guess what to do if directions were not understood, an approach which often leads to failure because the various scripts for spoken directions for tasks and tests may not be internalized or automatized.

Secondly, students with language disabilities often give error responses that can point directly to the underlying sources for difficulties in language learning and use. The psychologist should therefore record inaccurate spontaneous responses for, for example, word definitions so that error patterns can be identified and interpreted either for or by a speech–language pathologist. As an example, there is ample research of error types associated with word-finding problems (dysnomia), a characteristic concomitant of language disabilities of the expressive type (German, 1986, 1990, 1991). It is especially important to identify
circumlocutions, verbose descriptions, imprecise referencing with overuse of pronouns, word substitutions, and use of similar sounding words in context (e.g., television for telephone), all characteristics of word-finding difficulties.

Thirdly, the psychologist should relate the observed cognitive strengths and weaknesses, to educational expectations, curriculum objectives, and classroom behaviors. A pragmatic interpretation of the WISC-IV results can then be compared to interpretations based on a student’s performance on language tests. This can serve as validation or as a means of providing a more complete picture of the student. When cognitive deficits that are commonly linked to language and communication disabilities are observed, a referral to a speech–language pathologist for in-depth language evaluation seems appropriate. It follows, that the psychologist and speech pathologist should then collaborate to interpret and validate the WISC-IV results and integrate these with the language measures that led to a diagnosis of a language disability of a mixed receptive–expressive or predominantly expressive type.

CLINICAL INTERPRETATIONS AND IMPLICATIONS FOR INTERVENTION

CASE STUDIES

The following case studies describe language and cognitive test results for selected students with LI. The three cases were administered the CELF-4 and WISC-IV at the time of standardization. The clinical categories, from which the illustrative cases were selected, represent language disorders of the primarily expressive type (Cases A and C), and mixed receptive–expressive type (Case B). Each case study will follow a descriptive format in which the student’s (a) background and prior diagnosis is described, (b) CELF-4 norm-referenced index and selected criterion referenced subtest scores are presented and interpreted, (c) WISC-IV norm-referenced index scores and Full-Scale IQ are reported, and (d) the combined findings are interpreted for clinical and educational implications.

Case Study A: Male, Age 6 Years 5 Months

This study is of a 6 year 5 months old boy with language disorders and learning disabilities. The student was receiving speech and language intervention services at the time of the assessment. His language disorder was initially identified by administering the Preschool Language Scales (PLS) (standard score 58), the Peabody Picture Vocabulary Test (PPVT) (standard score 90) and the CELF-Preschool (Receptive 77; Expressive 65). The prior evaluations indicated performance on comprehensive language tests in the low to very-low educational range for his age and determined eligibility for speech–language resources. The student’s CELF-4 Core Language and Index scores are shown in Table 4.1 and WISC-IV Index scores and Full-Scale IQ in Table 4.2.
This student’s CELF-4 Core Language score (83) indicates performance in the marginal to average educational range and supports eligibility for continuation of language resource services. The Receptive Index score (101) indicates performance within the average educational range, while the Expressive Index score (83) indicates performance in the marginal to average range. The Modality Index scores (Receptive–Expressive) differ by 18 points and the discrepancy is significant ($p < .05$). In other words, this boy’s language difficulties are primarily expressive in nature based on the Modality Index scores. The Language Content score (94) indicates performance within the average educational range, and the Language Structure score (88) indicates performance in the marginal to average educational range. The Content Index scores (Language Content versus Language Structure) also did not differ significantly ($p > .05$). The Working Memory Index score (80) falls within the low to marginal range, indicating that Working Memory presents an area of relative weakness. The supplementary subtests showed performance within the typical range for Phonological Awareness (56; criterion $> 46$), Word Associations (22; criterion $> 18$), and Pragmatics (172; criterion $> 125$). The RAN time for color–shape combinations was significantly slower than typical (142 s; criterion $< 120$ s), indicating reduction in
cognitive speed (i.e., attention, visual working memory, set shifting). In summary, this student’s primarily expressive language difficulties are associated with inadequate Working Memory, as measured by the CELF-4 Index, and attention, Working Memory and set-shifting, as measured by CELF-4 RAN. Without repeated norm-referenced language assessment, language intervention services may have been discontinued for this student. This may have resulted in regression in the language competence gained through early intervention. Similarly, RtI procedures at Tier I might have resulted in dismissal from services. If the RtI process were to progress to Tier II, it may have resulted in symptomatic (expressive language and grammar), curriculum-based interventions.

The student’s WISC-IV Full-Scale IQ (96) and the Verbal Comprehension (95), Perceptual Reasoning (94), Working Memory (104) and Processing Speed (97) Index scores are all within the average normal range. There are no significant differences between paired WISC-IV Index scores, indicating no significant areas of cognitive strengths or weaknesses beyond the average normal range. Using the presence of a significant discrepancy between measures of language and cognition as a criterion for eligibility for special education resources may not have resulted in language services for this student. However, the persistence of an expressive language disability qualifies the student for continuation of already initiated resource services.

The combined WISC-IV and CELF-4 test results suggest that the student’s relative language and cognitive strengths (Verbal Comprehension and Perceptual Reasoning) should be activated to facilitate internalization and automatization of verbal strategies for expression. Language intervention approaches with picture support and cognitive bases (e.g., visual tools for conceptual mapping, cognitive mediation, and mediated learning) should support activation and use of these cognitive strengths. Time-added accommodations do not appear needed for processing visual information that does not require verbal processing and expression. In contrast, additional response and test-taking time should be allowed to accommodate for the observed expressive language, verbal and visual working memory and verbal fluency deficits.

**Case Study B: Female, Age 8 Years 0 Months**

This study is of an 8 years 0 months old girl with a diagnosed language disorder, who was receiving language intervention and resource reading services at the time of testing. The language disorder was first identified with the TOLD-P:3 (Newcomer & Hammill, 1997) at age 5. At the time of identification and determination of eligibility for service, Listening (standard score 94) was within the normal range, while Speaking (standard score 67) was significantly lower and indicated a severe expressive deficit. The student’s CELF-4 Core Language and Index scores are presented in Table 4.3 below and WISC-IV Index scores and IQ are shown in Table 4.4.

The girl’s CELF-4 Core Language score of 56 places her performance within the very low educational range and supports eligibility and continuing needs
for speech and language resource services. The Receptive Index score (53) falls within the very low educational range, as does the Expressive Index score (59), indicating a severe language disorder of the mixed receptive–expressive type. The Language Content score (60) falls within the very low educational range, as does the Language Structure score (58). Neither the Modality Index (Receptive versus Expressive) nor the Content Index (Language Content versus Language Structure) scores differ significantly ($p > .05$). The Working Memory Index (72) is in the low to marginal educational range, and while it represents an area of relative strength, it appears inadequate for successful compensation. The supplementary subtests showed performance within the typical range for Phonological Awareness (51; criterion > 24), Word Associations (24; criterion > 13), but indicated difficulties in the area of Pragmatics (108; criterion > 125). The CELF-4 RAN time for color–shape combinations was significantly slower than typical (204 s; criterion < 135 s), indicating highly significant attention, working memory, set-shifting, and verbal automaticity deficits. In other words, the student’s language and communication difficulties can be related to inadequate acquisition of content and structural linguistic rules in

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**TABLE 4.3** Overview of CELF-4 Core language and Index Scores (Age 8 Years 0 Months)

<table>
<thead>
<tr>
<th>CELF-4 Index scores</th>
<th>Standard score</th>
<th>Confidence interval (90%)</th>
<th>Percentile rank</th>
<th>Educational performance range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language</td>
<td>56</td>
<td>51–62</td>
<td>0.2</td>
<td>Very low</td>
</tr>
<tr>
<td>Receptive Index</td>
<td>53</td>
<td>46–60</td>
<td>0.1</td>
<td>Very low</td>
</tr>
<tr>
<td>Expressive Index</td>
<td>59</td>
<td>53–65</td>
<td>0.3</td>
<td>Very low</td>
</tr>
<tr>
<td>Language Content</td>
<td>60</td>
<td>54–66</td>
<td>0.4</td>
<td>Very low</td>
</tr>
<tr>
<td>Language Structure</td>
<td>58</td>
<td>51–65</td>
<td>0.3</td>
<td>Very low</td>
</tr>
<tr>
<td>Working Memory</td>
<td>72</td>
<td>64–80</td>
<td>3</td>
<td>Low to marginal</td>
</tr>
</tbody>
</table>

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**TABLE 4.4** Overview of WISC-IV IQ and Index Scores (Age 8 Years 0 Months)

<table>
<thead>
<tr>
<th>WISC-IV Index scores</th>
<th>Standard score</th>
<th>Confidence interval (90%)</th>
<th>Percentile rank</th>
<th>Performance range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension</td>
<td>89</td>
<td>84–95</td>
<td>23</td>
<td>Average normal</td>
</tr>
<tr>
<td>Perceptual Reasoning</td>
<td>106</td>
<td>99–112</td>
<td>66</td>
<td>Average normal</td>
</tr>
<tr>
<td>Working Memory</td>
<td>88</td>
<td>83–95</td>
<td>21</td>
<td>Average normal</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>65</td>
<td>62–77</td>
<td>1</td>
<td>Very low</td>
</tr>
<tr>
<td>Full-Scale IQ</td>
<td>85</td>
<td>81–90</td>
<td>16</td>
<td>Average to marginal</td>
</tr>
</tbody>
</table>

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the presence of low to marginal working memory abilities, executive dysfunction (i.e., attention, implicit working memory for visual input, set-shifting) and deficits in verbal automaticity. In this case, the RtI process would be expected to identify the severity of the language disorders at Tier I and this should have resulted in referral for repeated norm-referenced language assessment (Tier III).

The student’s WISC-IV Full-Scale IQ (85) is within the marginal to average range, but this measure does not describe the student’s cognitive strengths, weaknesses or potential for learning. The student’s Perceptual Reasoning (106) is significantly higher than Verbal Comprehension (89), indicating nonverbal reasoning abilities that may assist in building language and communication competence and developing adaptive compensatory strategies. The differences between the index scores for Verbal Comprehension and Processing Speed (24 points); Perceptual Reasoning and Processing Speed (41 points); Perceptual Reasoning and Working Memory (16 points) and Processing Speed and Working Memory (23 points) were all significant \( (p < .05) \). In other words, this student presents a complex picture of cognitive strengths and weaknesses with clear evidence of executive dysfunction. The very low Processing Speed Index (65) suggests a need for extensive classroom accommodations in form of use of basic technology (e.g., audio taping; word processing) and added time for completing tests and projects.

This student would meet discrepancy criteria between cognitive and language abilities for continuation of language resource services. However, the LI are severe enough to warrant continued intervention to establish linguistic competence. In relation to language intervention, the student’s relative strengths in Perceptual Reasoning should be used to develop semantic networks and abstract concepts, as well as structural linguistic (sentence transformation) and pragmatic rules for communicating in context. The use of linguistic structures for communication in context should be developed to a level of automaticity to compensate for working memory and verbal fluency deficits. The nonverbal reasoning strengths should also be activated to develop executive functions (e.g., planning and organization) and compensatory strategies for communication and real-time performance (e.g., studying, working). Visual supports (e.g., pictures, conceptual maps, diagrams, and other organizational structures) and cognitive approaches (e.g., mediated learning, conceptual mapping, and cognitive mediation) should also be used to strengthen critical thinking and the integration and internalization of new knowledge. The very low performance on measures of processing speed, including visual memory, visual discrimination and visual-motor integration, suggests that the students may benefit from accommodations such as extended time for tests and tasks and introduction to basic technology in preparation for producing written products at the higher grades.

**Case Study C: Female Age 12 Years 9 Months**

This study is of a 12 year 9 months old girl with diagnosed language disorders and learning disabilities. The student was administered the TOLD-I:3
(Hammill & Newcomer, 1997) at age 9 and obtained a listening standard score of 94, speaking standard score of 68, and total standard score of 79. Her test scores on the WISC-III indicated a significant discrepancy between Verbal (92) and Performance IQ (126). The student received special education services with emphasis on reading and writing at the time of testing. The CELF-4 Core Language and Index scores are presented in Table 4.5 and the WISC-IV Index scores in Table 4.6.

This student’s CELF-4 Core Language score (87) places her performance in the marginal to average educational range. The overall performance barely supports her eligibility for continuing language intervention. The Receptive Index (93) indicates performance within the average educational range, while the Expressive Index (77) places her performance in the low to marginal educational range. The Language Content Index (78) also places the student’s performance in the low to marginal range. In contrast, the Language and Memory Index (92) places her performance within the average range. The Modality (Receptive versus Expressive) and Content Index scores (Language Content versus Language & Memory) both differ significantly ($p < .05$). In other words, there are obvious

<table>
<thead>
<tr>
<th>CELF-4 Index scores</th>
<th>Standard score</th>
<th>Confidence interval (90%)</th>
<th>Percentile rank</th>
<th>Educational performance range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language</td>
<td>87</td>
<td>81–93</td>
<td>19</td>
<td>Marginal to average</td>
</tr>
<tr>
<td>Receptive Index</td>
<td>93</td>
<td>86–100</td>
<td>32</td>
<td>Average</td>
</tr>
<tr>
<td>Expressive Index</td>
<td>77</td>
<td>70–84</td>
<td>6</td>
<td>Low to marginal</td>
</tr>
<tr>
<td>Language Content</td>
<td>78</td>
<td>71–85</td>
<td>7</td>
<td>Low to marginal</td>
</tr>
<tr>
<td>Language Memory</td>
<td>92</td>
<td>85–99</td>
<td>30</td>
<td>Average</td>
</tr>
<tr>
<td>Working Memory</td>
<td>97</td>
<td>87–107</td>
<td>32</td>
<td>Average</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WISC-IV Index scores</th>
<th>Standard score</th>
<th>Confidence interval (90%)</th>
<th>Percentile rank</th>
<th>Performance range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Comprehension</td>
<td>87</td>
<td>82–93</td>
<td>19</td>
<td>Average to marginal</td>
</tr>
<tr>
<td>Perceptual Reasoning</td>
<td>102</td>
<td>95–108</td>
<td>55</td>
<td>Average normal</td>
</tr>
<tr>
<td>Working Memory</td>
<td>110</td>
<td>103–116</td>
<td>75</td>
<td>High average</td>
</tr>
<tr>
<td>Processing Speed</td>
<td>97</td>
<td>90–105</td>
<td>42</td>
<td>Average normal</td>
</tr>
<tr>
<td>Full-Scale IQ</td>
<td>98</td>
<td>94–102</td>
<td>45</td>
<td>Average normal</td>
</tr>
</tbody>
</table>
modality- and content-related strengths and weaknesses. Thus, receptive language skills are superior to expressive language skills and memory for spoken language is superior to language content acquisition. The student’s Working Memory Index (97) is within the average range and this explains why receptive and language memory abilities are areas of relative strengths for this student. The supplementary subtests showed performance outside the typical range for Phonological Awareness (60; criterion > 67), Word Associations (18; criterion > 30), and Pragmatics (83; criterion > 142). The RAN time for color–shape combinations was in the slower-than-typical range (93 s; criterion < 75 s). The marginal phonological awareness, verbal fluency and severely slowed RAN cognitive speed (i.e., perceptual processing speed + cognitive overhead imposed by demands on executive attention, visual working memory, and set shifting) concur with the student’s difficulties in reading and writing. An RtI process would be expected to identify the literacy deficits at Tier I, and the student would probably have been put through procedures associated with Tiers II and III. The final outcome would be expected to lead to recommendations for special education services for reading and writing. The deficits in the acquisition of language content (semantics) and skills that are basic to literacy (i.e., phonological awareness and visual working memory) might have been overlooked, however.

The student’s WISC-IV Full-Scale IQ (87) places her performance within the average to below average range. The profile of index scores, however, points to specific strengths and weaknesses among cognitive abilities. Notably, the differences between (a) Perceptual Reasoning (102) and Verbal Comprehension (87), (b) Working Memory (110) and Verbal Comprehension (87) and Processing Speed (97) are all significant ($p < .05$). The student therefore shows strengths in perceptual/nonverbal reasoning and verbal Working Memory, which may support further development of expressive language skills and language content. The CELF-4 Core Language and WISC-IV Verbal Comprehension scores are generally in agreement and validate the persistence of language disabilities in this student. The test results are complementary in that CELF-4 pointed to visual Working Memory deficits, while WISC-IV indicated adequate verbal Working Memory abilities. CELF-4 also pointed to inadequacies in phonological awareness and fluent retrieval of word associations, a measure of executive functions supported by activation of frontal cortical regions. Application of discrepancy criteria between language abilities and WISC-IV Verbal Comprehension and Perceptual Reasoning measures of cognition would support the continuation of resource services for this student. The areas of weakness in oral language abilities suggest that supportive resources should be expanded to include individualized language intervention in addition to the continuation of current reading and writing resource services. In language intervention, the Perceptual Reasoning and verbal Working Memory strengths of the student should be activated in structured, cognitive approaches. The purpose would be to accelerate concept formation, the development of semantic networks and use of higher-level and abstract language content, as well as of complex linguistic structures and pragmatic competence.
The slower-than-typical RAN speed (CELF-4) suggests that time-added accommodations for verbal and written linguistic responses, academic projects and test taking would be appropriate.

CONCLUSIONS

The strength of the WISC-IV as a tool for broadening the assessment and understanding of students with language disabilities resides in the new model for categorizing and interpreting performances. This model stresses the use and interpretation of index scores, validated by factor analysis, rather than using the traditional verbal versus performance IQ categorization. From the perspective of the speech–language pathologist, this model is attuned to current trends in assessment and differentiation of language disabilities (i.e., SLI versus language difference) and responds to the IDEA mandates for language resources. The new model that identifies strengths and weaknesses in Verbal Comprehension, Perceptual Reasoning, Working Memory, and Processing Speed avoids the tendency for static interpretations of IQ. Instead it supports the value of using language versus cognitive function discrepancy measures for determining eligibility for language resources. In combination with results from language tests, the WISC-IV can point to targets for intervention, developing compensatory strategies and providing classroom accommodations for access to content and curriculum. Without in-depth language assessment, including cognitive referencing, a student’s cognitive strengths might be overlooked and unaccounted for in language and literacy intervention. As a result, valuable avenues for compensation and accommodation and appropriate strategies for language and literacy intervention may not be put to use. Without assessment and integration of relative strengths and weaknesses in language and cognition, as provided by WISC-IV administration, inappropriate placement, statements of Individualized Educational Program (IEP) objectives, provisions for accommodations, selection of intervention approaches and stipulations of expected educational objectives may result. WISC-IV can provide broad-based cognitive referencing and reliable measures of cognitive strengths and weakness that should be shared with and interpreted for speech–language pathologists in educational and clinical settings. The sharing and integration of norm-referenced and naturalistic observations of students with language disorders would be expected to foster inter- and trans-disciplinary collaboration and sharing of responsibilities for intervention across the continuum of special needs.

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4. Language Disabilities


