

Indices of Narrative Language Associated with Disability

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Narratives skills are associated with long-term academic and social benefits. While students with disabilities often struggle to produce complete and complex narratives, it remains unclear which aspects of narrative language are most indicative of disability.

academic language

language sampling

narrative discourse

disability

1. Methods for Identifying Language Disabilities

To identify students with language-related disabilities, SLPs rely heavily on norm-referenced tests (NRTs) ^[1]. NRTs are typically administered using standardized materials, tasks, and procedures under highly controlled conditions that require a child to engage in behaviors that simulate language but are not necessarily the discourse-level language used in authentic contexts. Despite their efficiency and utility for diagnosing disabilities, NRTs are not infallible. For example, kindergartners may perform at their grade level on an NRT despite having weak syntactic complexity and narrative discourse ability ^[2], which can result in the misidentification of students who would benefit from early support. Due to the limitations of NRTs, language sampling is often recommended as an alternative or supplement to NRTs ^{[3][4]}. It is no surprise that the American Speech-Language-Hearing Association (ASHA) considers language sampling to be an essential part of the speech-language pathologists' (SLPs) assessment process ^[5].

Language sampling involves the audio (or video) collection of a child's language. Once a sample has been transcribed, it can be analyzed for specific language features of interest ^[6]. The inclusion of a language sample when determining disability has many clinical benefits. SLPs can examine a child's language as it is used in a meaningful context. Typical language sampling tasks such as play or storytelling have similar processing demands to what students encounter in everyday routines ^[7]. Because language sampling can occur in contexts in which spontaneous language is generated, it has superior ecological validity, which makes it useful for informing intervention and goal development ^{[8][9][10][11][12]}. Language sampling is also a sensitive method for identifying language disabilities across age groups and cultures ^{[8][9][13][14]}. Therefore, the current best practice for SLPs is to augment the information obtained from NRTs, when their use is mandated, with a more culturally relevant and authentic assessment of students' oral language use in meaningful contexts such as language sampling ^{[8][15][16]}.

2. Narrative Language Sampling and Analysis

Language can be sampled in different contexts that include conversation and expository and narrative registers. Researchers have known for years that narrative language has a uniquely powerful influence on many academic repertoires. This is because narratives are constructed from the complex literate language that is needed in academic settings. In fact, narratives are commonly used to elicit the complex language of school-aged students [17][18][19][20]. Additionally, narratives are common tools for social engagement. For example, students tell stories about their daily interactions and experiences. Because of their academic and social relevance [21][22], narratives are suitable for language sampling.

Narrative language sampling allows clinicians to capture a snapshot of a child's true linguistic ability, but the manner in which it is quantified, coded, or measured has the greatest impact on the decisions that can be made [4][10][23]. Regarding the constructs of what is measured, narrative samples are often conceptualized according to their content (named "macrostructure" in some studies), and their form ("microstructure"). At the macro level, story grammar refers to the rules for ordering and grouping the narrative content, and this variable is usually characterized by the inclusion and clarity of story grammar elements. This is more indicative of the narrative content. At the micro level, the complexity of the sentences and the novelty of the words used to tell or retell the story are considered [24][25][26][27]. The examination of narrative language at the word and sentence level aligns more closely with the form of language. Both content and form can be quantified in the same language sample and both types of analysis contribute to the overall story quality [28]. However, the time and skill required to analyze both may be unreasonable for busy school-based SLPs. Therefore, it is prudent to explore the extent to which content and form variables are useful and/or necessary.

Because measures of content and form reflect linguistic proficiency, they have been used to differentiate students with language disabilities from students with typical language development [27][29]. As the language production of high-quality narratives demands discourse-level content knowledge, linguistic knowledge, and word knowledge [30][31][32], scholars expect students with disabilities to produce narratives of a reduced quality with respect to content and form indices. This is reflected in the research on the narrative language performance of students with and without disabilities.

3. Indices of Narrative Form and Their Relation to Disability

There is a large corpus of research suggesting that narrative form is useful for identifying language disability [33][34]. Narrative language form is most often ascertained by quantifying a child's inclusion of the grammatical features of complex language [24][26][27][35]. The commonly reported measures in the literature include indices for grammaticality, lexical diversity, and syntactic complexity [36][37]. The evidence for each of these indices for identifying disability is described in the sections below.

3.1. Grammaticality

Grammaticality is a measure of grammatical errors in each C-unit or T-unit (e.g., ungrammatical verb forms, ungrammatical pronouns, and ungrammatical morphemes). There is some consensus that grammatical errors are

a persistent problem in school-aged students with DLD, as reported in multiple studies. The proportion of grammatical errors in C-units has been found to be significantly different in DLD children compared to their typically developing peers in the second [38][39][40] and fourth grades [38]. However, the differences between studies are considerable. Focusing only on the directly comparable age group within second grade, ref. [40] documented a 49% error rate difference between children with and without DLD, while ref. [39] reported a 23% difference, and ref. [38] found only an 8% difference for the same age group. It is well documented that grammatical errors in the narratives of students with DLD do not disappear. Rather, weaknesses in narrative production continue, and possibly worsen, as language demands increase [41].

For older children, between the ages of 9 and 12 years old, and the proportion of grammatical errors per T-Units, ref. [42] found a 41% error rate difference between 20 students with and 20 without DLD. Similarly, ref. [29] found a 24% error rate difference between 11-year-olds with and without DLD.

3.2. Lexical Diversity

Even when other measures exist, the Number of Different Words (NDW) is the measure that has been used consistently in the literature to evaluate differences in lexical diversity in narrative production between students with and without disabilities, and it is routinely computed using automatic language analysis software such as Systematic Analysis of Language Transcripts (SALT) 20 software [43]. There is also converging evidence that NDW is a reliable indicator for the differentiating of students with and without language disorders up to fourth grade. Ref. [38] found that students with DLD in second and fourth grade generated narratives with a significantly reduced NDW, compared to the TD grade-level matched students. Similarly, ref. [44] found that the NDW from narrative language samples collected from 77 students with DLD between the ages of 4 and 9 years old was lower (85.1 NDW at age 4 and 161.2 NDW at age 9) than the NDW produced by 300 typically developing students (127.7 NDW and 169.9 NDW at the same ages, respectively). The NDW group differences appear to shrink with age, which is consistent with [29] finding that 11-year-old children with DLD and their age-matched controls do not differ significantly in NDW production (56.1 and 60.6 NDW, respectively) [44].

3.3. Syntactic Complexity

Syntactic complexity has been measured in several different ways. In some studies, they have used the Subordination Index (SI), or clausal density, which is a measure of the number of clauses in each C-unit, an independent clause with its modifiers [45]. Others have used the proportion of complex coding units (C- or T-units) in relation to the total number of coding units.

Of the studies cited above, some did not find significant differences in SI between children with and without DLD in the second and fourth grades [38], nor in 11-year-olds [29]. Meanwhile, in other studies, significant differences among 7- to 10-year-olds were found [40]. Other researchers using the proportion of complex coding units (C- or T-units) have found that the proportion of complex (and correct) T-units predicted DLD in children aged 9 to 12 years [42]. In the same developmental window, ref. [46] found significant differences in the proportion of complex sentences produced by students in DLD and TD groups across the ages of 4 to 12 years old. Although the students

with DLD made improvements with age, their performance remained lower than TD students, even until the age of 12 years [46].

4. Indices of Narrative Content and Its Relation to Disability

Narrative content has been primarily analyzed using the story grammar framework [47], or a holistic evaluation of the plot [48]. Although both have been used in the SLP literature, the bulk of the recent research relies on the story grammar approach due to its superior replicability [49][50][51][52]. Story grammar refers to key components of a story, including the sequence of events, and the episodic structure of a story [53]. The canonical elements include the character, setting, problem, plan, attempt, consequence, emotion, and ending. Although researchers have used a variety of methods when analyzing narrative samples, such as scoring rubrics and computerized software after the sample is segmented and coded [4], quantifying the inclusion and clarity of story grammar has not been fully automated. It generally requires a human to rate the extent to which elements are present in the sample and how understandable they are.

In a seminal study using the story grammar approach, ref. [54] compared the narratives of 40 students with and without DLD in 10-year-olds. Students in the DLD group retold significantly fewer story grammar elements compared to TD students, $F(1, 38) = 7.71, p < 0.05$. Students with DLD also retold fewer complete story episodes than the group without DLD, $t(38) = 2.02, p < 0.05$ [54]. Using a similar methodology, ref. [40] replicated the story elements findings in 7- to 10-year-olds with an effect size of $d = 1.5$, which indicated a large effect by itself and in relation to the literature [55].

Depending on the measure used, some studies report a ceiling effect. Ref. [56] examined a normative sample of 300 TD students and 77 students with DLD, ages 4 to 9 years, using the Edmonton Narrative Norms Instrument (ENNI) [57] for differences in story grammar. The inclusion of story elements was discriminated between the students for all age groups except at age nine. A ceiling effect, but with older children, was also shown in the study by [46] where story elements were distinguished between TD and children with DLD in age ranges of 4 to 6 years, 7 to 9 years, but not in the 10 to 12 years age range. The findings of significant differences up to nine years of age were also replicated in the study by [38], using a modified version of a story grammar rubric to score for elements and plot complexity called narrative quality. This body of research suggests that story grammar elements and episode complexity can be used to differentiate students with DLD from typically developing students in the lower primary grades, but that there are potential ceiling effects in later grades.

5. Comparing Narrative Form and Narrative Content in Relation to Disability

Even when several of the studies examined narrative form and content differences between TD students and students with DLD, only one study directly compared the relative strengths in form and content; ref. [40] compared narratives generated by two different cohorts of students evenly classified into children with and without DLD: a

group of 26 9-year-olds, and a group of 40 7-year-old students. Students with DLD from both groups displayed distinct patterns of strengths and weaknesses. Using measures from the Test of Narrative Language (TNL) [58], approximately 27 out of the 33 students with DLD produced stories with either strong content and reduced grammatical accuracy or the opposite pattern; the six remaining students showed a balanced profile (i.e., strong in both, or low in both). These findings indicate that students with DLD face challenges when it comes to producing either the content or the form aspects of narratives, or both [40]. This also suggests that there may not be a single index that predicts language disability reliably.

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