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Knowledge and Training in Language Sample Analysis of US Speech-Language Pathology Graduate Students

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Knowledge and Training in Language Sample Analysis
of US Speech-Language Pathology Graduate Students

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in Communication Sciences and Disorders

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ABSTRACT

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Purpose: Speech-language pathologists (SLPs) play an integral role in identification and treatment of developmental language disorders (DLD). Best practices include the use of language sample analysis (LSA) as part of a comprehensive evaluation. However, LSA requires a specific set of foundational morphological and syntactic knowledge. Previous studies have shown a knowledge gap for both SLPs and SLP graduate students for other areas of morphosyntax and phonology. This study examined the language analysis skills of current SLP graduate students on a test of Mean Length of Utterance (MLU) analysis and Clausal Density (CD) and whether there were possible factors associated with performance outcomes.

Method: A national web-based survey was distributed to accredited US SLP graduate programs to disseminate to their students. From the 37 programs which participated, 239 individual students completed they survey. Respondents answered questions about their experiences with LSA, didactic course instruction, and completed a skills test that examined their knowledge of MLU, grammatical morphemes, independent and dependent clauses, and CD. The students' previous experiences with LSA were examined as potential factors affecting performance outcomes.

Results: The majority of students (88.3%) failed to obtain a mastery level of 80% on MLU skills and none of the students achieved a mastery level of 80% in the CD skills. Previous coursework and general LSA experience had no effect on scores while the use of specific LSA tools and protocols had a significant relationship.

Conclusion: The lack of mastery for MLU and CD skills by the SLP graduate students indicate that the ability to reliably analyze language samples is not present. Current instructional practices at the undergraduate and graduate level would indicate that students lack the clinical skills to accurately evaluate language samples for the morphosyntactic structures that are clinical markers of DLD. Implications include the examination of current graduate education and continuing development for practicing SLPs.

DEDICATION

This dissertation work is dedicated to all of the wonderful creatures who have supported me and pushed me to finish even when I didn't think I could.

To my husband, I will never be able to express my gratitude for all the time and effort you have put into keeping the ship running so that I could pursue my degree. It has truly been a labor of love.

To my children, Alex, Leo, and Max, you have always been a source of motivation when I had nothing left to give. I hope watching my progress has served to encourage you to pursue your paths with enthusiasm.

To Taniya, the opportunity to know you has been a greater benefit than even the diploma can provide. I am proud of your accomplishments and look forward to many more adventures.

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Finally, this dissertation is dedicated to the memory of my father, Robert Cornaglia. You may not have been able to see the end, but your love and the pure enjoyment you took in watching my journey made it all worth it.

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LIST OF ABBREVIATIONS

CD – Clausal Density

DLD – Developmental Language Disorder

EBP – Evidence Based Practice

LI – Language Impairment

LSA – Language Sample Analysis

MLU – Mean Length of Utterance

SLI – Specific Language Impairment

SLP – Speech-Language Pathologist/Pathology

Knowledge and Training in Language Sample Analysis

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Introduction

The identification and treatment of language deficits and disorders is one of the fundamental purposes of the field of speech-language pathology. Language difficulties affect individuals across numerous conditions and throughout their lifetime. The ability to complete a thorough evaluation of language skills and implement effective language intervention is paramount to meeting the needs of clients, regardless of setting. To ensure that SLPs are competent, it is necessary to ensure speech-language pathology graduate students are adequately prepared to assess and treat language concerns.

Language is described as the integration of three general components: form (phonology, morphology, syntax), content (semantics), and use (pragmatics). There are numerous areas where breakdowns can occur in an individual's language system and throughout one's lifespan. A developmental language disorder is present at birth and represents a significant impairment in the acquisition and use of language across modalities due to deficits in comprehension and/or production. Developmental language impairments (LIs) persist across the lifespan, although the symptoms may change over time and depend on the demands of the environment. When a language disorder is the primary disability, it is referred to as a developmental language disorder or specific language impairment (DLD/SLI; Bishop, 2014; Bishop et al., 2017).

DLD/SLI (referred to as DLD for the remainder of this paper) is one of the most prevalent disorders of school-age children. The reported percentage of children aged 3-17 with DLD in the US is estimated to be between 7%-10% (average 7.40%) (Tomblin et al., 1997). In addition to this primary language disorder, many other neurodevelopmental and acquired disorders frequently include a secondary LI such as autism spectrum disorder, intellectual

disabilities, developmental disabilities, attention deficit hyperactivity disorder, traumatic brain injury, psychological/emotional disorders, and hearing loss (see Bax & Gillberg, 2011; Chow, 2018; Halliday et al., 2017; Hollo et al., 2019; Hughes et al., 2016, 2017; Marrus & Hall, 2017; May et al., 2018; Pickles et al., 2016; Rapin, 2010). Language impairment incidence ranges from 13.6%-47.6% in children 3-10 and from 23.2%-48.6% in children 11-17 (Black, 2015; Rosenbaum et al., 2016). Because of the diverse causes of LI, there may be a negative impact on the recognition, progression, and treatment for individuals with LI.

The effects of an LI can persist into adolescence and adulthood with a variety of consequences (Langbecker et al., 2020). Research has indicated that individuals with LI have an increased likelihood of difficulties with literacy (Catts et al., 2014), mental health (Helland et al., 2020; Valera-Pozo et al., 2020), lower socio-economic status (Pluck et al., 2020), and other adverse social and academic outcomes (Dubois et al., 2020). Furthermore, a history of LI significantly increases the rate of incarceration (Winstanley et al., 2018).

Therefore, because of the severity of the potential outcomes of an LI diagnosis, it is important for there to be accurate identification and implementation of effective treatments. Treatment has been observed to lessen the severity of primary symptoms and mitigates the long-term effects on educational/occupational achievement in adolescents and adults (Dubois et al., 2020). Given the prevalence of LI in school-aged children and the academic consequences, one of the professional groups who work with this population is the school-based SLP. In a recent survey by the American Speech-Language-Hearing Association (ASHA, 2020), 91% of school-based SLPs reported providing intervention for language disorders which included semantic, morphologic, and syntactic deficits (i.e., average of 22 students). These SLPs provided language intervention to children who have primary language deficits as well as language deficits

secondary to a primary diagnosis. For example, SLPs also provided language intervention to

children with autism spectrum disorder (91.7%), children with traumatic brain injuries (13.2%),

and children with hearing loss (45.5%). As a result of the high frequency of children receiving

language intervention, school-based SLPs need to be well-versed in the best-practices for

language assessment and intervention in order to effectively serve this population.

   Due to the prevalence and persistent effects of LI, accurate and early identification is

essential to positive outcomes. While there are several standardized tests designed to identify

children who have language difficulties (e.g., CELF-5[1], CASL-2[2], OWLS II[3], TEGI[4], TILLS[5],

TOAL-4[6], and TOLD-4[7]), none are currently sensitive or extensive enough on their own to

sufficiently describe the functional language skills of school-aged children (Kaderavek, 2015;

Pawlowska, 2014). These tests typically evaluate what children know about language but not

how they perform in the academic setting relative to their language skills (Costanza-Smith, 2010;

Heilmann et al., 2020). Since there is no current research describing the relationship between

standardized language tests and classwork, it is often unclear how the LI is impacting a student's

ability to access the curriculum or complete academic tasks regardless of the outcome of

standardized assessment (Ebert & Scott, 2014; Nippold et al., 2014). Furthermore, individuals

with LI present as a highly heterogenous group, with large variations in severity and symptoms;

therefore, normative data must be interpreted carefully (see Leonard, 2014, and Tomblin et al.,

2014).

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[1] Clinical Evaluation of Language Fundamentals-5 (Wiig et al., 2013)
[2] Comprehensive Assessment of Spoken Language-2 (Carrow-Woolfolk, 2017)
[3] Oral and Written Language Scales II (Carrow-Woolfolk, 2011)
[4] Rice Wexler Test of Early Grammatical Impairment (Rice & Wexler, 2001)
[5] Test of Integrated Language and Literacy Skills (Nelson et al., 2016)
[6] Test of Adolescent Language-4 (Hammill et al., 2007)
[7] Test of Language Development-4 (Newcomer & Hammill, 2008)

Researchers, test authors, and state education agencies have all advocated using a variety of assessments when evaluating the language abilities of children suspected of having LI (Brandel & Petersen, 2018; Kaderavek, 2014; West Virginia Board of Education, 2017; Wiig et al., 2013; Zimmerman et al., 2011). Additionally, best practice would recommend that clinicians use psychometrically sound measures to make decisions about language skills. Given the limitations of standardized tests, clinicians must consider assessment tools beyond standardized tests to improve diagnostic accuracy. Comprehensive language evaluations should not rely primarily on norm-referenced assessment instruments to determine a student's eligibility for services (ASHA, 2004, 2016; Individuals with Disabilities Education Act, 2004). This is true for both formal and informal analyses since language performance may be influenced by the context of the testing environment rather than by actual skill level (Eisenberg et al., 2018; IDEA, 2004). Additionally, a number of studies have noted that structured evaluations (i.e., standardized tests) correlate more with each other than they do with unstructured daily language activities such as following classroom directions, interacting with teachers and peers, and communicating their needs throughout the day (Dethorne et al., 2005; Harlaar et al., 2016; Ukrainetz & Blomquist, 2002). One way to improve the identification of children with LI is to supplement norm-referenced, standardized tests with activities which align with how language is utilized within the home and school environment such as language sample analysis using research-tested activities (Costanza-Smith, 2010; Eadie et al., 2014; Ebert & Scott, 2014; Heilmann et al., 2020).

Language Sample Analysis

The term 'language sampling' is often used to refer to a wide range of activities designed to elicit continuous language from individuals across a variety of genres (i.e., conversation, narrative, expository or persuasive). However, this term may also be used to refer to as any

assessment that elicits or observes discourse abilities within a natural context while utilizing a set of guidelines or procedures for administration so that comparisons to a normative database can be done (Westerveld & Claessen, 2014). For the purposes of this study, LSA is defined as the process of systematically examining a transcription of oral or written language. Transcription provides the SLP an opportunity to examine multiple domains of expressive language within the same context. These analyses can happen at the morpheme, word, sentence, and/or discourse level. The benefit of LSA is that it examines dimensions of language in their natural context that are also included in typical standardized assessments but in isolation. Additionally, LSA provides detailed information about linguistic behaviors not as easily observed during norm-referenced standardized language tests. For example, filled and silent pauses, repetitions, revisions, and word and utterance-level errors are often observed at higher rates among children struggling to develop age-appropriate language skills. These behaviors are noted in LSA but are unable to be examined, compared to same age peers with typical language, or scored on a standardized test (Schuele, 2010). Therefore, LSA evaluates aspects of language and communication behaviors present in those with language disorders that are not assessed by standardized tests but provide important information about a child's ability to use language in real-world situations (Heilmann et al., 2020).

Another difference between norm-referenced standardized tests and language samples is that norm-referenced standardized tests are not designed or recommended to be used to identify areas for treatment, whereas LSA can be helpful in guiding treatment decisions. To evaluate the effectiveness of treatment, SLPs should understand the child's skill using language spontaneously in their environment to meet their needs (World Health Organization, 2007). Data collected from LSA may be used for a variety of purposes, including the identification of a

disorder, when determining eligibility for services, guiding decisions related to intervention approaches, identifying appropriate areas of language to target in treatment, and providing a context to examine the effectiveness of interventions that are provided (Betz et al., 2013; Dockrell & Marshall, 2015; Fulcher-Rood et al., 2018; Paul & Norbury, 2012). Previous research also suggests that a diagnosis of LI in young children may be more accurately accomplished through the use of quantitative LSA measures than through standardized tests (Colozzo et al., 2011; Costanza-Smith, 2010; Owens & Pavelko, 2017). Therefore, LSA provides a more complete picture of language skills in a contextualized context (i.e., conversation, narration, or expository tasks) that is invaluable to identifying a LI and selecting the target behavior(s) for treatment (Ebert & Scott, 2014; Paul & Norbury, 2012; Schuele, 2010).

Given the significant weight of assessment activities when determining an individual's eligibility for special education services, it is important that SLPs employ evidence-based decision making when selecting assessment activities to use in the diagnostic process (Betz et al., 2013). Once the elicitation task is selected for the language sample that will be analyzed, the SLP must administer the language sampling activity and then systematically evaluate the language product provided by the students on a number of linguistic measures such as lexical diversity (the extent of a child's functional vocabulary), use of grammatical morphology (how the child uses grammatical morphemes to adapt the function of words), and use of complex syntax (how the child uses phrases and clauses). Although methods of language analysis continue to be refined (e.g., MacWhinney et al., 2020; McCarthy & Jarvis, 2010), all measures of lexical diversity (i.e., NDW[8], TNW[9], and TTR[10]) as well as grammatical morphology (e.g.,

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[8] Number of different words
[9] Total number of words
[10] Type to token ratio

Mean Length of Utterance) require the same skill by the SLP: consistency in identification of word roots and their inflectional morphemes. One particular complication when measuring lexical diversity is the inconsistent spelling of word roots, which can inflate measures such as the total number of words or number of different words. Accurate measurement of lexical diversity requires root words to be transcribed separately from the grammatical bound morphemes. Therefore, SLPs must be able to identify and count bound grammatical morphemes, including verb inflections (e.g., progressive -ing, third-person singular -s, regular past tense -ed), regular plurals, possessives, and contractions. For example, the root word of "flying" and "flies" should be considered one lexical item: "fly." To correctly identify the grammatical morphemes, "flying" should be marked as "fly + progressive -ing" and "flies" should be marked as "fly + third-person singular -s". This allows for the accurate identification of lexical items and morpheme use.

To complicate this process, there is a need to differentiate bound grammatical structures from derivational morphology such as gerunds and participles which are frequently spelled in the same manner in English (Heilmann, 2010). For example, in the sentence: "The bird is flying in the sky" "flying" is a verb in the progressive tense. Therefore, the -ing should be separated as a grammatical morpheme. However, in the sentence: "There is a flying bird in the sky," "flying" is an adjectival participle and -ing is now considered a derivational morpheme. Only after these structures have been correctly identified, can the root words be counted independent of their modifiers allowing for total word counts, different word counts, and bound morpheme usage to be reliable. Language sample measures that specifically evaluate tense and agreement markers can have clinical significance because children with LI have particular difficulty using tense and agreement morphemes (Guo & Schneider, 2016; Leonard, 2014; Rice & Wexler, 1996; Tager-Flusberg et al., 2009). Children with LI are more likely to omit tense morphemes (Rice &

Wexler, 1996) and difficulty producing and comprehending tense morphemes may persist into

school ages (Windsor et al., 2000) or even adulthood (Poll et al., 2010).

Other common measures of overall sentence complexity calculated in LSA are mean

length of utterance (MLU, in words or morphemes), and the extent to which sentences are simple

or complex (clausal density, CD) (Scott, 2020). Language ability has been observed to have a

positive correlation with both MLU and CD in that children with LI use shorter sentences with

less clausal subordination than their typically developing peers (Koutsoftas & Gray, 2012;

Nelson & Van Meter, 2007; Scott & Windsor, 2000). The ability to produce complex sentences

containing subordinate clauses is essential to language and social development because it allows

the speaker to be clear and precise (Tomblin & Nippold, 2014; Wisman Weil & Schuele,

2019). In addition, the use of complex syntax is present within common core state standards for

early elementary school (National Governors Association Center for Best Practices (NGACBP)

& Council of Chief State School Officers (CCSSO), 2010). Second graders are expected to

"produce, expand, and rearrange complete, simple, and compound sentences" (NGACBP &

CCSSO, 2010, CCSS.ELA-Literacy.L.2.1.F). Third graders are expected to "form and use

comparative and superlative adjectives and adverbs, and choose between them depending on

what is to be modified," "use coordinating and subordinating conjunctions," and "produce

simple, compound, and complex sentences" (NGACBP & CCSSO, 2010, CCSS.ELA-

Literacy.L.3.1.G-I). Therefore, students with LI who are struggling with complex syntax are at

risk for falling behind on benchmarks.

One method used to evaluate students' mastery of these complex skills is to calculate

MLU and CD within language samples, oral and written. To accurately calculate MLU and CD,

clear and consistent utterance boundaries are necessary. However, in connected speech and

written samples, individual utterances do not always have clear boundaries. Specifically, to calculate an individual's clausal density and MLU, the analysis requires SLPs to be able to separate utterances and sentences into communication-units (C-units; Loban, 1976). Each C-unit includes an independent clause and its dependent clausal modifiers. Therefore, SLPs need to be able to identify a clause and to differentiate between independent and dependent clauses since each independent clause is segmented to be its own C-unit regardless of punctuation or phrasing. To further complicate this skill, the SLP needs to distinguish clauses from other complex structures such as infinitive or participial phrases (Heilmann et al., 2020).

Many tools and protocols have been developed to aid in the completion of LSAs (e.g., SALT[11], SUGAR[12], CLAN[13]). While these tools are helpful, SLPs must understand the language structures being analyzed and how the analysis is being done. They have to understand enough to follow protocols consistently to ensure the accuracy of analyses (Heilmann et al., 2008; Miller, 1981; Miller et al., 2016). Table 1 includes a list of morphological and syntactic knowledge needed for accurate transcription for LSA as suggested by the literature. Following the rules for coding ensures the fidelity of the transcript, allowing words, morphemes, and utterances to be precisely counted. The computer programs which have been developed to date can only reliably calculate what is included in the transcript and accurately segmented and coded.

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[11] Systematic Analysis of Language Transcripts (Miller & Iglesias, 2019)
[12] Sampling Utterances and Grammatical Analysis Revised (Pavelko & Owens, 2017)
[13] Computerized Language Analysis (MacWhinney, 2018)

Table 1

Structures SLPs Need to Know to Complete LSA

	Structure	Reference
Grammatical Morphemes		
	tense markers (-ed, -ing, 3ʳᵈ person -s)	Bishop, 1994; Brimo & Henbest, 2020; Eisenberg & Guo, 2013; Leonard, 2014; Owens et al., 2018; Rice et al., 2004; Ullman & Gopnik, 1994
	number (plural -s)	Bishop, 1994; Brimo & Henbest, 2020; Leonard & Finneran, 2003; Owens et al., 2018; Rice et al., 2004
	possessives (-'s)	Brimo & Henbest, 2020; Owens et al., 2018
	verb finiteness (gerunds, participles)	Brimo & Henbest, 2020; Leonard & Finneran, 2003; Owens et al., 2018; Rice et al., 2009
	copula auxiliary verbs (be, do)	Beverly & Williams, 2004; Brimo & Henbest, 2020; Eisenberg & Guo, 2013; Leonard, 2014; Owens et al., 2018; Rice et al., 2009
	concatenatives (gonna, hafta)	Arndt & Schuele, 2013; Brimo & Henbest, 2020
	contractions (-'t, -'ll, -'s)	Arndt & Schuele, 2013; Brimo & Henbest, 2020
Derivational Morphemes		Brimo & Henbest, 2020; Casalis et al., 2015; Goodwin et al., 2013; Jarmulowicz & Taran, 2013; Levesque et al., 2019; Marshall & van der Lely, 2007; McCutchen & Stull, 2015
Complex Syntax		Eisenberg, 2003; Owen & Leonard, 2006; Schuele & Wisman Weil, 2004
	coordinating clauses	Arndt & Schuele, 2013; Diessel, 2004; Marinellie, 2004
	subordinating clauses (noun, relative, adverbial)	Arndt & Schuele, 2013; Diessel, 2004; Marinellie, 2004; Owen Van Horne & Lin, 2011 ; Schuele & Dykes, 2005; Schuele & Tolbert, 2001
	participial and gerund phrases	Arndt & Schuele, 2013

Current Use of Language Sample Analysis in Clinical Practice

Despite the research and recommended best practices for language evaluations to combine multiple sources of information such as interviews, observations, standardized tests, and non-standardized activities such as language sampling (ASHA, 2004, 2016; Gallagher & Hoover, 2020; Heilmann et al., 2020), many SLPs do not regularly include LSA in a comprehensive assessment (Pavelko et al., 2016). Recent studies have indicated that the frequency with which LSA is used in everyday practice is relatively low. For instance, Pavelko and colleagues (2016) reported that two-thirds of SLPs reported using LSA, indicating that one-third of SLPs did not use LSA. Additionally, of the 67% of SLPs who reported using LSA, most (55%) reported analyzing less than ten samples per year despite having much larger caseloads of individuals with language disorders.

These findings are similar to Westerveld and Claessen's (2014) observations that, although 90.8% of their respondents reported collecting spontaneous language samples, 11% reported never or rarely listening to the language samples they collected and 11% reported never or rarely transcribing the samples. Forty-nine percent of SLPs transcribed and/or analyzed spoken samples in real time, with 43% of the SLPs relying on audio recordings to assist with transcription. LSA is most likely to be used by SLPs serving preschool and elementary grades than those serving middle- and high-school students and most SLPs limited their LSA efforts to conversational discourse (Pavelko et al., 2016). These findings are problematic in that online (live) transcription is not sufficiently reliable (Evans & Miller, 1999; Furey & Watkins, 2002; Klee et al., 1991) and best practices recommend the use of other discourse types beyond conversational samples (i.e., narrative, expository, persuasive) to elicit complex language structures (Brimo & Hall-Mills, 2019; Nippold, 2016). Surveys also identified that although

SLPs report valuing evidence-based practice, they experienced barriers when implementing evidence-based practice recommendations into clinical practice (Hoffman et al., 2013; Siegel et al., 2010; Vallino-Napoli & Reilly, 2004).

A commonly reported barrier to using LSA was related to transcription practices. Online transcription remains prevalent because transcription of recorded samples was a time-consuming endeavor when many practitioners were trained (Kemp & Klee, 1997). Although the time constraint may have been accurate years ago, the process is much more efficient today due to technological advances (Heilmann, 2010). Improvements in audio recording devices, along with computer programs that replace manual transcription, streamline and standardize the LSA process and assist interpretation (Garbarino et al., 2020; MacWhinney, 2000; Miller & Iglesias, 2019; Miller et al., 2016; Pezold et al., 2020). The recommended sample size has decreased significantly from 100 utterances or more to recordings of 50 utterances or less (Heilmann et al., 2010, 2013; Tucci et al., 2022).

Other reasons reported for SLPs' reluctance in using LSA include: the difficulty in eliciting samples (Oh et al., 2020), the need for more normative data across age groups for comparison, and limited recognition as a valid assessment measure (Pavelko et al., 2016). However, SLPS now have a variety of standardized activities across multiple genres from which to choose that include normative data. CLAN and SUGAR have static normative databases that allow for comparison by age groups and SALT has multiple embedded databases that allow for comparison by age and other demographics (MacWhinney, 2000; Pavelko & Owens, 2017; Tucci et al., 2022). Moreover, language sample measures have been shown in the research as having strong reliability, validity, and sensitivity (Guo & Eisenberg, 2015; Guo & Schneider, 2016; Kazemi et al., 2015; Owens & Pavelko, 2017; Troia et al., 2019).

In contrast to use of LSA, most SLPs reported routinely using standardized assessments. Wilson and colleagues (1991) reported that nearly all SLPs they surveyed (265 of 266) used standardized assessments during a language evaluation. Eickhoff and colleagues (2010) observed that nearly 100% of the surveyed SLPs rated standardized tests as one of the five most important assessment measures and 50% indicated standardized tests were the most important assessment measure. A majority of SLPs have reported that they use English-only standardized tests when assessing multilingual children or monolingual children (Williams & McLeod, 2012; Westerveld & Clasessen, 2014). Researchers have noted that SLPs defer to standardized testing results despite receiving additional information from non-standard measures indicating SLI-inclusive clinical symptoms (Betz et al., 2013; Fulcher-Rood et al., 2018; Selin et al., 2019). Additionally, the severity of standard scores continues to be a significant influence for rates of identification (Records & Tomblin, 1994; Selin et al., 2019). Taken together, these results suggest that although LSA is recognized as an ecologically valid way to assess children's language (Nippold, 2014), many SLPs continue to rely primarily on standardized tests and do not routinely utilize LSA when assessing children when English isn't their first language and the child is suspected of having a language impairment (Caesar & Kohler, 2007; Eickhoff et al., 2010; Owens & Pavelko, 2017; Pavelko et al., 2016; Williams & McCleod, 2012).

Heilmann summarizes these findings succinctly:

"Language sample analysis (LSA) is like flossing your teeth: it's something we all

know we should do, but the majority of us neglect to do so on a regular basis.

And, those that are flossing regularly may not be doing it correctly; are you

sliding the floss up and down each tooth? While there is overwhelming support

from clinical texts, journal articles, and our national organization for the use of

LSA in clinical practice, the reality is that many clinicians do not use it

consistently. And, those who are using LSA may be collecting and analyzing

samples using methods that have not been empirically tested" (2010, p. 4).

Practicing SLPs know that they should be using LSA, but the research indicates that are

frequently not done and when completed the transcription and analysis is done in a manner that

lacks evidence-based methods.

SLP Knowledge and Skills Analyzing Language

While the research supports the use of LSA and the skills needed to complete an LSA

have been delineated, there remains the question of whether SLPs have the requisite skills.

Accurate use of LSA requires SLPs to have knowledge of grammatical structures and proper

training in sample elicitation and transcription. Previous research examining SLPs' and SLP

students' knowledge of language has focused on phonology (Spencer et al., 2008, 2011; Werfel,

2017), morphology (Good, 2019) and syntax (Brimo & Melamed, 2017). Spencer and colleagues

(2008) examined the phonological awareness skills of SLPs in comparison to kindergarten, first-

grade, and special education teachers. The SLPs outperformed the other groups; however, they

still demonstrated gaps in knowledge.

Good (2019) surveyed 105 SLPs employed in a school-based setting on their

morphological awareness and intervention practices. Although 83.5% of those surveyed reported

that they implement written morphological awareness intervention, 67.7% of the SLPs providing

morphological treatment rated themselves as having a moderate or low level of confidence

providing morphological awareness intervention. Another 30.5% (17% were not sure) had not

received graduate coursework on morphological awareness, and 43.8% reported not attending

continuing education on morphological awareness.

Selin and colleagues (2019) surveyed SLPs working with children across various work settings in the United States. The participants were asked to determine whether a child should receive a diagnosis and intervention based on several vignettes. Based on the results of the study, the severity of standard scores was the factor that most impacted clinical decisions regardless of other clinical data. Also, students with a speech sound disorder (with or without LI) were more likely to be recommended to receive intervention than those with LI alone. These findings would indicate that SLPs have higher diagnostic competency for speech sound disorders as compared to LI. Additionally, Selin and colleagues found that these same SLPs acknowledged the need for finiteness marking and verb tense as important treatment goals. However, if these same symptoms are not recognized as inclusionary criteria for LI, there is a risk that potential treatment goals are never implemented. This finding is consistent with outcomes from previous studies of clinical decision making. Studies have shown that decreased MLU measures have limited influence on eligibility and treatment decisions, which is evidence of decreased clinical competency and lack of regard for best practices in LSA and LI assessment (Pavelko et al., 2016; Selin et al. 2019).

Notably, these children with LI, who are known to have significant long-term difficulties, remain unidentified and underserved. Selin et al. (2019) recommended increasing training on the clinical profile for LI and the clinical markers for DLD such as difficulties with verb finiteness and decreased MLU. The proposition is that the improvement of training in diagnostic practices will likely improve competency and the identification of children with LI (Selin et al., 2019).

The introduction of phonetic coursework and transcription training can significantly improve phonemic awareness (Spencer et al., 2011; Werfel, 2017). These results were not consistent, however, for explicit syntax knowledge. Brimo and Melamed (2017) found no

significant difference between preprofessional students who did and did not complete language development coursework on an explicit knowledge of syntax task, which suggests that coursework may not provide enough direct instruction on language structure.

Purpose of Current Study

Scholars on LI have observed a gap between recommendations for best practice and actual practice relative to the use of language samples during evaluation and treatment of LI (Pavelko et al, 2016; Westerveld & Claessen, 2014). Additionally, research has observed that SLPs report a lack of training relative to the skills necessary to reliably analyze the samples that are gathered as being a barrier to the utilization of LSA in clinical practice. Given clinicians' hesitancy to utilize LSA due to the previously identified barriers related to time and knowledge, it is possible that SLPs lack the training during their educational programs to develop and master the skills necessary to complete LSA with confidence (Pavelko et al., 2016). The purpose of this study was to examine the knowledge of pre-professional speech-language pathologists on tasks related to LSA as well as to evaluate whether there are factors that impact their LSA knowledge or skills needed to reliably analyze language samples.

SLPs play a critical role in addressing the needs of students with LI to meet their academic and socio-emotional goals. Diagnosing speech and language disorders in children is a complex process that requires integrating information on speech and language with information on biological and medical factors, environmental circumstances, and other areas of development. In order to adequately serve this role when doing LSA, SLPs need to have explicit knowledge of morphology and syntax. This study aimed to evaluate the knowledge and skill level of current graduate students in speech-language pathology programs relative to morphology (grammatical morphemes) and syntax (clause structure).

Specific morpho-syntactic structures were selected because of their impact on completing an accurate language sample analysis and their importance in distinguishing between individuals with and without a developmental language disorder (Table 1). After establishing this measure of baseline knowledge, information was gathered to examine where specific factors contributed to the pre-professionals' knowledge. Determining which factors contributed to increased knowledge and skills would help graduate programs in speech-language pathology to create a more effective curriculum. One consideration is whether these students have had explicit coursework in language analysis. Undergraduate programs have begun to incorporate what is called "Language Science" into their curriculum. There are various definitions for what this specific course addresses. For example, West Virginia University's 200-level "Language Science" course is listed as the "study of the structure and function of human language," (http://catalog.wvu.edu/undergraduate/schoolofmedicine/csad/#majortext) while George Washington University labels the course as "Language: Structure, Meaning, and Use" and is listed as a "survey of basic linguistic terminology and the components of language structures. Language structure (syntax, morphology, phonology), meaning (semantics), and the use of language as a means of communication among individuals (pragmatics)" (http://bulletin.gwu.edu/courses/slhs/). Clearly, variations in courses exist as well as the fact that in some undergraduate programs a similar course is not available in many undergraduate programs and even fewer classify it as a required course (Schuele, 2021).

In addition to course instruction, it is also imperative to examine the clinical practice experiences of these students. Human understanding comes from not only having knowledge, but more importantly, applying knowledge. Early human understanding was based on modeling actions and decision-making rather than learning facts and rules for relating them (Dreyfus,

1986, p.4). According to the tenets of skills-based education, competence and then mastery are achieved through deliberate practice with formative feedback (Hancock & Brundage, 2010; Henri et al., 2017). SLPs would not be expected to demonstrate mastery of LSA if they were not given an opportunity to practice within the clinical setting. Theoretical understanding of language structure and analysis would likely not be enough. Therefore, LSA instruction needs to extend beyond the classroom and into students' clinical education (Affoo et al., 2020; Allen & Baughman, 2016; Parker & Emanuel, 2001; Wolff et al., 2015).

Research Questions

1. Do graduate students in speech-language pathology master's programs demonstrate mastery of foundational skills needed for language sample analysis?

2. Are there factors that predict students' ability to analyze language samples (i.e., graduate school experience, academic coursework, clinical experience)?

Predictions

Although there is little research on student performance in language analysis tasks, based on similar studies, the expectation was that students would demonstrate limited skills in segmentation of utterances, identifying independent and dependent clauses, and counting grammatical morphemes. Spencer and colleagues (2011) and Werfel (2017) noted low-performance levels in phonemic awareness for phoneme segmentation, identification, and isolation among SLP grad students and practitioners. Similarly, Brimo and Melamed (2017) found low performance levels in syntax knowledge when asked to identify and match clauses. There was reason to suspect, however, that students would perform better on MLU-based tasks such as counting morphemes as compared to identifying clauses for clausal density-based tasks. Selin et al. (2019) observed that SLPs used MLU measures more often than syntax measures

such as clausal density. Therefore, it was predicted that graduate students who become SLPs would also perform better on the tasks related to MLU as compared to clausal density.

Relative to factors which impacted student performance on the LSA tasks, it was expected that both previous coursework and clinical practice would significantly predict performance outcomes. In both phonemic awareness studies (Spencer et al., 2011; Werfel, 2017), the introduction of phonetic coursework and transcription training were found to significantly improve phonemic awareness abilities. In addition, several researchers have suggested increased training on specific structural markers for LI. The idea was that the improvement of training in diagnostic practices would likely improve competency and the identification of children with LI (Schuele, 2010; Selin et al., 2019).

Method

Prior to initiation of the study, the research design was approved by the West Virginia University Institutional Review Board (IRB) as a Non-Human Research Subject/Flex protocol because the study utilized an anonymous survey.

Sampling Procedures

A cluster sampling approach was used to approximate a random sample because there was no database containing all graduate students enrolled in speech-language pathology programs within the United States (Lohr, 2019; Till & Matei, 2016). One-hundred and twenty-five programs from a variety of geographic regions and different research classifications were selected. A stratification process was utilized to address coverage and sampling error in the selection of the 125 graduate programs that received the request (Fowler 2014; Lohr, 2019; Kalton, 2021; Valliant et al., 2018). Using a stratified cluster sample approach, a list of U.S. Master's level Speech-Language Pathology clinical-entry programs was created using

information from ASHA's EdFind website (www.asha.org/edfind). The initial list included 284

in-person programs. However, one institution was excluded because it was used for the pilot

study (i.e., the West Virginia University MS Speech-Language Pathology program). Programs

which offered multiple master's degree options within one program (e.g., M.A., M.S., or M.Ed.)

were combined into one. The stratification model was based on the U.S. census geographical

divisions: New England, Middle Atlantic, East North Central, West North Central, South

Atlantic, East South Central, West South Central, Mountain, and Pacific. Currently, with U.S.

territories and protectorates not being included in these divisions, the four Puerto Rican programs

were ineligible for inclusion. After combining the multiple degree programs from a single

institution as well as applying the exclusionary criteria, 250 of the original 284 programs were

eligible for participation.

The 250 in-person, accredited programs eligible for participation were divided by state

into the nine divisions within four regions based upon the U.S. Census Map (U.S. Census

Bureau, n.d.). Programs were then classified into Urban and Nonurban Areas with an Urban Area

defined as a "continuously built-up area with a population of 50,000 or more" (U.S. Department

of Commerce, 1994, p. 12-1). Each program's city was cross-referenced with the U.S. Census'

list of ranked urban areas from 2019 (U.S. Census Bureau, 2020). If the program's city was not

on the list, it was labeled as a Non-urban Area. Therefore, each university was classified by

region, division, and population.

To identify the number of graduate programs to include so as to have sufficient power for

the proposed analyses, the sample size was calculated using Cochran's (1954) formula for small

sample populations, leading to a suggested sample size of 125 graduate programs (Glen,

2021). This sample size allowed for a 95% confidence interval with ±5% margins of error

(Dillman et al., 2014). Since the selected graduate programs were stratified by geographical region, research classification, and population of the surrounding area, a proportionate number of programs were selected for each of these criteria to minimize sampling error (Kalton, 2021; Valliant et al., 2018). For a model of the sampling process, see Appendix A. A total of 125 programs were invited to participate (Table 2).

Table 2

Random Sample of Programs with Geographical, Population, and Carnegie Classifications

Division	Program	Urban Classification	CCIH Rating[a]
1	Boston University	UA	15
1	MGH Institute of Health Professions	UA	26
1	Northeastern University	UA	15
1	Sacred Heart University	NUA	17
1	University of Connecticut	NUA	15
1	University of Massachusetts, Amherst	NUA	15
2	Buffalo State College	UA	18
2	California University of Pennsylvania	NUA	18
2	Duquesne University	UA	16
2	East Stroudsburg University	NUA	18
2	Hofstra University	UA	17
2	Ithaca College	NUA	18
2	LIU Brooklyn	UA	17
2	LIU Post	NUA	17
2	Marywood University	UA	18
2	Misericordia University	NUA	17
2	Monmouth University	NUA	18
2	Nazareth College	UA	18
2	St. John's University	UA	21
2	Stockton University	NUA	18
2	SUNY at Buffalo	UA	18
2	SUNY at Cortland	NUA	18
2	SUNY at New Paltz	NUA	18
2	SUNY at Plattsburgh	NUA	19
2	Temple University	UA	15
2	Touro College	UA	17
2	University of Pittsburgh	UA	15

2	West Chester University	NUA	18
2	William Paterson University of New Jersey	NUA	18
3	Andrews University	NUA	17
3	Ball State University	UA	16
3	Calvin University	UA	20
3	Case Western Reserve University	UA	15
3	Cleveland State University	UA	16
3	Eastern Michigan University	NUA	16
3	Elmhurst University	NUA	18
3	Governors State University	NUA	18
3	Grand Valley State University	UA	18
3	Indiana State University	UA	17
3	Kent State University	NUA	16
3	Michigan State University	NUA	15
3	Midwestern University, Illinois	NUA	25
3	Northern Illinois University	NUA	16
3	Northwestern University	UA	15
3	Ohio University	NUA	16
3	University of Illinois, Urbana - Champaign	UA	15
3	University of Toledo	UA	16
3	University of Wisconsin, Madison	UA	15
3	University of Wisconsin, Stevens Point	NUA	20
3	University of Wisconsin, Whitewater	NUA	18
3	Western Michigan University	UA	16
4	Fontbonne University	UA	18
4	Kansas State University	UA	15
4	Maryville University	UA	17
4	Minnesota State University, Mankato	NUA	18
4	Minnesota State University, Moorhead	NUA	19
4	Minot State University	NUA	19
4	Southeast Missouri State University	NUA	18
4	Truman State University	NUA	19
4	University of Central Missouri	NUA	18
4	University of Kansas	UA	15
4	University of Minnesota, Duluth	UA	19
4	University of Missouri	UA	15
4	University of Nebraska, Kearney	NUA	18
5	Appalachian State University	NUA	18
5	Florida State University	UA	15
5	Gallaudet University	UA	16
5	George Washington University	UA	15
5	Georgia State University	UA	15
5	Hampton University	UA	16

5	Howard University	UA	16
5	Longwood University	NUA	19
5	North Carolina Central University	UA	18
5	Radford University	NUA	18
5	South Carolina State University	NUA	20
5	University of Central Florida	UA	15
5	University of Florida, Gainesville	UA	15
5	University of Maryland, College Park	NUA	15
5	University of Virginia	NUA	15
5	Valdosta State University	UA	17
6	Alabama A&M University	NUA	18
6	Auburn University	UA	15
6	East Tennessee State University	UA	16
6	Mississippi University for Women	NUA	19
6	Murray State University	NUA	18
6	Samford University	UA	17
6	University of Memphis	UA	16
6	University of Mississippi	NUA	15
6	University of South Alabama	UA	16
7	Arkansas State University	NUA	16
7	Louisiana State University and A&M College	UA	15
7	Oklahoma State University	UA	15
7	Our Lady of the Lake University	UA	17
7	Southeastern Louisiana University	NUA	18
7	Southern University and A&M College	UA	18
7	The University of Texas Rio Grande Valley	UA	16
7	University of Arkansas for Medical Sciences	UA	25
7	University of Central Arkansas	UA	17
7	University of Central Oklahoma	NUA	18
7	University of Louisiana, Lafayette	UA	16
7	University of Louisiana, Monroe	NUA	17
7	University of Oklahoma - Health Sciences Center	UA	25
7	University of Texas at Dallas	UA	15
7	University of Texas, Austin	UA	15
7	University of Texas, El Paso	UA	15
7	West Texas A & M University	NUA	18
8	Arizona State University	UA	16
8	Northern Arizona University	UA	15
8	University of Colorado, Boulder	UA	15
8	University of Montana	NUA	16
8	University of Utah	UA	15
8	University of Wyoming	NUA	16
8	Utah State University	UA	16

9	California State University, East Bay	UA	18
9	California State University, Fresno	UA	17
9	California State University, Long Beach	UA	18
9	California State University, San Marcos	UA	18
9	Loma Linda University	NUA	25
9	Portland State University	UA	16
9	San Francisco State University	UA	18
9	University of Hawaii at Manoa	NUA	15
9	University of Oregon	UA	15
9	University of Redlands	UA	18
9	University of the Pacific - SLP Program	UA	17
9	Washington State University	UA	15

[a]15 = Doctoral Universities: Very High Research Activity; 16 = Doctoral Universities: High Research Activity; 17 = Doctoral/Professional Universities; 18 = Master's Colleges & Universities: Larger Programs; 19 = Master's Colleges & Universities: Medium Programs; 20 = Master's Colleges & Universities: Small Programs; 21 = Baccalaureate Colleges: Arts & Sciences Focus; 25 = Special Focus Four-Year: Medical Schools & Centers; 26 = Special Focus Four-Year: Other Health Professions Schools (Indiana University Center for Postsecondary Research, n.d.).

Recruitment

For the 125 programs that were selected, recruitment emails were sent to the program/clinical directors explaining the study and the importance of participation (Appendix B). These individuals were asked to distribute an email using text that was attached to their initial email. Included in the email to students was a link to the survey and information regarding the research study. In addition to the initial request to participate that was sent to program and clinical directors, two reminders were also sent to the program directors to forward to the graduate students in their program: one invitation two weeks after the survey opened and the second during the final week of the survey (Sebo et al., 2017; Van Mol, 2017). To improve participation, students were offered a chance to win one of twenty $25 Amazon gift cards by choosing to provide their email at the conclusion of the survey (Stanley et al., 2020; Voslinksy & Azar, 2021). The emails to participate contained language explaining the

significance of the survey study and the potential to contribute to improvements in clinical

training (Groves et al., 2004; Maynard et al., 2010).

Participating Programs

Of the 125 programs that were contacted, 37 programs had graduate students in their

speech-language pathology program complete the survey with representation from across the

four US Census regions (Northeast = 18.9%, Midwest = 35.1%, South = 27%, and West =

18.9%) (Table 3). The majority of programs (59.5%) were located in urban areas, while the other

40.5% were located in non-urban areas. The programs also had varying Carnegie Classifications:

Doctoral Universities (Very High Research = 29.7%, High Research = 8.1%, Other = 10.8%),

Master's Colleges and Universities (Larger = 29.7%, Medium = 10.8%, Small = 5.4%), and

Special Focus Four-Year programs (5.4%). The makeup of the final sample of programs was

proportionally similar to the makeup of total graduate programs.

Graduate Student Participants

The individual participants in this study included 239 speech-language pathology

graduate students from accredited master's level programs in the United States. The majority of

the participants were female (96.2%), white (82%), and non-Hispanic/Latinx (84.5%) (Table 4).

Although the demographics were not representative of the U.S. population as a whole, these

distributions were similar to the current demographic make-up of the field of speech-language

pathology (95.5% female, 91.5% white, 93.9% non-Hispanic/Latinx; ASHA, 2021).

Table 3

Characteristics of Participating Institutions

	n	%	Total %
Census Region			
Northeast	7	18.9	23.5
Midwest	13	35.1	28.0
South	10	27.0	33.0
West	7	18.9	15.4
Population Density			
Urban Area	22	59.5	61.8
Non-Urban Area	15	40.5	38.2
CCIH[a] Designation			
Doctoral Universities: Very High Research Activity	11	29.7	23.5
Doctoral Universities: High Research Activity	3	8.1	21.8
Doctoral/Professional Universities	4	10.8	11.9
Master's Colleges & Universities: Larger Programs	11	29.7	28.4
Master's Colleges & Universities: Medium Programs	4	10.8	4.6
Master's Colleges & Universities: Small Programs	2	5.4	2.1
Special Focus Four-Year: Medical Schools & Centers	2	5.4	4.2

[a]CCIH = Carnegie Classification of Institutions of Higher Education.

Table 4

Demographic Characteristics of Participants

Characteristic	*n*	%
Gender		
Female	230	96.2
Male	6	2.5
Non-Binary	2	0.8
Prefer not to say	1	0.4
Race		
White	196	82.0
Asian	17	7.1
Black or African American	9	3.8
American Indian or Alaska Native	2	0.8
Self-Describe	8	3.3
Prefer not to say	7	2.5

Characteristic	n	%
Ethnicity		
Non-Hispanic/Latinx	202	84.5
Hispanic	22	9.2
Latinx	2	0.8
Self-Describe	7	2.9
Prefer not to say	6	2.5
Cohort		
1st Year	119	49.8
2nd Year	120	50.2
Undergraduate Major		
CSD	108	70.3
Humanities	25	10.5
CSD+	15	6.3
STEM	14	5.9
Linguistics	7	2.9
Education	5	2.1
Creative Arts	4	1.7
Business	1	0.4

Note. $N = 239$.

When asked whether they had taken a Language Science course, 71.5% ($N = 239$) said yes. When asked what experience they had in language assessment, 65.3% had administered a standardized language test and 72.8% had done LSA.

Survey Development

Prior to the survey being initiated, a pilot study was completed to mitigate measurement error and improve internal validity. Thirteen SLP graduate students enrolled in the speech-language pathology program at West Virginia University completed the initial version of the survey (Appendix C). After taking the survey, the researcher then met with eight of the 13 students in two focus groups (one group of 5 and another group of 3) to discuss the survey in more detail. Feedback from the focus groups were as follows: it was recommended

that information be added to the instructions regarding the time needed to complete the survey as well as clearly explaining the differences in presentation when taking the survey on a mobile device as opposed to computer. In addition, it was recommended that participants be provided the opportunity to receive the results of the study when it was completed.

The focus groups also provided information related to the clarity of the questions. This feedback indicated that there was misinterpretation of Question 10: "Have you completed an assessment for a client with language concerns?" Some of the participants had interpreted "client with language concerns" as meaning "clients with only language concerns." The purpose of the question was to determine whether the students have had the opportunity to assess language, including clients for whom there are other areas of concern such as speech, voice, or fluency. To address this concern, the question was re-worded to: "Have you completed an assessment for a client where there were language concerns whether or not language was the main or only concern?" The original focus group participants approved of the language changes.

In addition to the modifications described previously, a question was added about the type of undergraduate degree the students had earned because of the possibility that this could impact student knowledge or performance. Another question (number 36), referred to as an attention question, was added in the clausal density section as a validity measurement (Maniaci & Rogge 2014; Meade & Craig, 2012). This type of question was used to determine whether participants were actively engaged in completing the survey as opposed to selecting the same answer for each question.

The final self-administered, online survey was created and distributed using Qualtrics to query current SLP graduate students regarding their use of and training in language sample analysis (LSA) (Appendix D). The first section of the survey began with an eligibility question

("Are you a masters-level speech-language pathology student?") and had six demographic

questions about the student's master's program, undergraduate degree, gender, race, and

ethnicity. The next section requested information about the participant's course instruction and

experience with language sample analysis including coursework, client assessment, goal writing,

and use of language analysis software. The final section of the survey included questions to

assess the participant's ability to segment samples into C-units, identify grammatical morphemes

and distinguish between dependent and independent clauses. For example, participants were

provided an utterance and asked to identify the number of grammatical morphemes in each word

or phrase. They were also asked to identify how many C-units and dependent clauses there were

in a given utterance and to identify all of the dependent clauses in the utterance. To encourage

completion, the time to complete survey was approximately 16 minutes and included three

sections and was open for a total of four weeks (Revilla & Ochoa, 2017).

Analysis

To address the first research question regarding the mastery level of graduate students, an

accuracy score on the MLU skills section and the Clausal Density skills section of the survey

was calculated based upon the number of language sample analysis questions answered

correctly. Questions were worth one point for each individual response. Therefore, the MLU

Total Score had a total possible score of 40 points and the possible Clausal Density Total Score

was 31. These scores were analyzed for their means, standard deviations, and standard errors.

Scores were considered to be at mastery level if the participants correctly answered 80% or more

of the questions related to MLU or Clausal Density (Fuller & Fienup, 2018; McDougale et al.,

2020; Richling et al., 2019).

For the second research question, two multiple regression models (one for MLU and one for CD) were used to evaluate whether predictors of the graduate student's ability to accurately identify morphemes or clauses were statistically significant. Before regression analysis could be done, it was noted that we did not reach our target number of programs (125), therefore, we did not have the power needed to look at differences between programs. So, while included in the demographic information, program characteristics were not included in any models. However, we did have enough individual respondents for sufficient power to analyze differences between respondents. Using G*Power (a statistical power analysis program), the total sample size needed for our linear regression model (Effect size = .15 (medium effect size), Confidence level = 95%, margin of error = 5%, number of predictors = 4) was 129 individual respondents (Faul et al., 2007, 2009).

For the second research question, there were four categorical variables included in each regression model. The independent variable examining the impact of graduate school was whether the participant was a first-year (coded = 0) or second-year graduate student (coded = 1). The impact of academic coursework was included based on whether a student had a language science type course as an undergraduate student (0 = no language science; 1 = yes had language science;). The last variable, clinical experience, had two types of experiences that could have occurred with each participant: administration of a standardized test (0 = no experience; 1 = experience) and experience in LSA (0 = no experience; 1 = experience) within the clinical setting. These variables were included in the two regression analyses to determine if they impacted MLU Total Score and Clausal Density Total Score (Table 5).

Table 5

Dependent and Independent Variables for Regression Models

MLU Model

    Dependent Variable

        MLU Total Score

    Independent Variables

        Year in Graduate School

        Language Science Course Taken

        Standardized Testing Experience

        Language Sample Analysis Experience

Clausal Density Model

    Dependent Variable

        Clausal Density Total Score

    Independent Variables

        Year in Graduate School

        Language Science Course Taken

        Standardized Testing Experience

        Language Sample Analysis Experience

Results

The responses of 239 graduate students currently enrolled in 37 graduate programs across the United States were analyzed when answering the research questions related to master of knowledge to reliably complete LSA and factors associated LSA skills. At the midway point in the CD portion of the survey, participants were asked an attention question (Question 36). The question text provided the answers to both 36a and 36b. All participants who completed the CD section ($N = 210$) answered these questions correctly. Therefore, the responses were considered reliable.

Research Question 1: Foundational Knowledge for LSA

To determine whether a participant had the foundational skills needed to reliably calculate Mean Length of Utterance in morphemes (MLU) or clausal density (CD), percent accuracy was calculated for questions 17, 19-23, and 25 (total of 40 points) for MLU and for questions 27 and 30-40 (total of 31 points) for CD on the survey. A participant was considered to reach mastery if they correctly answered 80% of the questions for MLU (32/40) and 80% of the questions for CD (25/31). Overall, 11.7% of the participants achieved mastery in the MLU skills section of the survey (Accuracy reported as percent correct, Range = 0 – 95, $M = 59.5$, $SD = 21.2$) (Figure 1).

Figure 1

Frequency Histogram and Normal Curve for MLU Scores
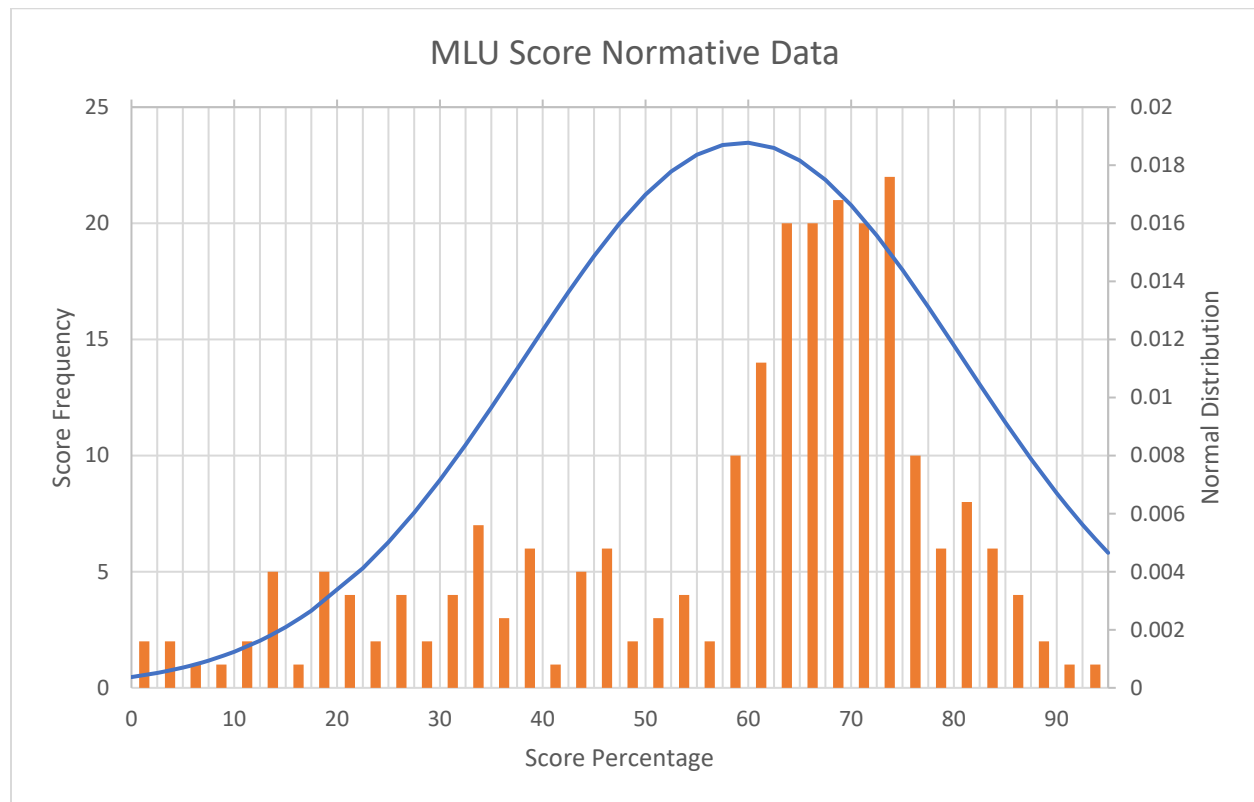
In contrast to MLU, none of the participants ($N = 210$) reached a level of mastery on CD knowledge (Accuracy reported as percent correct, Range $= 0 – 64.5$, $M = 19.4$, $SD = 15.5$) (Figure 2). The highest CD accuracy earned by first-year graduate students (n = 104) was 64.5% with an average accuracy of 17.6% ($SD = 10.9$). The average accuracy for the 106 second-year graduate students was 21.1% correct. However, the highest percent correct achieved by the second-year students was the same as the first-year graduate students at 64.5% (Accuracy reported as percent correct, Range $= 0 – 64.5$, $M = 21.0$, $SD = 16.9$).

Figure 2

Frequency Histogram and Normal Curve for Clausal Density Scores
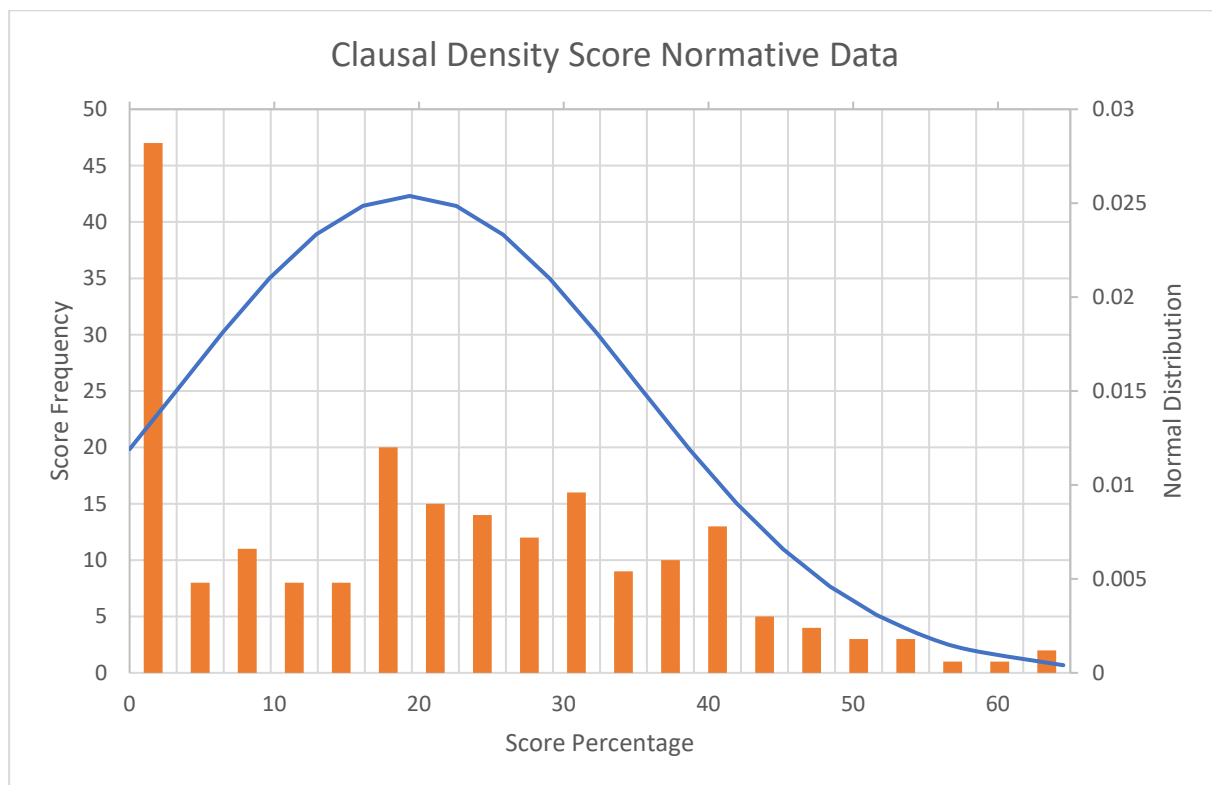
To examine further the knowledge and skills within each of these categories, the three subsections of the MLU skills test (Formula Identification, Analysis Inclusion, and Grammatical

Morpheme Identification) were then examined separately. For Formula Identification, 69.9% of total participants were able to correctly identify the formula for calculating MLU. For questions related to whether to include a C-unit (Analysis Inclusion), 62.8% of participants achieved a mastery score of 80% accuracy or better (8 out of 10 questions) (Accuracy reported as percent correct, Range = 0 – 100, M = 69.5, SD = 33.5). Regarding Grammatical Morpheme Identification, 9.6% of participants were able to achieve a mastery score of 80% accuracy or better (24 out of 29 questions) (Accuracy reported as percent correct, Range = 0 – 96.6, M = 58.1, SD = 22.8).

The four subsections of the Clausal Density section (Formula Identification, C-Unit Segmentation, Number of Dependent Clauses, Identification of Dependent Clauses) were also calculated separately. For Formula Identification, 21.4% of participants were able to correctly identify the formula for calculating CD. When tasked with C-Unit Segmentation, 5.8% of participants were able to identify how many C-Units were contained in each utterance at mastery (8 out of 10 questions answered correctly). Ability to identify the number of dependent clauses in an utterance was achieved at mastery (8 of 10 questions) by 2.4% of participants, and 0% of participants correctly identified the individual dependent clauses in the utterances at mastery (8 out of 10 questions). The highest percentage of dependent clause questions answered correctly by any participants was 30%.

Research Question 2: Factors Predicting Mastery of MLU and CD

Two standard multiple linear regression models were completed (one for MLU and one for CD). The models included cohort year, LSA training and experience as possible predictors of the students' total scores. Both sets of data (MLU and CD) met normality, collinearity, and homoscedasticity assumptions for multiple regression. In the model for MLU total scores, the

independent variables were "Year in Graduate School," "Language Science Course Taken",

"Standardized Testing Experience," and "Language Sample Analysis Experience." No

significant effect was observed in MLU total scores based upon their experience in graduate

school, i.e. whether the students had completed a Language Science course or had experiences

with standardized language assessments, or LSA ($R^2 = 0.02$, $F(4, 234) = 1.20$, $p = 0.31$) (Table

6).

Table 6

Regression Coefficients for Predicting MLU Performance Based on Cohort and LSA Experience

Variable	B	95% CI	β	t	p
Year in Graduate School	-0.06	[-7.06, 6.95]	-0.00	-0.02	0.99
Language Science Course Taken	2.07	[-3.92, 8.07]	0.04	0.68	0.50
Language Standardized Test Experience	5.93	[-1.61, 13.46]	0.15	1.71	0.09
Language Sample Analysis Experience	0.41	[-6.29, 7.11]	0.01	0.12	0.90

Note. $R^2 = 0.02$ ($N = 239$, $p = 0.31$). CI = confidence interval for *B*.

In the model for CD total scores, as in the model for MLU, the independent variables

were "Year in Graduate School," "Language Science Course Taken," "Standardized Testing

Experience," and "Language Sample Analysis Experience." None of the predictors in this model

were significant ($R^2 = 0.01$, $F(4, 205) = 1.30$, $p = 0.27$) (Table 7).

Table 7

Regression Coefficients for Predicting CD Performance Based on Cohort and LSA Experience

Variable	*B*	95% CI	*β*	*t*	*p*
Year in Graduate School	2.39	[-2.99, 7.77]	0.08	.88	0.38
Language Science Course Taken	-2.37	[-7.14, 2.41]	-0.07	-0.98	0.33
Language Standardized Test Experience	3.19	[-2.77, 9.16]	3.02	1.06	0.29
Language Sample Analysis Experience	-2.67	[-8.02, 2.69]	-0.08	-0.98	0.33

Note. R^2 =0 .01 (N = 210, p > 0.5). CI = confidence interval for *B*.

Discussion

This study looked at the foundational skills for language sample analysis in SLP graduate students in the US. An anonymous survey was developed and distributed to a select sample of US accredited SLP graduate programs. Participants were asked about their cohort year and their experience with LSA coursework and administration. In addition, they were asked to complete a skills test that measured their ability to complete foundational morphological and syntactic exercises. Analysis of their performance was used to determine the mastery level of the students. The students' experience with various aspects of language assessment and analysis were examined to determine whether they had a significant effect on the outcomes.

The majority of the participants failed to meet mastery levels on the skills tests, with none of the participants achieving mastery on the Clausal Density section. When looking at the possible predicting factors, no variables significantly contributed to participant performance. Based on the skills observed in this survey, many graduate students struggle with the foundational skills needed to complete language sample analysis. Fewer than 12% of the participants achieved the necessary score of 80% or higher in the MLU Skills section. This

section required knowledge of the formula for calculating MLU, what utterances should be included in an MLU, knowledge of grammatical morphemes (e.g., plurals, possessives, progressive -ing, third-person singular -s, and past tense), and the ability to discern grammatical morphemes from derivational morphemes. Students performed better with formula identification (69.9%) and inclusion in the analysis (62.8%). However, few participants (6.9%) were able to achieve mastery in the grammatical morpheme identification section, indicating that the specific skill of counting grammatical morphemes was not reliable.

In contrast to the MLU Skills section, none of the participants achieved mastery, a score of 80% accuracy or higher on the section that required knowledge of the formula for calculating CD and the ability to identify independent and dependent clauses. Some participants knew the formula for CD (21.5%) compared to nearly 70% for MLU. For C-Unit Segmentation within the CD questions, fewer participants (5.8%) were able to achieve the 80% mastery level, and this proportion continued to decline when asked to identify the number of clauses in an utterance (2.4%). None of participants were able to identify the individual dependent clauses at the mastery level.

These results are similar to the previous research examining morphological and syntactic knowledge. While SLPs and SLP students tended to outperform other professions in phonological, morphological, and syntactic activities, there was still a significant knowledge gap (Brimo & Melamed, 2017; Spencer et al., 2008, 2011; Werfel, 2017). The mean score for SLP students on an explicit syntax test was 49.7% in the study by Brimo and Melamed (2017). Spencer and colleagues (2008, 2011) found the mean score for practicing SLPs on a phonemic awareness skills test was 79.4% and SLP students with coursework had a mean score of 74.4% and without coursework had a mean score of 55.7%. Similarly, Werfel (2017) observed that SLP

students had an average score of less than 50% before training on a phoneme segmentation task, with only a 60% average score after training. The results of the current study as well as previous research indicate that both graduate students in SLP as well as practitioners may lack knowledge and skills related to aspects of the profession to reliably complete tasks within assessment and treatment of individuals with communication disorders.

The students' higher level of performance on skills related to the MLU versus CD also aligns with previous research by Good (2019). Good observed that 79.1% of SLPs have moderate to high levels of confidence in teaching morphological awareness skills. The results of Good's (2019) study in conjunction with the current study indicates that morphological concepts are covered in more detail within the academic curriculum and training as opposed to syntactical concepts such as independent and dependent clauses. However, the low percentage of students who demonstrated mastery on MLU implies that current academic and clinical instruction may not provide enough opportunities to practice the skill so as to prepare graduate students to apply these skills on clinical tasks reliably as needed for assessment and progress monitoring of treatment.

When attempting to identify patterns of skill and knowledge that could assist in making targeted modifications in graduate curriculum, the regression models failed to reveal significant effects for cohort year, coursework, or clinical experience (i.e., administration of standardized language tests and LSA) on the knowledge needed for calculating MLU and CD. These results align with the previous research which indicated that coursework alone does not provide students with the skill sets to complete language analyses. Brimo and Melamed (2017) found that preservice coursework had no effect on students' scores in an explicit syntax knowledge task.

Curricular Implications

The results of this study indicate there are many opportunities available to undergraduate and graduate programs within Communication Sciences and Disorders to improve the knowledge and skills needed for students to effectively engage in LSA. Current practices need to be evaluated to determine if this information is included as well as how it is being included. Instruction methods should ensure that students have the knowledge base needed to properly use LSA and interpret the data generated. In addition, academic programs should consider the opportunities for practical experiences for students. In order to implement effective intervention, the practitioner has to be well-versed in the targeted structures. Without exposure and practice, there is no opportunity to increase their language knowledge and analysis abilities.

Best practice would recommend that graduate students in speech-language pathology programs be able to complete a language sample analysis for assessment or treatment purposes. To do this, academic programs need to intentionally build those specific skills into the curriculum (Nilson, 2016; Wiggins et al., 2005). This requires explicit instruction on identifying morphological and syntactic structures and elaborating on the relevance of these structures to language intervention as well as opportunities for applied practice using the skill as they will in clinical practice. It is likely that doing these activities once will not provide enough practice for skills to be developed to reach an appropriate level of mastery. Adults learn through elaborate rehearsal and with targeted feedback that can be used to improve performance with ongoing activities (Ambrose et al., 2010; Bransford et al., 1999; Nilson, 2016; Tigner, 1999). In addition, information is most readily learned when students regard the information as relevant to their lives and future careers (Ambrose et al., 2010; Persellin & Daniels, 2015; Winne & Nesbit,

2010). Therefore, instruction on LSA needs to occur over an extended time period with activities that align with clinical practice and how they will use LSA as speech-language pathologists.

The recent shift toward including Language Science courses in undergraduate programs, while not a significant factor in this study, indicates a recognized need by academics within the profession for increased coverage of language concepts at the undergraduate level. While this addition of undergraduate coursework is likely to continue, it is still not covered by all programs and there is currently no data about the consistency of course content across different programs. Fewer than three-fourths of students reported having formal coursework in language science and language analysis before beginning their graduate programs. It is not known if these students had the content integrated into other courses and if so whether the instruction included application as well as didactic instruction. Additionally, it is unclear the type of instruction the current programs utilize when providing coursework, whether it integrates principles of best practice relative to adult learning and clinical practice, and whether students have the opportunity to revisit and apply concepts learned early in the program as they progress in their studies. Due to the poor overall performance of students in this study, there is a need to systematically evaluate and revise the current pedagogical approaches for LSA content.

Based upon the findings of Brimo and Melamed (2017) and the current study, the current graduate curricula did not provide adequate clinical practice in language sampling analysis given that a majority of the second-year students failed to reach mastery criteria for MLU or CD. This finding is not surprising given that foundational knowledge and skills across topics in speech-language pathology and in professional training in general have not been observed to be at levels expected for clinical performance (Heilmann & Bertone, 2021). Professional training literature has discussed this issue previously and has specifically recommended that training have as much

time and effort spent on the learning of propositional knowledge as the practice and use of that knowledge and that the timing in the clinical curricula should allow for immediate application to clinical practice once the propositional knowledge is introduced (Eraut, 1994).

There is limited time in SLP graduate programs for additional clinical activities. Therefore, the current practice for obtaining clinical experiences needs to be reexamined for increased effectiveness and alignment with evidence-based practice relative to clinical training and retention of clinical knowledge and skills. Ideally, adjustments would be made at the programmatic level to increase opportunities for practice with either real or simulated patients that align with the didactic coursework in which the student is enrolled or has just completed. However, many programs rely on licensed SLPs outside of the academic program to assist in providing students mentored clinical experiences. Yet, previous research would indicate that practicing SLPs may be using LSA in a limited manner or in ways that are not reliable (Pavelko et al., 2016; Westerveld & Claessen, 2014). When current practitioners do not perform LSA, or perform it incorrectly, it limits the opportunity of students to observe and practice the correct use of LSA during their graduate training.

Clinical Implications

LSA is a recommended component of evidence-based practice and has been codified and researched for over forty years (Bloom & Lahey, 1978). There is a great deal of information on language sampling techniques and the development of spoken and written language disorders. Many language-sampling tasks have been created that can be used by SLPs to elicit and analyze conversational, narrative, expository, and persuasive discourse. Computer programs such as SALT (Miller & Iglesias, 2019) have been developed, making it faster and easier to elicit, transcribe, and analyze language samples. Moreover, the process of interpreting the results of a

language sample has improved with the establishment or expansion of databases including

samples from typical children and adolescents speaking in different genres (e.g., Bishop, 2004;

Miller & Iglesias, 2019; Nippold, 2021). However, despite these advances, LSA is not

universally used by speech-language pathologists (Graham et al., 2006; Kemp & Klee, 1997;

Pavelko et al., 2016; Westerveld & Claessen, 2014).

As advances in LSA technology have been made, the commonly cited barriers to LSA use

related to time or efficiency have been lessened (Heilmann, 2010). Additionally, most SLPs have

reported a firm commitment to the use of evidence-based practice (Hoffman et al., 2013). Yet,

recent research related to the use of LSA by practitioners indicates that it is not widely used and,

when done, may lack in quality and reliability (Graham et al., 2006; Kemp & Klee, 1997;

Pavelko et al., 2016; Westerveld & Claessen, 2014). It is possible that the lack of alignment is

due to a lack of knowledge and skills in this area. Given the results of this study and previous

studies on the language analysis skills of SLPs and SLP students (Brimo & Melamed, 2017;

Spencer et al., 2008, 2011; Werfel, 2017), there is legitimate concern that an underlying barrier

to the use of LSA may be practitioner knowledge and self-efficacy.

With large caseloads and efficiency requirements, it is likely that many practitioners develop

routines. This is a natural and essential process for improving everyday practice. For school

SLPs, as in most professions, caseloads consist of primarily typical and well-defined cases and

routines allow for less deliberation and a streamlined workday. However, these routines may also

reduce the ways in which SLPs think about their caseloads (Buchmann, 1980; Eraut, 1994;

Schon, 1987). This can be problematic for heterogeneous conditions such as LI. Set routines

have the potential to lessen the identification of these students and effect the overall quality of

services. School SLPs are capable of recognizing the need for additional knowledge and

deliberation for nonstandard cases (Heilmann & Bertone, 2021); yet, finding the time to address these concerns can be a significant undertaking. Established professional routines then impede the ability to adjust to new circumstances and begin to serve merely as a coping mechanism for the practitioner at the expense of their caseload (Eraut, 1994).

The gap in LSA use and the importance of LI identification and treatment serve as impetuses to improve the professional development in language disorders for school-based SLPs. As with any profession, improvement in practice must start with the acknowledgement of the need for improvement. This requires practitioners to engage in candid self-reflection and evaluation. Reflection and reflective practice are considered essential characteristics of professionally competent clinical practice (Epstein & Hundert, 2002; Mann et al., 2009). Integrating the tools for self-evaluation and knowledge checks may serve to connect the aspirational to reality. Those who develop curriculum have the responsibility to meet both SLPs and students where they are and identify practical solutions for increasing clinical competency. Looking at recent discussion in the field of SLP about closing the gap between research and practice, this is a topic of interest important to scientists and clinicians alike (Dodd, 2021; Harold, 2019).

Limitations & Future Research

There are several limitations to the current study. Surveys have specific problems in all of their designs and caution must be used in interpreting the results of survey-based research. There may be unknown differences between respondents and nonrespondents, which could lead to selection bias and pose a challenge in generalizing the results. The survey's sample size was small in comparison with the number of current SLP graduate students. Although the sampling method was appropriate considering there is currently no national register of SLP students (to allow for random sampling), it is not clear if the results from this survey reflect the LSA skills

and abilities of the general SLP student population. Additionally, program directors were used as an intermediary between the researcher and the participants. It is worth noting that those directors who did choose to participate might differ from non-participating directors. To address these issues, future studies may also want to consider increasing the sample size or targeting programs by a different set of criteria to yield findings that are reflective of specified groups or areas. There is also the possibility of misinterpretation by participants on specific wording and items. Although the survey provided a definition of language sample analysis, participants may have used their own definitions. Lastly, the questions utilized within the survey context may not align with actual practice in transcription and analysis. Future research should be conducted to examine the correlation between the ability to answer these questions and then reliably transcribe and analyze a language sample.

The results of this study indicate several areas of potential future research. Beyond larger sample sizes or targeted populations, further inquiry into the effects of different LSA protocols on learning outcomes as well as other training approaches is warranted. Although the results in this study were calculated using overall scores, it may be useful to look in more depth at the concepts included within test items on the test. This may yield information about which structures and concepts were more difficult for the students which can be used to inform training practices. Additionally, research into the LSA skills and abilities of current practicing SLPs may be useful for the creation of targeted professional development.

Lastly, a deeper evaluation of programmatic strategies and techniques being implemented by programs to teach skills such as LSA could help to identify opportunities for improvement or growth. An analysis at this level would require an evaluation of the curriculum map, periodic assessment of student learning, and evaluation of the data over time before and after specific

curricular changes are implemented. Based upon the results of the current study and previous

research (Brimo & Melamed, 2017; Good, 2019; Selin et al., 2019; Spencer et al., 2008, 2011;

Werfel, 2017), a systematic evaluation of the skills needed to be an effective SLP is warranted.

General Conclusions

Language sample analysis is a critical tool for language disorder diagnosis and treatment.

LSA allows for analysis of how a person uses their language abilities in natural, connected

speech which can help to support or contrast an individual's performance on standardized

language testing. To adequately utilize LSA, graduate students in speech-language pathology

programs need to be prepared to elicit, transcribe, and analyze language samples reliably.

The results of this survey indicate that the majority of graduate students do not have the

morphological or syntactic knowledge needed for competent practice. If improvements in

clinical practice related to the use of LSA are to be observed, there is a need for changes in

educational practice at the undergraduate and graduate level. Additionally, these findings would

imply that professional development is needed for current speech-language pathologists given

that currently enrolled graduate students in speech-language pathology did not have mastery of

these baseline skills and previous research in other related areas including practicing speech-

language pathologists (Brimo & Melamed, 2017; Spencer et al., 2008, 2011; Werfel, 2017), have

observed similar levels of knowledge of language.

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Appendix A: Sampling Model

Symbol Legend

Symbol	Label
🔴 (pink circle)	Total Population
🟢 (green circle)	Region
🔵 (blue circle)	Division
🟪 (purple square)	Urbanized Area
🔶 (yellow diamond)	Non-urbanized Area
⚫ (black circle)	Randomly Selected Program
⚪ (white circle)	Non-selected Program
🟧 (orange square)	First-year Cohort
🟦 (cyan square)	Second-year Cohort
👤 (person icon)	Students
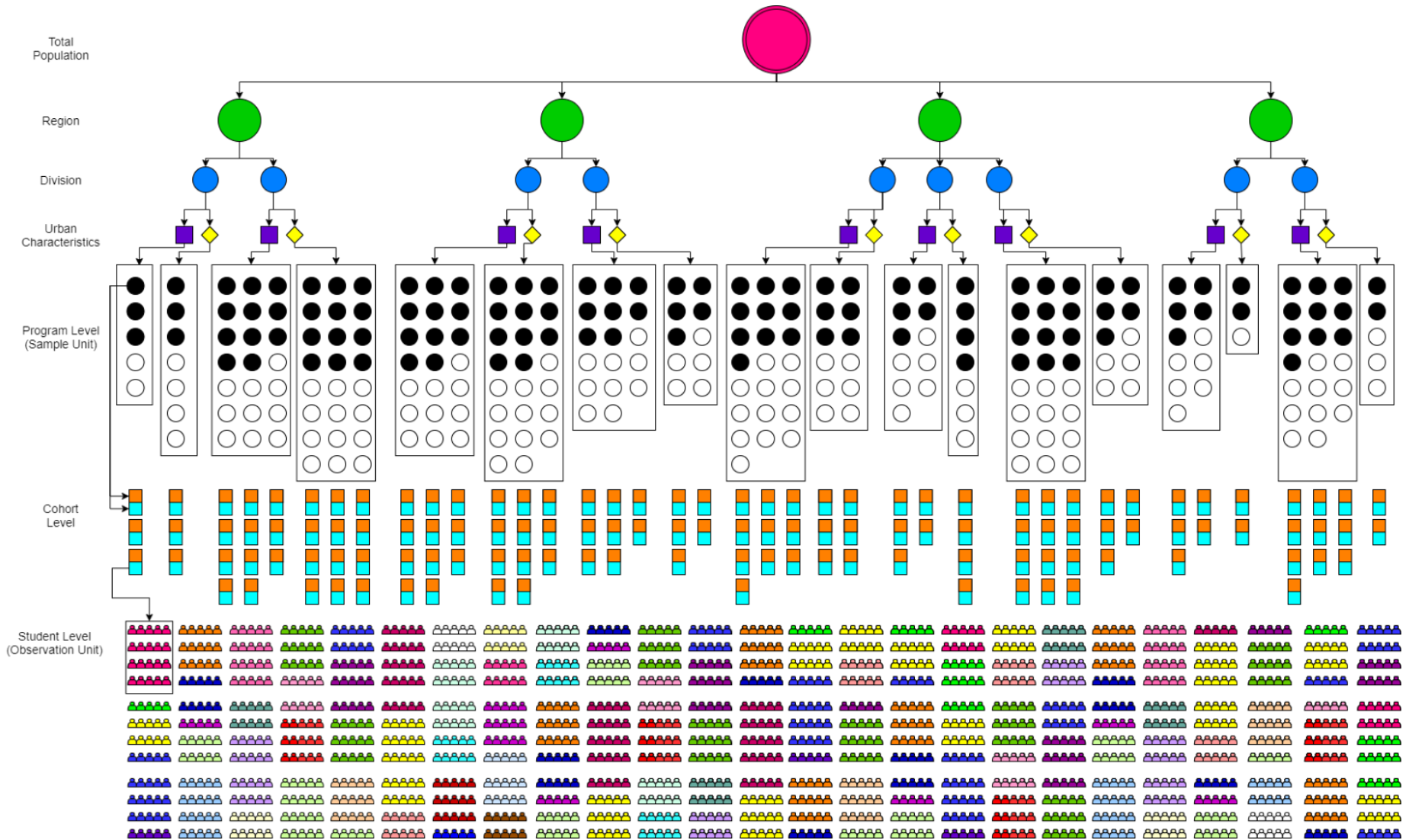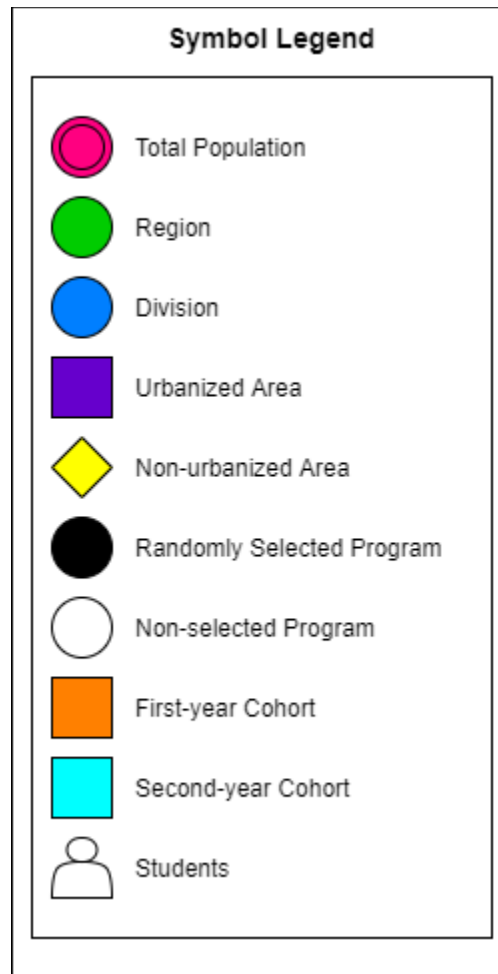
Appendix B: Recruitment Emails

Director Recruitment Email

Hello,

I am a doctoral candidate in the *Communication Sciences and Disorders at West Virginia University*. I am conducting a study for my dissertation to analyze the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

As the clinical director/chair of your program, I'm sure you are aware of the importance of gauging the knowledge levels of students and developing effective teaching methods.

The study consists of a 15-20 minute survey containing questions on previous training along with language analysis skills-based questions. The survey is entirely anonymous. Participants will be entered in a drawing for one of twenty $25 Amazon gift cards.

If you are willing to assist, I will ask you to forward a student recruitment email on to your <u>current graduate students</u>. I will send this email separately**.**

I really do appreciate your support in the execution of this study.

If you have any questions, please contact me (acornagl@mix.wvu.edu) or my supervisor Dr. Jayne Brandel (jayne.brandel@hsc.wvu.edu).

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Student Recruitment Email

Hello,

I am a doctoral candidate in the *Communication Sciences and Disorders at West Virginia University*. I am conducting a study for my dissertation to analyze the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

SLP grad students, regardless of training or knowledge, can provide valuable insight in this study. **There is no judgment value placed on knowing or not knowing this information.** Some questions may present unfamiliar concepts; however, answering them to the best of your ability (or selecting "I don't know") allows us to determine the gaps in training that need to be addressed.

This survey should take between 15-20 minutes to complete. It can be completed on a desktop or mobile device. **If you are using a mobile device, please take note of the question formats in order to ensure you have answered all sections of a question**.

Make sure to enter your email address at the end of the survey to be eligible to win **a $25 Amazon gift card!**

Click here to take the survey.

Participation in this survey is completely voluntary and you may exit the survey at any time.

I really do appreciate your involvement!

All questions and comments about this project can be directed to
Allegra Cornaglia at acornagl@mix.wvu.edu or Dr. Jayne Brandel
at jayne.brandel@hsc.wvu.edu.

This survey will close on XX/XX/XXXX and gift card winners will be notified by
XX/XX/XXXX.

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Follow-up Email 1 (Sent to directors)

Hello,

I wanted to reach out to thank you for assisting in the advertisement for my study.

At this point, there are 2 weeks left to complete the survey. Would you mind sending the follow-up email attached below to your current graduate students?

If you have any questions, please contact me (acornagl@mix.wvu.edu) or my supervisor Dr. Jayne Brandel (jayne.brandel@hsc.wvu.edu).

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Attached email:

Hello,

I am a doctoral candidate in the *Communication Sciences and Disorders at West Virginia University*. I am conducting a study for my dissertation to analyze the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

The survey will be available for you to complete until [date survey is no longer available]. If you have already completed the survey, thank you for your time!

If you have not completed the survey, I would greatly appreciate any input you could provide.

As a reminder:

SLP grad students, regardless of training or knowledge, can provide valuable insight in this study. **There is no judgment value placed on knowing or not knowing this information.** Some questions may present unfamiliar concepts, however, answering them to the

best of your ability (or selecting "I don't know") allows us to determine the gaps in training that need to be addressed.

This survey should take between 15-20 minutes to complete. It can be completed on a desktop or mobile device. **If you are using a mobile device, please take note of the question formats in order to ensure you have answered all sections of a question**.

Make sure to enter your email address at the end of the survey to be eligible to win **a $25 Amazon gift card!**

Click here to take the survey.

Participation in this survey is completely voluntary and you may exit the survey at any time.

I really do appreciate your involvement!

All questions and comments about this project can be directed to Allegra Cornaglia at acornagl@mix.wvu.edu or Dr. Jayne Brandel at jayne.brandel@hsc.wvu.edu.

This survey will close on XX/XX/XXXX and gift card winners will be notified by XX/XX/XXXX.

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Follow-up Email 2 (Sent to directors)

Hello,

At this point, there is **one week left** to complete the survey. Would you mind sending the follow-up email attached below to your current graduate students?

Thank you so much for your assistance in this study. This is the final reminder.

If you have any questions, please contact me (acornagl@mix.wvu.edu) or my supervisor Dr. Jayne Brandel (jayne.brandel@hsc.wvu.edu).

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Attached email:

Hello,

I am a doctoral candidate in the *Communication Sciences and Disorders at West Virginia University*. I am conducting a study for my dissertation to analyze the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

The survey will be available for you to complete until [date survey is no longer available]. If you have already completed the survey, thank you for your time!

If you have not completed the survey, we would greatly appreciate any input you could provide.

As a reminder:

SLP grad students, regardless of training or knowledge, can provide valuable insight in this study. **There is no judgment value placed on knowing or not knowing this information.** Some questions may present unfamiliar concepts, however, answering them to the best of your ability (or selecting "I don't know") allows us to determine the gaps in training that need to be addressed.

This survey should take between 15-20 minutes to complete. It can be completed on a desktop or mobile device. **If you are using a mobile device, please take note of the question formats in order to ensure you have answered all sections of a question**.

Make sure to enter your email address at the end of the survey to be eligible to win **a $25 Amazon gift card!**

Click here to take the survey.

Participation in this survey is completely voluntary and you may exit the survey at any time.

I really do appreciate your involvement!

All questions and comments about this project can be directed to Allegra Cornaglia at acornagl@mix.wvu.edu or Dr. Jayne Brandel at jayne.brandel@hsc.wvu.edu.

This survey will close on XX/XX/XXXX and gift card winners will be notified by XX/XX/XXXX.

Sincerely,

Allegra Cornaglia, M.S., CCC-SLP

Appendix C: Initial Survey Draft

Welcome! Thank you for your willingness to participate in this pilot study.

This study is looking at the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

SLP grad students, regardless of training or knowledge, can provide valuable insight in this study. There is no judgment value placed on knowing or not knowing this information. Some questions may present unfamiliar concepts, however, answering them to the best of your ability (or selecting "I don't know") allows us to determine the gaps in training that need to be addressed.

Participation in this survey is completely voluntary and you may exit the survey at any time.

I really do appreciate your involvement!

All questions and comments about this project can be directed to Allegra Cornaglia at acornagl@mix.wvu.edu

1. Are you a speech-language pathology masters level student?
   - Yes
   - No

Survey logic: If "No" is selected skip to end of survey

2. What institution do you attend for your SLP master's program? (Text Fill-in)
3. What year in your program are you in?
   - 1st Year
   - 2nd Year
4. How do you describe yourself?
   - Male
   - Female
   - Non-binary/third gender
   - Prefer to self-describe (Text Fill-in)
   - Prefer not to say
5. How do you describe your race?
   - White
   - Black or African American
   - American Indian or Alaska Native
   - Asian
   - Native Hawaiian or Pacific Islander
   - Prefer to self-describe (Text Fill-in)
   - Prefer not to say
6. How do you describe your ethnicity?
   - Non-Hispanic/Latinx

- Hispanic
- Latinx
- Prefer to self-describe (Text Fill-in)
- Prefer not to say

7. Have you ever taken a Language Science Course?
- Yes
- No

Survey logic: If "Yes" is selected display Question 8

8. Was it required for graduation?
- Yes
- No
9. Have you ever had to complete a language sample analysis as part of your coursework?

   Language Sample Analysis (LSA) is the practice of eliciting an oral or written sample from a student and analyzing it to determine language abilities and treatment plans.
- Yes
- No
10. Have you completed an assessment for a client with language concerns?
- Yes
- No
11. Have you created any language-based goals for working with a client?
- Yes
- No
12. Have you ever used Language Sample Analysis to assess a client?
- Yes
- No
13. What kinds of language samples have you elicited with a client? Mark all that apply.
- Conversation
- Oral Narrative (e.g., "Tell me a story")
- Written Narrative
- Oral Expository (e.g., "Explain how you…")
- Written Expository
- Oral Persuasive
- Written Persuasive
- Observation of child communication in school or play setting
- Other (Please specify)
- I have never elicited a language sample
14. Have you utilized any of the following in language sample analysis? Mark all that apply.
- Assigning Structural Stage (ASS)
- Content Form Analysis (C/FA)

- Computerized Language Analysis (CLAN)
- Developmental Sentence Scoring (DSS)
- Index of Productive Syntax (IPSyn)
- Systematic Analysis of Language Transcripts (SALT)
- Sampling Utterances and Grammatical Analysis Revised (SUGAR)
- State Language Sample Protocol
- Local/District Language Sample Protocol
- Self-Designed Protocol
- Excel or other spreadsheet
- Other (Please specify)

The next section of this survey contains questions about:

- Mean Length of Utterance in morphemes (MLUm)

- Clausal Density

- Grammatical (Inflectional) Morphemes

- Independent and Dependent Clauses

*All utterances are from a spoken word/oral sample

DEFINITIONS

- **Mean Length of Utterance in morphemes (MLUm)** is a measure of language development in young children based on the average number of grammatical morphemes in utterances in their spontaneous speech

- **Clausal Density** is a measure of the average number of clauses in utterances in spontaneous speech or writing

- **Grammatical (Inflectional) Morphemes** modify the tense, aspect, mood, person, or number of a verb, or the number, gender, or case of a noun, adjective, or pronoun, without affecting the word's meaning or class (part of speech)

- **Derivational Morphemes** change the semantic meaning or the part of speech of the affected word

- **C-Units** include one main clause with all subordinate clauses attached to it

- A **clause** is a statement containing both a subject and a predicate.

Please answer these questions to the best of your ability. Any responses that you give will be highly valuable for the purposes of this study.

Remember:

- If you are unsure about an answer, please make your best guess.

- If you don't know the answer, please mark "I don't know"

15. How confident do you feel calculating MLU? (0-100 Scale)
16. What is the correct formula for calculating MLUm?
    - $\dfrac{Total\ \#\ of\ Derivational\ Morphemes}{Total\ \#\ of\ Utterances}$
    - $\dfrac{Total\ \#\ of\ Grammatical\ Morphemes}{Total\ \#\ of\ Utterances}$
    - $\dfrac{Total\ \#\ of\ Derivational\ Morphemes}{Total\ \#\ of\ Grammatical\ Morphemes}$
    - $\dfrac{Total\ \#\ of\ Utterances}{Total\ \#\ of\ Grammatical\ Morphemes}$
    - None of the above
    - I don't know
17. How confident do you feel counting grammatical morphemes? (0-100 Scale)

Please use the following utterances to label how many grammatical morphemes are in each word or phrase.

18. "Mary's dogs were digging in the garden and ate her favorite bushes."

	0	1	2	3	4+	I don't know
a. Mary's						
b. dogs						
c. digging						
d. ate						
e. bushes						

19. "Exhausting exercises made Susan's children fall asleep easily."

	0	1	2	3	4+	I don't know
a. exhausting						
b. exercises						
c. made						
d. Susan's						
e. children						
f. easily						

20. "He's gonna be lonely when she leaves for Blackstone College for swimming camp."

	0	1	2	3	4+	I don't know
a. he's						
b. gonna						
c. lonely						
d. she leaves						
e. Blackstone College						
f. swimming camp						

21. "Peter Pan only flies through its gate when he isn't walking."

	0	1	2	3	4+	I don't know
a. Peter Pan						
b. only						
c. flies						
d. its gate						
e. isn't						
f. walking						

22. "The Honorable Judge Thompson looked directly at the unexpected women on trial."

	0	1	2	3	4+	I don't know
a. The Honorable Judge Thompson						
b. looked						
c. directly						
d. unexpected						
e. women						
f. trial						

23. How confident do you feel deciding which utterances should be included in an MLU analysis? (0-100 Scale)
24. Please mark whether each utterance would be included or excluded in an MLUm analysis.

The use of "X" indicates that part of the utterance was unintelligible

	Included	Excluded	I don't know
a. My my my brother Max is a baby			
b. He X his toes			
c. I hafta watch him sometimes			
d. He puts stuff in his mouth			
e. He eated a quarter once			
f. He makes noises like ga ga ga			
g. He sleeps I mean he cries a lot			
h. X Mommy			
i. He's got a tickly button uh belly button			
j. Um			

25. How confident do you feel calculating clausal density? (0-100 Scale)
26. What is the correct formula for calculating clausal density?

- $\dfrac{Total\ \#\ of\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Dependent\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Indpendent\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Dependent\ Clauses}{Total\ \#\ of\ Independent\ Clauses}$

- None of the above
- I don't know

27. How confident do you feel identifying C-units? (0-100 Scale)
28. How confident do you feel identifying dependent clauses? (0-100 Scale)
29. "I went to the park, played with my friends, and went home."
    a. How many C-Units are in the utterance?
       - 0
       - 1
       - 2
       - 3
       - More than 3
       - I don't know
    b. How many dependent clauses are in the utterance?
       - 0
       - 1
       - 2
       - 3
       - More than 3
       - I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

   c. Which option correctly **<u>highlights</u>** all DEPENDENT clauses in the utterance?
- **<u>I went to the park, played with my friends, and went home.</u>**
- **<u>I went to the park</u>**, / **<u>played with my friends</u>**, and **<u>went home</u>**.
- I went to the park, **<u>played with my friends</u>**, and went home.
- **<u>I went to the park</u>**, played with my friends, and went home.
- I went to the park, played with my friends, and **<u>went home</u>**.
- None of the above
- I don't know

30. "Waiting in line is my least favorite thing to do, but at least I don't have to talk to people while I wait."

   a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

   b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

   c. Which option correctly **<u>highlights</u>** all DEPENDENT clauses in the utterance?
- **<u>Waiting in line</u>** is my least favorite thing to do, but at least I don't have to talk to people while I wait.
- **<u>Waiting in line</u>** is my least favorite thing to do, but at least I don't have to talk to people **<u>while I wait</u>**.
- Waiting in line is my least favorite thing to do, **<u>but at least I don't have to talk to people while I wait.</u>**
- **<u>Waiting in line is my least favorite thing to do</u>**, but at least I don't have to talk to people while I wait.
- Waiting in line is my least favorite thing to do, but at least I don't have to talk to people **<u>while I wait.</u>**
- None of the above
- I don't know

31. "We went home and my mom was there."

a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **We went home and my mom was there**
- **We went home** / and **my mom was there**
- **We went home** and my mom was there
- We went home and **my mom was there**
- None of the above
- I don't know

32. "Please tell me who left this package when I left to run errands."
a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **Please tell me** who left this package when I left to run errands.
- Please tell me **who left this package** / **when I left to run errands**.
- **Please tell me** who left this package **when I left to run errands**.
- **Please tell me** / **who left this package** when I left to run errands.
- Please tell me who left this package **when I left to run errands**.
- None of the above
- I don't know

33. "I thought 'I gotta get out of here'."
   a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know
   b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

   c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **I thought 'I gotta get out of here'.**
- **I thought** / **'I gotta get out of here'.**
- **I thought** 'I gotta get out of here'.
- I thought **'I gotta get out of here'.**
- I thought 'I gotta get **out of here'.**
- None of the above
- I don't know

34. "The children who skateboard in the street are especially noisy in the early evening so I shut my window so I could work."
   a. How many C-Units are in the utterance?
- 0
- 1
- 2

- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **<u>highlights</u>** all DEPENDENT clauses in the utterance?

- **<u>The children who skateboard in the street</u>** are especially noisy in the early evening so I shut my window so I could work.
- **<u>The children who skateboard in the street</u>** are especially noisy in the early evening **<u>so I shut my window</u>** / **<u>so I could work.</u>**
- The children **<u>who skateboard in the street</u>** are especially noisy in the early evening **<u>so I shut my window</u>** so I could work.
- The children **<u>who skateboard in the street</u>** are especially noisy in the early evening so I shut my window **<u>so I could work</u>**.
- The children who skateboard in the street are especially noisy in the early evening so I shut my window **<u>so I could work</u>**.
- None of the above
- I don't know

35. "Because I need to get out of this place."

    a. How many C-Units are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

      c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- Because **I need to get out of this place.**
- Because I need **to get out of this place**.
- **Because I need to get out of this place.**
- Because **I need** to get out of this place.
- None of the above
- I don't know

36. "I think I should start walking in the evening because I'm feeling cooped up"
      a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

      b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

      c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- I think **I should start walking in the evening** / **because I'm feeling cooped up**
- **I think** I should start walking in the evening **because I'm feeling cooped up**
- **I think** I should **start walking in the evening** / **because I'm feeling cooped up**
- I think **I should start walking in the evening** because I'm feeling cooped up
- I think I should start walking in the evening **because I'm feeling cooped up**
- None of the above
- I don't know

37. "The horse trotting up to the fence hopes that you have an apple or carrot."

    a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly <u>**highlights**</u> all DEPENDENT clauses in the utterance?
- <u>**The horse trotting up to the fence**</u> hopes that you have an apple or carrot.
- <u>**The horse trotting up to the fence**</u> hopes <u>**that you have an apple or carrot**</u>.
- The horse <u>**trotting up to the fence**</u> hopes that you have an apple or carrot.
- The horse <u>**trotting up to the fence**</u> hopes <u>**that you have an apple or carrot**</u>.
- The horse trotting up to the fence hopes <u>**that you have an apple or carrot**</u>.
- None of the above
- I don't know

38. "The dog said 'woof woof'."
    a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?
- 0
- 1
- 2

- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c.   Which option correctly <u>**highlights**</u> all DEPENDENT clauses in the utterance?

- <u>**The dog said 'woof woof'.**</u>
- <u>**The dog said**</u> / <u>**'woof woof'.**</u>
- <u>**The dog said**</u> 'woof woof'.
- The dog said <u>**'woof woof'.**</u>
- None of the above
- I don't know

Appendix D: Final Survey

Welcome! Thank you for your willingness to participate!

This study is looking at the Language Sample Analysis skills of SLP graduate students. The purpose is to gather information for improvements in graduate school training.

SLP grad students, regardless of training or knowledge, can provide valuable insight in this study. There is no judgment value placed on knowing or not knowing this information. Some questions may present unfamiliar concepts; however, answering them to the best of your ability (or selecting "I don't know") allows me to determine the gaps in training that need to be addressed.

This survey should take between 15-20 minutes to complete. It can be completed on a desktop or mobile device. If you are using a mobile device, please take note of the question formats in order to ensure you have answered all sections of a question.

Make sure to enter your email address at the end of the survey to be eligible to win a $25 Amazon gift card!

Participation in this survey is completely voluntary and you may exit the survey at any time.

I really do appreciate your involvement!

All questions and comments about this project can be directed to Allegra Cornaglia at acornagl@mix.wvu.edu

1. Are you a speech-language pathology master's level student?
   - Yes
   - No

Survey logic: If "No" is selected skip to end of survey

2. What institution do you attend for your SLP master's program? (Text Fill-in)
3. What year in your program are you in?
   - 1st Year
   - 2nd Year
4. What was your undergraduate degree in? (For example: Speech-Language Pathology, Communication Sciences and Disorders, Linguistics, etc.)
5. How do you describe yourself?
   - Male
   - Female
   - Non-binary/third gender
   - Prefer to self-describe (Text Fill-in)
   - Prefer not to say
6. How do you describe your race?
   - White

- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Prefer to self-describe (Text Fill-in)
- Prefer not to say

7. How do you describe your ethnicity?
- Non-Hispanic/Latinx
- Hispanic
- Latinx
- Prefer to self-describe (Text Fill-in)
- Prefer not to say

8. Have you ever taken a Language Science Course?
- Yes
- No

Survey logic: If "Yes" is selected display Question 8

9. Was it required for graduation?
- Yes
- No

10. Have you ever had to complete a language sample analysis as part of your coursework?

   Language Sample Analysis (LSA) is the practice of eliciting an oral or written sample from a student and analyzing it to determine language abilities and treatment plans.
- Yes
- No

11. Have you completed an assessment for a client where there were language concerns *whether or not language was the main or only concern*?
- Yes
- No

12. Have you created any language-based goals for working with a client?
- Yes
- No

13. Have you ever used Language Sample Analysis to assess a client?
- Yes
- No

14. What kinds of language samples have you elicited with a client? Mark all that apply.
- Conversation
- Oral Narrative (e.g., "Tell me a story")
- Written Narrative
- Oral Expository (e.g., "Explain how you…")
- Written Expository

- Oral Persuasive
- Written Persuasive
- Observation of child communication in school or play setting
- Other (Please specify)
- I have never elicited a language sample

15. Have you utilized any of the following in language sample analysis? Mark all that apply.
- Assigning Structural Stage (ASS)
- Content Form Analysis (C/FA)
- Computerized Language Analysis (CLAN)
- Developmental Sentence Scoring (DSS)
- Index of Productive Syntax (IPSyn)
- Systematic Analysis of Language Transcripts (SALT)
- Sampling Utterances and Grammatical Analysis Revised (SUGAR)
- State Language Sample Protocol
- Local/District Language Sample Protocol
- Self-Designed Protocol
- Excel or other spreadsheet
- Other (Please specify)

The next section of this survey contains questions about:

- Mean Length of Utterance in morphemes (MLUm)

- Clausal Density

- Grammatical (Inflectional) Morphemes

- Independent and Dependent Clauses

*All utterances are from a spoken word/oral sample

Please answer these questions to the best of your ability. Any responses that you give will be highly valuable for the purposes of this study.

Remember:

- If you are unsure about an answer, please make your best guess.

- If you don't know the answer, please mark "I don't know"

16. How confident do you feel calculating MLU? (0-100 Scale)
17. What is the correct formula for calculating MLUm?
- $\frac{Total\ \#\ of\ Derivational\ Morphemes}{Total\ \#\ of\ Utterances}$
- $\frac{Total\ \#\ of\ Grammatical\ Morphemes}{Total\ \#\ of\ Utterances}$

- $\dfrac{Total\ \#\ of\ Derivational\ Morphemes}{Total\ \#\ of\ Grammatical\ Morphemes}$
- $\dfrac{Total\ \#\ of\ Utterances}{Total\ \#\ of\ Grammatical\ Morphemes}$
- None of the above
- I don't know

18. How confident do you feel counting grammatical morphemes? (0-100 Scale)

Please use the following utterances to label how many grammatical morphemes are in each word or phrase.

19. "Mary's dogs were digging in the garden and ate her favorite bushes."

	0	1	2	3	4+	I don't know
a. Mary's						
b. dogs						
c. digging						
d. ate						
e. bushes						

20. "Exhausting exercises made Susan's children fall asleep easily."

	0	1	2	3	4+	I don't know
a. exhausting						
b. exercises						
c. made						
d. Susan's						
e. children						
f. easily						

21. "He's gonna be lonely when she leaves for Blackstone College for swimming camp."

	0	1	2	3	4+	I don't know
a. he's						
b. gonna						
c. lonely						
d. she leaves						
e. Blackstone College						
f. swimming camp						

22. "Peter Pan only flies through its gate when he isn't walking."

	0	1	2	3	4+	I don't know
a. Peter Pan						
b. only						
c. flies						
d. its gate						
e. isn't						
f. walking						

23. "The Honorable Judge Thompson looked directly at the unexpected women on trial."

	0	1	2	3	4+	I don't know
a. The Honorable Judge Thompson						
b. looked						
c. directly						
d. unexpected						
e. women						
f. trial						

24. How confident do you feel deciding which utterances should be included in an MLU analysis? (0-100 Scale)

25. Please mark whether each utterance would be included or excluded in an MLUm analysis.
    The use of "X" indicates that part of the utterance was unintelligible

	Included	Excluded	I don't know
a. My my my brother Max is a baby			
b. He X his toes			
c. I hafta watch him sometimes			
d. He puts stuff in his mouth			
e. He eated a quarter once			
f. He makes noises like ga ga ga			
g. He sleeps I mean he cries a lot			
h. X Mommy			
i. He's got a tickly button uh belly button			
j. Um			

26. How confident do you feel calculating clausal density? (0-100 Scale)

27. What is the correct formula for calculating clausal density?

- $\dfrac{Total\ \#\ of\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Dependent\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Indpendent\ Clauses}{C-units}$

- $\dfrac{Total\ \#\ of\ Dependent\ Clauses}{Total\ \#\ of\ Independent\ Clauses}$

- None of the above

- I don't know

28. How confident do you feel identifying C-units? (0-100 Scale)

29. How confident do you feel identifying dependent clauses? (0-100 Scale)

30. "I went to the park, played with my friends, and went home."

    a. How many C-Units are in the utterance?

        - 0
        - 1
        - 2
        - 3
        - More than 3
        - I don't know

    b. How many dependent clauses are in the utterance?

        - 0
        - 1
        - 2
        - 3
        - More than 3
        - I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?

        - **I went to the park, played with my friends, and went home.**
        - **I went to the park**, / **played with my friends**, and **went home**.
        - I went to the park, **played with my friends**, and went home.
        - **I went to the park**, played with my friends, and went home.
        - I went to the park, played with my friends, and **went home**.
        - None of the above
        - I don't know

31. "Waiting in line is my least favorite thing to do, but at least I don't have to talk to people while I wait."

    a. How many C-Units are in the utterance?

        - 0
        - 1

- 2
- 3
- More than 3
- I don't know

b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **Waiting in line** is my least favorite thing to do, but at least I don't have to talk to people while I wait.
- **Waiting in line** is my least favorite thing to do, but at least I don't have to talk to people **while I wait**.
- Waiting in line is my least favorite thing to do, **but at least I don't have to talk to people while I wait.**
- **Waiting in line is my least favorite thing to do**, but at least I don't have to talk to people while I wait.
- Waiting in line is my least favorite thing to do, but at least I don't have to talk to people **while I wait.**
- None of the above
- I don't know

32. "We went home and my mom was there."
a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

      c. Which option correctly **<u>highlights</u>** all DEPENDENT clauses in the utterance?
- **<u>We went home and my mom was there</u>**
- **<u>We went home</u>** / and **<u>my mom was there</u>**
- **<u>We went home</u>** and my mom was there
- We went home and **<u>my mom was there</u>**
- None of the above
- I don't know

33. "Please tell me who left this package when I left to run errands."
      a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

      b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

      c. Which option correctly **<u>highlights</u>** all DEPENDENT clauses in the utterance?
- **<u>Please tell me</u>** who left this package when I left to run errands.
- Please tell me **<u>who left this package</u>** / **<u>when I left to run errands</u>**.
- **<u>Please tell me</u>** who left this package **<u>when I left to run errands</u>**.
- **<u>Please tell me</u>** / **<u>who left this package</u>** when I left to run errands.
- Please tell me who left this package **<u>when I left to run errands</u>**.
- None of the above
- I don't know

34. "I thought 'I gotta get out of here'."
      a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3

- I don't know

    b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **I thought 'I gotta get out of here'.**
- **I thought** / **'I gotta get out of here'.**
- **I thought** 'I gotta get out of here'.
- I thought **'I gotta get out of here'.**
- I thought 'I gotta get **out of here'.**
- None of the above
- I don't know

35. "The children who skateboard in the street are especially noisy in the early evening so I shut my window so I could work."

    a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- **The children who skateboard in the street** are especially noisy in the early evening so I shut my window so I could work.
- **The children who skateboard in the street** are especially noisy in the early evening **so I shut my window** / **so I could work.**

- The children **who skateboard in the street** are especially noisy in the early evening **so I shut my window** so I could work.
- The children **who skateboard in the street** are especially noisy in the early evening so I shut my window **so I could work**.
- The children who skateboard in the street are especially noisy in the early evening so I shut my window **so I could work**.
- None of the above
- I don't know

36. The answer to this question is three c-units and three dependent clauses.
    a. How many C-Units are in the utterance?
      - 0
      - 1
      - 2
      - 3
      - More than 3
      - I don't know
    b. How many dependent clauses are in the utterance?
      - 0
      - 1
      - 2
      - 3
      - More than 3
      - I don't know

37. "Because I need to get out of this place."
    a. How many C-Units are in the utterance?
      - 0
      - 1
      - 2
      - 3
      - More than 3
      - I don't know
    b. How many dependent clauses are in the utterance?
      - 0
      - 1
      - 2
      - 3
      - More than 3
      - I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- Because **I need to get out of this place.**
- Because I need **to get out of this place**.
- **Because I need to get out of this place.**
- Because **I need** to get out of this place.
- None of the above
- I don't know

38. "I think I should start walking in the evening because I'm feeling cooped up"
    a. How many C-Units are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

    b. How many dependent clauses are in the utterance?
- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?
- I think **I should start walking in the evening** / **because I'm feeling cooped up**
- **I think** I should start walking in the evening **because I'm feeling cooped up**
- **I think** I should **start walking in the evening** / **because I'm feeling cooped up**
- I think **I should start walking in the evening** because I'm feeling cooped up
- I think I should start walking in the evening **because I'm feeling cooped up**
- None of the above
- I don't know

39. "The horse trotting up to the fence hopes that you have an apple or carrot."
    a. How many C-Units are in the utterance?
- 0

- 1
- 2
- 3
- More than 3
- I don't know

   b. How many dependent clauses are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

   c. Which option correctly **highlights** all DEPENDENT clauses in the utterance?

- **The horse trotting up to the fence** hopes that you have an apple or carrot.
- **The horse trotting up to the fence** hopes **that you have an apple or carrot**.
- The horse **trotting up to the fence** hopes that you have an apple or carrot.
- The horse **trotting up to the fence** hopes **that you have an apple or carrot**.
- The horse trotting up to the fence hopes **that you have an apple or carrot**.
- None of the above
- I don't know

40. "The dog said 'woof woof'."
   a. How many C-Units are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

   b. How many dependent clauses are in the utterance?

- 0
- 1
- 2
- 3
- More than 3
- I don't know

Survey logic: If "0" or "I don't know" is selected skip to next utterance

    c. Which option correctly <u>**highlights**</u> all DEPENDENT clauses in the utterance?
- <u>**The dog said 'woof woof'.**</u>
- <u>**The dog said**</u> / <u>**'woof woof'.**</u>
- <u>**The dog said**</u> 'woof woof'.
- The dog said <u>**'woof woof'.**</u>
- None of the above
- I don't know

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