

A COMPARISON OF TWO PROCEDURES FOR ANALYZING SPONTANEOUS
LANGUAGE IN PRESCHOOL CHILDREN WITH DEVELOPMENTAL LANGUAGE
DISORDER

By

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ABSTRACT

The purpose of this study is to make a comparison of the SALT and SUGAR language sample analysis procedures in gathering evidence of language impairment from spontaneous language samples. Three preschool children with developmental language disorder (DLD) participated in the study. The children were asked a variety of open-ended questions in order to obtain a conversational sample. A total of 50 utterances were then transcribed and analyzed using the SALT and SUGAR analysis procedures. The results were then compared against the normative database for each procedure. The SALT analysis identified 2 out of 3 children as being outside one standard deviation (SD) relative to database peers on measures common to both procedures whereas the SUGAR analysis identified only 1 of the 3 children. SALT provided additional measures in which all 3 of the children fell outside of one SD relative to database peers. Based on the results, researchers determined that despite the SUGAR analysis being more efficient, the SALT analysis provides much more detailed data about expressive language development. Therefore, the SALT analysis should be used over the SUGAR analysis to analyze spontaneous language and provide supporting evidence for diagnosing children with DLD.

1 | INTRODUCTION

Developmental Language Disorder (DLD) classifies children whose language skills fall behind those of their peers in the absence of a hearing loss, cognitive impairments or significant social-emotional difficulty such as those present in Autism Spectrum Disorder. In The Plante Lab, researchers need to accurately diagnosis preschool children (ages 4-5) with DLD. In order to rule out hearing loss and cognitive impairment as a cause of language delay, researchers conduct a hearing screening and administer a standardized, norm-referenced test of nonverbal cognitive skills (*Kaufman Assessment Battery for Children, 2nd Edition* (KABC-II), Nonverbal Scale). Language skills are measured using the *Structured Photographic Expressive Language Test-Preschool Second Edition (SPELT-P2)*. The judgment of an experienced clinician also plays heavily into the final decision as to whether or not a child has DLD.

1.1 | *SPELT-P2*

The *SPELT-P2* has been identified as being very accurate in discriminating children with DLD from those with normal language. This test has good sensitivity (90%) and specificity (100%) (Greenslade, Plante, & Vance, 2009). Sensitivity refers to how accurately the test classifies children with a language impairment as being language impaired, while specificity refers to how accurately the test classifies children who do not have a language impairment as having typical language development. While the *SPELT-P2* does have good sensitivity, it is not perfect, as 90% sensitivity means that 1/10 children with DLD is missed. This presents the need for more information to make an accurate clinical diagnosis. This includes the child's history, parent and teacher reports, as well as language samples to corroborate the results of the standardized tests and clinical judgment.

1.2 | Conversational Language Samples

Conversational language samples are used for collecting more information about where a child's language skills may be lacking, as well as for additional data to give to parents, doctors, and educators when clinical judgments are made. Currently in The Plante Lab, researchers have a need to select a more practical way to collect and assess these language samples. There are two analyses that researchers want to look at: the Systematic Analysis of Language Transcripts (SALT) (Miller, 2018) and the Sampling Utterances and Grammatical Analysis Revised (SUGAR) (Pavelko & Owens, 2017).

1.3 | SALT

The SALT analysis is an in depth analysis, requiring a language sample of 100 utterances, extensive time allotted to transcribing and coding the language samples, as well as professional software to transcribe and calculate various measures. The analysis presents information about a child's intelligibility, syntax and morphology, semantics, verbal facility, as well as errors. All measures can be compared to data from a normative base.

1.4 | SUGAR

The SUGAR analysis was developed because clinicians often do not have the time to analyze language samples using SALT. This analysis presents information about syntax and morphology. SUGAR also provides preliminary information from a normative base. It only requires 50 utterances, does not require complex codes, and uses Word for transcription and calculating the measures, rather than commercial software. Therefore, in the Plante Lab, researchers wanted to determine if the much less extensive SUGAR analysis can be used over the SALT analysis for their diagnostic goals, as they feel it will save them time when conducting these language measures.

1.5 | Purpose

The purpose of this study is to make a comparison of the SALT and SUGAR language sample analysis procedures in gathering evidence of language impairment from spontaneous language samples. Findings from the two language sample analysis procedures have been compared to the results of the *SPELT-P2*, as well as Rebecca Vance's clinical judgment, to see which analysis best corroborates the presence of a language disorder. In addition to measuring the analyses against data found in the lab, the two analyses have been compared on several parameters: time to transcribe, time to analyze, information gained, as well as challenges faced. This plethora of information will ultimately tell researchers if they can use the SUGAR analysis to examine conversational language samples, or if it is worth the extra time to conduct the SALT analysis instead.

2 | METHOD

Researchers collected language samples from preschool children and analyzed them using both the SALT and SUGAR analyses. The following sections will go into more detail.

2.1 | Participants

Three children between the ages of 4 and 5 were recruited from preschools in Tucson, Arizona. Informed consent was obtained from caregivers in order to allow the children to participate in a larger study from which these participants were drawn. Of the children that participated in this study, two were males and one was female. One of the children had a Hispanic background, while the other two were non-Hispanic. One of the children was American Indian and the other two had nothing reported for race. All children were native English speakers. Additionally, the mother's education levels varied for each child. One child's mother had an education level of 16 (bachelor's degree), the second child's mother had an

education level of 12 (high school diploma), and the third child's mother had an education level of 14 (two years post high school). The parents of all three children reported concerns about language development, but none of the children were enrolled in speech-language services. All three children were identified as having DLD based on results on the *SPELT-P2* as well as clinical judgment. The subjects in this study are identified as AC, TM, and LN.

2.2 | Materials

A voice recorder was used in order to capture the conversational sample. Once the sample was collected, the analyses required various materials. The SALT analysis required a computer, the SALT software, and the SALT handbook/training materials. The SUGAR analysis required a computer, Microsoft Word, and the SUGAR article by Pavelko and Owens (2017).

2.3 | Procedure

The children in this study were taken out of their preschool classrooms in order to meet with the examiner. A recorder was placed between the child and the examiner in order to record the conversations. The children were asked a variety of open-ended questions to encourage them to express ideas in complete sentences. An example of such a question is "I wonder what you will dress up as for Halloween?" Commentary was also used, such as "This weekend I bought Halloween decorations to decorate my house". Finally, children's utterances were repeated back to encourage further conversation. An example of this technique is (Child: "I got candy." Examiner: "You got candy?"). See Appendix A for more examples of elicitation techniques used. The conversations were ended upon completion of at least 50 conversational utterances. Once the conversational samples were collected, a total of 50 utterances were analyzed per child, rather than the 100 that SALT uses. Researchers selected this number because it is the number of utterances that SUGAR uses. This decision was supported by research that resulted in the

determination that 50 utterances are sufficient to reliably and efficiently analyze language (Casby, 2011). The findings of both the SALT and SUGAR analyses have been compared in order to find the most efficient means to provide corroborating evidence of DLD from spontaneous language samples.

2.4 | *Transcription*

The most robust 50 utterances were selected and transcribed for each child. This differs from using the first 50 utterances as recommended for SUGAR. This determination was based on researcher's findings that it takes some time for the children to warm up and begin speaking in utterances that are more true to their capabilities. The utterances began at the same starting point and were transcribed until 50 utterances were obtained according to each procedure's transcription rules. For the SALT analysis, both the examiner and the child's utterances were transcribed. The children's utterances included filled pauses (such as "uh uh uh cookie"), false starts (such as "I want the, I want the cookie), and repetitions (such as "I want want the cookie"). Additionally, utterances with coordinating conjunctions (such as "and") and those that included yes/no responses were segmented into two separate utterances. For the SUGAR analysis, solely the child's utterances were transcribed. Only the fullest form of each utterance was transcribed, omitting pauses, false starts, and repetitions. In contrast with the SALT analysis, the SUGAR analysis allowed for utterances containing one coordinating conjunction, as well as utterances with yes/no responses, to be kept together in a single utterance. Transcription for each child switched off in terms of which analysis was transcribed and analyzed first. For subject AC, SUGAR was conducted first, for subject TM, SALT was conducted first, and for subject LN, SUGAR was conducted first.

2.5 | *Analyses*

The SALT analysis required complex coding into the SALT software program. Once the codes were inputted, the results were compared to a normative database. The databases were matched for the child's age, number of utterances analyzed (50), as well as the type of sample (conversational). The software program generated the results for easy comparison. The measures consisted of a plethora of information, such as word-level errors (omitted words/morphemes), utterance-level errors (such as incorrect word order), transcription length, syntax/morphology, semantics, etc. Central measures of interest for this study include: number of total words (NTW), mean length of utterance in morphemes (MLU), number of different words (NDW), Utterances with Mazes as % of Total Utterances (mazes include filled pauses, false starts, repetitions, and reformulations), and % Utterances with Errors. The SUGAR analysis, on the other hand, required the use of Word. The utterances were analyzed to find the total number of words (TNW), mean length of utterance in morphemes (MLUs), words per sentence (WPS), and clauses per sentence (CPS) for each child. The "s" in MLUs refers to specific segmentation rules used for the SUGAR analysis rather than those that used for other measures of MLU. Their results were then compared to an age-matched normative database. Both the SALT and SUGAR databases consisted of typically developing children.

3 | **RESULTS**

The analyses were compared to normative databases in order to determine whether or not each child falls within the normal range (one standard deviation) for his/her age range on measures of interest. Comparable measures (MLU and NTW/TNW) from the SALT and SUGAR analyses were then addressed for each child. Finally, the results were considered relative to each child's *SPELT-P2* scores and clinical judgment.

3.1 | *SALT Analysis*

AC. Subject *AC* was outside the normal range for 2 of the 5 central measures on the SALT analysis (see Appendix B for the analysis). Table 1 displays *AC*'s results in comparison to the normative database. Her Utterances with Mazes as % of Total Utterances was 1.73 SD above the mean and her % Utterances with Errors was 3.77 SD above the mean (note that scores above the mean for these two measures indicated poorer performance relative to typical peers). Her NTW and MLU were above the mean and both fell within the SD. Her NDW was below the mean and within the SD.

Table 1. *AC* SALT Analysis Outcomes

	NTW	MLU	NDW	Utts with Mazes as % Of Total Utt	% Utterances With Errors
<i>Normative Database</i>					
<i>M</i>	201.14	4.54	94.64	24.64	11.66
<i>SD</i>	50.16	1.14	22.27	10.51	7.74
<i>Subject</i>					
<i>AC</i>	243	5.10	83	42.9%	40.8%
<i>+/- SD</i>	0.83	0.49	-0.52	1.73	3.77

Note. The normative database is taken from a SALT database. The subjects are matched by: conversational database, age (age range from 4;0-4;5), and same number of analysis-set utterances. NTW = number total words; MLU = mean length of utterance in morphemes; NDW = number different words; Mean Turn Length is in words.

TM. Subject *TM*'s results fell outside of the normal range for all of the measures on the SALT analysis (see Appendix C for the analysis). Table 2 displays *TM*'s results in comparison to the normative database. His NTW was 1.08 SD below the mean, his NDW was 5.39 SD below the mean, his MLU was 1.24 SD below the mean, his Utterances with Mazes as % of Total Utterances was almost 2 SD above the mean, and his % Utterances with Errors was 7.15 SD above the mean.

Table 2. TM SALT Analysis Outcomes

	NTW	MLU	NDW	Utts with Mazes as % Of Total Utt	% Utterances With Errors
<i>Normative Database</i>					
<i>M</i>	219.80	5.05	91.00	29.79	8.94
<i>SD</i>	21.13	0.69	5.39	9.15	5.30
<i>Subject</i>					
TM	197	4.19	62	46.8	46.8%
<i>+/- SD</i>	-1.08	-1.24	-5.39	1.86	7.15

Note. The normative database is taken from a SALT database. The subjects are matched by: conversational database, age (age range from 4;6-4;11), and same number of analysis-set utterances. NTW = number total words; MLU = mean length of utterance in morphemes; NDW = number different words; Mean Turn Length is in words.

LN. Subject LN's results fell outside of the normal range for most measures on the SALT analysis (see Appendix D for the analysis). Table 3 displays LN's results in comparison to the normative database. His NTW and MLU fell below the mean and outside of the SD. He was 2 SD below the mean for both measures. His NDW was almost 4 SD below the mean and his % Utterances with Errors was 2.14 SD above the mean. His Utterances with Mazes as % of Total Utterances was below the mean and within the SD.

Table 3. LN SALT Analysis Outcomes

	NTW	MLU	NDW	Utts with Mazes as % Of Total Utt	% Utterances With Errors
<i>Normative Database</i>					
<i>M</i>	323.22	5.47	134.37	24.26	0.64
<i>SD</i>	50.84	0.88	18.69	9.36	6.54
<i>Subject</i>					
LN	217	3.54	61	20.0%	24.6%
<i>+/- SD</i>	-2.09	-2.19	-3.93	-0.46	2.14

Note. The normative database is taken from a SALT database. The subjects are matched by: conversational database, age (age range from 5;0-5;11), and same number of analysis-set utterances. NTW = number total words; MLU = mean length of utterance in morphemes; NDW = number different words; Mean Turn Length is in words.

3.2 | *SUGAR Analysis*

AC. Subject *AC* was within the normal range for all of the measures in the *SUGAR* analysis (see Appendix E for the analysis). Table 4 displays *AC*'s results in comparison to the normative database. While her *TNW* and *MLUs* were below the mean, they were within the standard deviation. Both her *WPS* and *CPS* were above the mean and within the *SD*.

Table 4. *AC SUGAR Analysis Outcomes*

	<i>TNW</i>	<i>MLUs</i>	<i>WPS</i>	<i>CPS</i>
<i>Normative Database</i>				
<i>M</i>	261.40	5.79	6.48	1.19
<i>SD</i>	69.98	1.53	1.37	0.13
<i>Subject</i>				
<i>AC</i>	256	5.66	6.51	1.21
<i>+/- SD</i>	-0.08	-0.08	0.02	0.15

Note. The normative database is taken from the *SUGAR* article (Pavelko & Owens, 2017). The subject's age (4;5) is matched to the age range 4;0-4;5. *TNW* = total number of words; *MLUs* = mean length of utterance in morphemes; *WPS* = words per sentence; *CPS* = clauses per sentence. Researchers calculated a Z score for each measure using the following formula: Raw Score – Mean/*SD*. This gave researchers the results in units of *SD*.

TM. Subject *TM* was within the normal range for all of the measures in the *SUGAR* analysis (see Appendix F for the analysis). Table 5 displays *TM*'s results in comparison to the normative database. His *TNW* was above the mean and within the *SD*. His *MLUs*, *WPS*, and *CPS* were below the mean; however, his scores fell within the *SD* for all 3 measures.

Table 5. *TM SUGAR Analysis Outcomes*

	<i>TNW</i>	<i>MLUs</i>	<i>WPS</i>	<i>CPS</i>
<i>Normative Database</i>				
<i>M</i>	278.71	6.18	6.97	1.21
<i>SD</i>	60.14	1.32	1.26	0.11
<i>Subject</i>				
<i>TM</i>	280	5.6	6.09	1.16
<i>+/- SD</i>	0.02	-0.44	-0.70	-0.45

Note. The normative database is taken from the *SUGAR* article (Pavelko & Owens, 2017). The subject's age (4;11) is matched to the age range 4;6-4;11. *TNW* = total number of words; *MLUs* = mean length of utterance in morphemes; *WPS* = words per sentence; *CPS* = clauses per sentence. Researchers calculated a Z score for each measure using the following formula: Raw Score – Mean/*SD*. This gave researchers the results in units of *SD*.

LN. Subject *LN*'s results fell outside of the SD on the SUGAR analysis (see Appendix G for the analysis). Table 6 displays *LN*'s results in comparison to the normative database. His TNW, MLUs, and WPS were all more than 1 SD below the mean. He performed below the mean for CPS, however his score fell within the SD.

Table 6. LN SUGAR Analysis Outcomes

	TNW	MLUs	WPS	CPS
<i>Normative Database</i>				
<i>M</i>	299.81	6.66	7.33	1.29
<i>SD</i>	61.46	1.35	1.21	0.13
<i>Subject</i>				
<i>LN</i>	217	4.68	5.84	1.22
+/- <i>SD</i>	-1.35	-1.47	-1.23	-0.54

Note. The normative database is taken from the SUGAR article (Pavelko & Owens, 2017). The subject's age (5;2) is matched to the age range 5;0-5;11. TNW = total number of words; MLUs = mean length of utterance in morphemes; WPS = words per sentence; CPS = clauses per sentence. Researchers calculated a Z score for each measure using the following formula: Raw Score – Mean/SD. This gave researchers the results in units of SD.

3.3 | *SALT* vs. *SUGAR*

In making a comparison of *SALT* vs. *SUGAR*, solely the MLU and NTW/TNW were discussed as these were the only measures that were similar across both analyses. The term “common measures” is used to refer to these measures. Further examination of other measures will be discussed in the following section..

AC. Neither *SALT* nor *SUGAR* picked up *AC* as being outside the SD relative to typically developing peers on common measures (MLU and NTW/TNW) (see Table 7). Subject *AC*'s MLU on the *SALT* analysis was 0.49 SD above the mean. Her MLU on the *SUGAR* analysis was 0.08 SD below the mean. Both measures fell within the normal range in comparison to each database. However, *SALT* picked up subject *AC*'s MLU as being lower relative to peers than her MLU on the *SUGAR* analysis. In terms of the total number of words, subject *AC* was

0.83 SD above the mean on the SALT analysis and 0.08 SD below the mean on the SUGAR analysis. These measures additionally fell within the normal range in comparison to each database. Subject AC's NTW/TNW was lower on SALT than on SUGAR.

Table 7. AC SALT vs. SUGAR Analysis Comparison – MLU & NTW/TNW

	Normative Database	AC	+/- SD
SALT			
MLU		5.10	0.49
<i>M</i>	4.54		
<i>SD</i>	1.14		
NTW		243	0.83
<i>M</i>	201.14		
<i>SD</i>	50.16		
SUGAR			
MLU		5.66	-0.08
<i>M</i>	5.79		
<i>SD</i>	1.53		
TNW		256	-0.08
<i>M</i>	261.40		
<i>SD</i>	69.98		

Note. AC is 4;5. The normative databases range from age 4;0-4;5. The normative database for SALT is taken from the SALT database. The normative database for SUGAR is taken from the SUGAR article (Pavelko & Owens, 2017). MLU is in morphemes.

TM. SALT picked up *TM* as being outside the SD relative to typically developing peers on common measures. SUGAR, on the other hand, did not pick up *TM* as being outside the SD on common measures (see Table 8). Subject *TM*'s MLU on SALT was 1.24 SD below the mean. This fell outside of the normal range for his age. His MLU on SUGAR was 0.44 SD below the mean. This fell within the normal range for his age. As was seen with Subject AC, *TM*'s MLU was lower on the SALT analysis than on the SUGAR analysis. In terms of the total number of words, Subject *TM* was 1.08 SD below the mean on the SALT analysis. This fell outside of the normal range for his age. He was 0.02 SD above the mean on the SUGAR analysis. This fell

within the normal range for his age. Subject TM's NTW/TNW was much lower on SALT than on SUGAR.

Table 8. TM SALT vs. SUGAR Analysis Comparison – MLU & NTW/TNW

	Normative Database	TM	+/- SD
SALT			
MLU		4.19	-1.24
<i>M</i>	5.05		
<i>SD</i>	0.69		
NTW		197	-1.08
<i>M</i>	219.80		
<i>SD</i>	21.13		
SUGAR			
MLU		5.6	-0.44
<i>M</i>	6.18		
<i>SD</i>	1.32		
TNW		280	0.02
<i>M</i>	278.71		
<i>SD</i>	60.14		

Note. TM is 4;11. The normative databases range from age 4;6-4;11. The normative database for SALT is taken from the SALT database. The normative database for SUGAR is taken from the SUGAR article (Pavelko & Owens, 2017). MLU is in morphemes.

LN. Both the SALT and SUGAR analysis picked up *LN* as being outside the SD relative to typically developing peers on common measures (see Table 9). Subject *LN*'s MLU on SALT was 2.19 SD below the mean. His MLU on SUGAR was 1.47 SD below the mean. Both measures fell outside of the normal range in comparison to each database. As was seen with the previous children, subject *LN*'s MLU was lower on the SALT analysis than on the SUGAR analysis. In terms of the total number of words, Subject *LN* was 2.09 SD below the mean on the SALT analysis and 1.35 SD below the mean on the SUGAR analysis. These measures fell outside of the normal range for his age. Subject *LN*'s NTW/TNW was the same on the SALT and SUGAR analyses.

Table 9. LN SALT vs. SUGAR Analysis Comparison – MLU & NTW/TNW

	Normative Database	LN	+/- SD
SALT			
MLU		3.54	-2.19
<i>M</i>	5.47		
<i>SD</i>	0.88		
NTW		217	-2.09
<i>M</i>	323.22		
<i>SD</i>	50.84		
SUGAR			
MLU		4.68	-1.47
<i>M</i>	6.66		
<i>SD</i>	1.35		
TNW		217	-1.35
<i>M</i>	299.81		
<i>SD</i>	61.46		

Note. LN is 5;2. The normative databases range from age 5;0-5;11. The normative database for SALT is taken from the SALT database. The normative database for SUGAR is taken from the SUGAR article (Pavelko & Owens, 2017). MLU is in morphemes.

4 | LOGISTICS

The SUGAR analysis took significantly less time to learn and conduct than the SALT analysis. It took 20 minutes to transcribe each child's sample and 15 minutes to analyze the samples. The SALT analysis, on the other hand, required 35 minutes to transcribe each child's sample and 30 minutes to analyze the samples. It additionally took a few days to learn all of the coding and segmenting rules of SALT. In terms of the information each analysis provides, the SALT analysis provides a wide range of measures while SUGAR only provides data on 4 measures. The measures in the SALT analysis were much more helpful and contained a wider range of information than those in the SUGAR analysis.

5 | DISCUSSION

This section will discuss the findings of the present study in order to answer the question of whether the SUGAR analysis can be used over the SALT analysis to provide evidence of

language impairment from spontaneous language samples. Each child's results on the analyses will be discussed relative to their *SPELT-P2*. The *SPELT-P2* has a cutoff of 87. When this cutoff point is used, the sensitivity is 90% and the specificity is 100%. Therefore, when discussing each child's scores, they are mentioned in points from the cutoff score of 87. It is important to keep in mind that based on the *SPELT-P2* and clinical judgment, all children are considered impaired.

AC. Subject AC's score on the *SPELT-P2* was a 76, which is 11 points below the cutoff score of 87. One could argue that relative to the other children in this study, her expressive language impairment is less severe. She was not identified as being impaired on common measures in the SALT or SUGAR analysis. This coincides with clinical judgment that she was thought to be the least severe out of the three children in this study.

TM. Subject TM's score on the *SPELT-P2* was a 58, which is 29 points below the cutoff score of 87. SALT was the only analysis that identified TM as being outside of the SD on common measures. This additionally coincides with clinical judgment that his expressive language skills were more impaired than those of AC.

LN. Subject LN's score on the *SPELT-P2* was a 47, which is 40 points below the cutoff score of 87. Both the SALT and SUGAR analysis identified LN as being outside of the SD on common measures. He had the lowest score on the *SPELT-P2* and was thought to be the most impaired of the three children. This coincides with the findings of this study, as he was the only child to be picked up by both analyses.

In terms of the common measures (MLU and NTW/TNW), SALT gave better data. SALT picked up 2 of the 3 children as being outside of the SD in comparison to their database

peers on both MLU and NTW/TNW. SUGAR only had one child outside of the SD for these two common measures.

All children had a lower MLU on the SALT analysis than the SUGAR analysis. Two children had a lower NTW/TNW on SALT than SUGAR. When taking into consideration the rules of segmentation for both analyses, it becomes evident why the results on SALT more often agreed with clinical impressions. SALT breaks up utterances containing coordinating conjunctions and yes/no responses, whereas SUGAR keeps these together in a single utterance. Therefore, SUGAR may overinflate the MLU by keeping more words together in a single utterance. This may explain why SUGAR did not pick up 2 of the 3 children on the MLU measure. The two children who were not picked up had longer utterances due to the segmentation rules. The one child who was identified on the SUGAR analysis spoke in significantly shorter utterances that did not contain any coordinating conjunctions, so he was picked up regardless of the segmentation rules used.

These rules additionally explain why the total number of words was different for 2 out of 3 children on the SALT versus the SUGAR analysis. Subject AC's results were slightly different between the two analyses and Subject TM's results were significantly different between the two analyses. Subject LN, on the other hand, had the exact same number of total words on both the SALT and SUGAR analyses. This happened because LN did not combine any independent clauses with a coordinating conjunction, so his utterances were segmented in the same way for both analyses. For subjects AC and TM, when two independent clauses were joined with a coordinating conjunction, they remained as one utterance in SUGAR, but not in SALT. Therefore, in the SUGAR analysis, more sentences were needed to reach the 50 utterances required. This led to the word counts being higher in SUGAR. Subject TM additionally used a

high number of yes/no responses, which were segmented as individual utterances in SALT, but not in SUGAR. This contributed further to TM having significantly fewer total words in SALT than in SUGAR. Based on this information, results indicate that SUGAR may only provide evidence of language impairment when children have extremely limited verbal output.

While there was one child (AC) who was not picked up on the common measures in SALT, she was picked up on other measures that the SALT analysis provides. Her percent of utterances with errors was 40.8%, 3.77 SD above the mean. Her errors consisted of omitted words, omitted bound morphemes, word-level errors, and utterance-level errors. This means that while she may have had significant verbal output comparable to typical peers, much of what she said contained errors in grammar, which is a hallmark characteristic of DLD in preschool children. Additionally, her sample contained 27 mazes, which were found in 42.9% of her utterances (1.73 SD above mean). These mazes consisted of a high number of both phrase-level and word-level revisions. Her high number of mazes may indicate difficulty with word retrieval and/or utterance formulation. Finally, another measure provided in the SALT analysis is the number of different conjunctions. She only used two types of conjunctions (“and” and “but), which is 1.17 SD below the mean. This may highlight her inability to produce a variety of utterances. What this information told researchers is that regardless of her scores on the common measures, she is impaired on other measures that only SALT provides.

SALT provided additional important information for the other two children as well. Subject TM’s percent of utterances with errors was 46.8%, 7.15 SD above the mean. His errors included omitted words, omitted bound morphemes, word-level errors, and utterance-level errors. This demonstrates that he does not use grammar correctly, which as mentioned above, is a hallmark feature of DLD in preschool children. His number of different words (NDW) was 3 SD

below the mean. This low score may indicate reduced vocabulary diversity. He also used significantly fewer different negatives, conjunctions (he only used “and”), and personal pronouns than his database peers. Finally, his sample contained 30 mazes, which were found in 46.8% of his utterances (1.86 SD above mean). His mazes consisted of a high number of both phrase-level and word-level revisions and repetitions. His high number of mazes may indicate difficulty with word retrieval and/or utterance formulation.

Subject LN’s NDW was 3 SD below the mean and he also used fewer different conjunctions (he only used “and”) and personal pronouns (he only used 5) than his database peers. This may indicate reduced vocabulary and utterance diversity. His percent of utterances with errors was 24.6%, which is 2.14 SD above the mean. His errors included omitted words, omitted bound morphemes, and utterance-level errors. It is evident that he has errors in grammar, which again is a hallmark characteristic of DLD in preschool children. He had 13 omissions (of words and bound morphemes), which is 4.91 SD above the mean. This highlights how he uses language incorrectly and leaves key information out.

6 | CONCLUSION

All of the children in this study were determined to have DLD based on *SPELT-P2* results and clinical judgment. However, when comparing common measures (MLU and NTW/TNW) across the SALT and SUGAR analyses, the SUGAR analysis provided corroborating evidence of impairment for only 1 of the 3 children, whereas SALT provided corroborating evidence of impairment for 2 of the 3 children. The child with low scores on SUGAR measures had the least verbal output of the 3 children, the lowest *SPELT-P2* score, and was judged to be the most severely impaired. When considering the additional information that SALT provides, such as % Utterances with Errors and Utterances with Mazes as % of Total

Utterances, the SALT analysis actually picked up all 3 children as having DLD, coinciding with clinical judgment. In fact, the % Utterances with Errors measure speaks to the hallmark feature of language impairment in preschool children, which is difficulty learning grammatical morphemes.

SUGAR takes much less time to conduct than SALT. It only requires the use of Word and only the child's most complete utterances are transcribed and analyzed. In the SALT analysis, it is necessary to learn and use a variety of codes within the software program. Additionally, the child's complete utterances need to be transcribed and analyzed, including mazes. While SALT takes significantly longer, researchers found themselves getting faster at SALT over time. However, even with the increase in speed seen with experience, the SUGAR analysis was still more efficient than the SALT analysis.

While the SUGAR analysis is more efficient, the SALT analysis provides more corroborating evidence of DLD. Due to the amount of information SALT provides, as well as the fact that the findings coincide more closely with clinical judgment, it is worth the extra time to learn SALT. Therefore, SALT is preferable to the SUGAR analysis for analyzing spontaneous language in children and providing supporting evidence of DLD.

7 | REFLECTIONS ON THIS PROJECT

This study has provided me with knowledge of language sampling analyses that will impact my future clinical decisions. I have learned how useful and beneficial the SALT analysis is, despite the time-consuming nature of its requirements. In graduate school and eventually as a Speech-Language Pathologist, I will use SALT in order to contribute to my clinical diagnosis of patients. This analysis will provide me with a starting point for each patient's therapy by providing me with information about where each child is the most impaired. The wide range of

data SALT provides will also allow me to track my patients' progress. In the future, I will explore using SALT on narrative samples (for children over 4;4) rather than conversational samples. I found that the nature of conversational samples allows children to use learned utterances that they are comfortable using. This led to the children repeating things or using the same sentence structure for multiple utterances. A narrative sample, particularly on a story retell, would encourage children to stray from those utterances and express ideas in more complex ways. This would give me a better concept of how a child's expressive language skills compare to those of his/her peers using a task that demands more cognitive resources and language complexity. Overall, I have learned a lot of useful information that I will use for the rest of my career.

Appendix A (p. 1 of 2)*Elicitation Techniques*

Family

- Do you have any brothers or sisters?
- I wonder if you have any brothers or sisters?
- I have one brother; he is younger than me.
- I wonder if he/she is bigger or smaller than you?
- I wonder what you play with your brother/sister(s)?
- What do you and your mom/dad/grandparents like to do?
- My mom used to read me bedtime stories.

Pets

- I wonder if you have any pets?
- I have 4 puppies. They are all small (demonstrate small with hands).
- Is your puppy/cat big or small?
- What is your pet's name?
- I wonder what you play with your pet?
- What do you do with your dog at the park?
- Who feeds your pet?
- I take my puppy to the park and we play with a ball.
- My puppies are white and black.

Play

- What toys do you like to play with?
- I wonder if you like to go to the park?
- What is your favorite toy?
- I like to play on the swings with my friends.
- My favorite toy is dolls/superman/legos/cars/etc.
- I wonder if you like to swim? I love to swim when it is hot outside.

Holiday/Birthday

- I wonder what Santa brought you for Christmas?
- What kind of Birthday party did you have?
- For Christmas I got a lot of presents from Santa.
- For Easter I like to go an Easter egg Hunt.
- Did you do anything special for Halloween? Tell me about that. I wonder what you dressed up as?
- For Valentine's Day I made my mom a card.

Appendix A (p. 2 of 2)*Elicitation Techniques*

Food

- My favorite food is ice cream. I love chocolate ice cream.
- My mom and I like to bake cookies.
- I like to put pink sprinkles on my ice cream.
- When it is really hot outside I like to eat popsicles.
- When I watch a movie I like to eat popcorn.
- My favorite snack is applesauce.

School

- At school I like to play with my friends.
- I wonder what you and your friends do in class?
- For lunch my mom packs me a peanut butter sandwich. I wonder what you have for lunch at school?
- I wonder who your best friends are at school?
- I wonder if you color in school?

Vacation/Trips

- I like to go to the beach and build sand castles. I wonder what you like to do?
- When I go to the zoo I like to see the Elephants.
- I visited my Grandma and we swam in the pool.
- This weekend I went to the pool with my friends.

Favorites

- My favorite color is blue. I painted the walls in my room blue and I have a blue blanket. I wonder what your favorite color is? I wonder what your room looks like?
- My favorite animals are monkeys. I wonder what your favorite animal is?
- My favorite TV show is Dora the Explorer. I wonder what your favorite TV show is?
- My favorite food is Pizza. I wonder what your favorite food is?
- My favorite birthday party was when I had a princes/superman/etc. birthday.

General Prompts for Extending Topics

- Tell me about that.
 - What else?
 - Tell me more.
-

Appendix B (p. 1 of 3)*AC SALT Analysis*

\$ Child, Examiner
 + Language: English
 + ParticipantId: 19-138
 + Name: AC
 + Gender: F
 + CA: 4;5
 + Context: Con
 - 0:00
 E Tell me are you going to see Santa Claus?
 E What do you want Santa to bring you?
 C I WANNA hug.
 C And him bring me LOTTA present/*s.
 E Like what?
 C LOTTA present/*s!
 C For I want a get [EU].
 E What do you want to get?
 C (Uh) I don't know what toy I get.
 E You don't know what toy you get?
 C And my X and my present.
 E I wonder if you want a babydoll.
 C (Um) Well my mom want/ed that.
 E Your mom wanted a babydoll?
 E What about you?
 C (Well well) Momma just want that one.
 C Well I don't know what I want to get.
 E I wonder what else you want?
 E Maybe a baby doll.
 E What else?
 C I don't know I get (get) the baby doll.
 E You don't know?
 E You don't know if you get a baby doll?
 C I don't what?
 E A game?
 C (Um) No.
 C (I get um) I don't know *what I get.
 E You don't know?
 C Yeah I don't know *what I get inside of my present.
 E Inside of your present.
 E You know what I would like?
 E A rainbow unicorn.
 C Yeah well I have a unicorn *that have[EP:has] pink hair.
 C But she in my room.
 E You have a unicorn with pink hair in your room?
 E Wow.
 C (Well) I don't know I get (get) giving [EU].
 C Well I don't know.
 E Hm I wonder if your unicorn with pink hair has a name.
 C (Uh) What?
 C What unicorn have[EP:has] a name?

Appendix B (p. 2 of 3)*AC SALT Analysis*

E Your unicorn.

C My unicorn have[EP:has] a X pink name.

E It has a pink name?

E Oh.

E Sometimes for Christmas Santa brings me clothes and pajamas.

C And I[EW] *a rainbow unicorn?

C Santa bring/*3s you all of that?

E I don't know, maybe.

E I wonder what Santa will bring your mommy.

C (um um um my mommy bring me pres*) (um Santa my mommy) Santa bring (me) my mom (um um um) playdough.

E Playdough?

E That's a great present.

E You know what we do at my house?

E We make cookies and we leave cookies and milk for Santa Clause.

C Well my mom want/*3s to make that.

E She wants to make cookies?

E I love to bake Christmas cookies and leave them for Santa.

E You know what else we leave?

E Carrots for the reindeer.

C (I don't call it Thanksfgiving) I don't want to call it Thanksgiving no more.

E You don't want to call it Thanksgiving?

C (Yeah) Yeah and now it/*'s Christmas.

E Pretty soon it will be Christmas because we just had Thanksgiving.

C Well we didn't get present/*s yet.

E No because it's not Christmas yet.

C (um um) Santa almost build me a[EW] toy/s.

E He is building the toys.

E Who helps him?

C (Um) No one.

E Not even the elves?

C No.

C She/'s build/ing a toy.

E Santa is building a toy?

C (I want nomnoms) (I have Thanksgiving) I want nomnom I want Thanksgiving [EU].

E You had nomnoms at Thanksgiving?

E What are nomnoms?

C (Um I) Nothing.

C Nomnom is (um) I don't know.

E Is that something to eat?

C Nomnom eat candie/s [EU].

E Nomnom eat candies?

C Their[EP:they] don't eat food just candie/s.

C (um yeah) Don't eat candie/s.

E Don't eat candies?

E What about you?

C (Um um) Well I want a Christmas candy.

C We don't eat them all.

E You don't eat them all?

Appendix B (p. 3 of 3)*AC SALT Analysis*

C I want one but (my but) a[EW] Christmas candy is sold out.

E The Christmas Candy was sold out?

E Maybe you can check again, maybe they got more.

C Well no.

C I don't have more in my house.

E You don't have more?

C I don't have more.

E I did not eat candy for Thanksgiving.

C Well I do.

E You do.

E You're lucky you eat candy for Thanksgiving.

C Well not my mom made it [EU].

E Not your mom made it?

C My daddy eat some.

C (Yeah my dad eat) (um) My dad/*z name is Randy Boller.

E Randy Boller?

E And was Daddy at Thanksgiving?

E Who else was there?

C Jacob Lela.

C (And and and Lilo and a Nina) And Lilo and Nina.

E Lilo and Nina?

E That's a lot of people.

C And my mom and my dad.

—

Appendix C (1 of 3)*TM SALT Analysis*

\$ Child, Examiner
 + Language: English
 + ParticipantId: 19-105
 + Name: TM
 + Gender: M
 + CA: 4;11
 + Context: Con
 - 0:00
 E He plays?
 C The dog.
 E The dog or the park?
 C With my grandma.
 E I wonder if you go to your Grandma's house?
 C Yeah.
 C (and and) my mommy (he) he[EP:she] pick/*ed up me with Grandma [EU].
 E Your mommy picks you up at Grandma's?
 E What does your Grandma's house look like?
 E Is there a room that you play with all your toys in?
 C Yeah.
 E Yeah?
 C I sleep in my bedroom.
 E Oh you sleep in your bedroom?
 C Yeah.
 C At my home.
 E At your home?
 E What is your bedroom like?
 E Do you have a lot of toys in your room?
 C Yeah.
 C In the closet.
 E Your toys are in the closet?
 C Yeah (uh uh uh) *in the toy bucket.
 E Oh the toy bucket.
 E What are your favorite toys?
 C I have a (a) big car.
 E You have a big car?
 E Wow.
 C I got[EW:have] a big army.
 E A big army?
 E Wow.
 C (I got) I got[EW:have] a motorcycle.
 E A motorcycle too!
 C (I got uh uh I got hmm) I got[EW:have] a lego.
 E Legos too?
 E I wonder if your friends ever come over and play with your toys?
 C (uh okay uh) My X have[EW:has] *a toy.
 E Your friend has toy?
 C My sister.
 E Your sister?
 C Yeah.

Appendix C (2 of 3)

TM SALT Analysis

C My sister have[EW:has] *a toy.
 E Your sister has a toy?
 C (uh he) (he have a big) he[EP:she] have[EW:has] a big game.
 E Oh your sister has a big game?
 C Yeah.
 C I have (my big) my big game (at my) at[EW:in] my room.
 E You have five games in your room?
 C I play a motorcycle [EU].
 E And you play with your motorcycle?
 C (uh uh I) I play a car [EU].
 E And you play with your car?
 C Yeah my game.
 E And your game?
 C (uh uh) My sister he[EP:she] let/*3s me play the walking_dead.
 E Your sister lets you play the walking dead?
 C Yeah he[EP:she] let/*3s me (watch uh) play the lego_game.
 E Wow.
 E She lets you watch and play the lego game?
 C He[EP:she] play/*3s (only uh) only the game [EU].
 E Only the game?
 C My sister he[EP:she] play/*3s call_of_duty.
 E Really?
 E Wow.
 C (uh I) I play the fight game.
 E The fight game?
 C (uh uh) I play the walking_dead.
 E Really?
 C (Uh Uh) (I play the walk) I play the walking_dead game.
 C And take it home.
 E The walking dead game and take it home?
 C He came home.
 E Oh.
 C (I play I play) I play X the walking_dead game.
 C (he play) I play motorcycle_game.
 E Which one do you like better?
 E The walking dead or motorcycle game?
 C (uh) Motorcycle.
 E The motorcycle.
 C Me and mom we bought *a snack.
 E You bought a snack?
 C (I ask) My mom tell[EW:told] me I can buy candy.
 E She did?
 C Yeah.
 C (she let me) She let me have X the candy.
 E Your mom let you have candy?
 E Did you eat your healthy food first?
 C Yeah.
 C (uh uh) Me and mom we eat[EW:ate] chicken.
 E You ate chicken.

Appendix C (3 of 3)

TM SALT Analysis

C I eat[EW:ate] a donut.
 E A donut?
 E I love donuts.
 C (I) I eat[EW:ate] a hot chip.
 E A hot chip?
 C (uh I) I ask/*ed my mommy (tell me) can I eat cookie [EU].
 E You asked her if you could eat cookies?
 E What did she say?
 C XXX.
 E Oh wow you have a cookie at home?
 C Me and mom we *were at the store.
 C And we bring[EW:brought] food.
 E You bring food?
 C (me and mom we uh) (my mom) My mom tell me (tell) I can play toy.
 E Toy story?
 E No toy.
 C (he tell me he tell me) (my mommy) My mommy say I can bring toy.
 E That you can bring a toy from the store?
 C (we yeah and I ask my mom) He[EP:she] say (he say) I can watch toy story.
 E Toy story?
 E I love that movie.
 C (me my mom) Me and mom we watch the walking_dead.
 E You and your mom were watching walking dead?
 E Your too little to be watching walking dead!
 E That's too scary!
 C Yeah it is.
 E Yes it is!
 C My mom tell[EW:told] *me I can watch walking_dead.
 C (I ask my mom I ask he) He[EP:she] say I can watch scary movie.
 E Scary movie?
 C My mom he[EP:she] say (he say) I can watch the X.
 E What's that about?
 C He[EP:she] tell[EP:told] me (tell me) I can watch X.
 E I don't know that one.
 C My mom tell[EP:told] *me I can watch X.
 E Really?
 E You can watch a lot of stuff.
 C My mom (he[EP:she]) tell me (tell me) I can watch scary movie.

Appendix D (p. 1 of 3)

LN SALT Analysis

\$ Child, Examiner

+ Language: English

+ ParticipantId: 19-158

+ Name: LN

+ Gender: M

+ CA: 5;2

+ Context: Con

- 0:00

E They ride on a horse or a bull?

C Yeah (yeah).

C Bull he *is strong.

E A bull is strong.

C Yeah like that.

E With horns!

C (People uh uh) My (my) daddy *got hurt right there.

E Did a bull hurt your dad?

C No.

C My daddy (my daddy).

E What happened to your daddy?

C My (my my) daddy *verb circle.

C And a bull hit him.

E A bull hit him?

C Yeah bull hit *his leg.

E In the leg.

C I got my toy *and I got my home.

C (I, I got) (I) I go *to sleep and I close my eye/s.

E Yeah me too.

E And then you go to sleep!

C Yeah.

C I got[EW] close my eye/s *article I have two.

E You have two?

C Yeah.

C Close my eye/s.

E MHMM because you have two eye/s!

C I got two eye/s.

E So will you go to the Rodeo Leo, or to the Rodeo parade?

C Yeah.

E With all the horses and the cowboys?

C Yeah.

E Yeah?

E Have you done that before?

C Yeah.

C (Uh uh) I got (uh my) my toy, (uh) (my) my home, I got (X) in my home is that one.

E Does your home have stairs?

C Yeah.

C I go like that and like that.

E Wow.

E My home does not have stairs.

C It don't[EW:doesn't]?

Appendix D (p. 2 of 3)*LN SALT Analysis*

E No.

C (I got I got) I saw a spider *preposition my home.

E You saw a spider?

C Yeah.

C He/*'s dead.

E He's dead?

C Yeah.

C My daddy kill/*ed it.

E Your daddy got it?

C He/'s dead.

E Good.

C Yeah a spider bite me a tiny[EU].

E Sometimes I catch the spider, not with my hands, sometimes I catch it with something like a cup and then I take it outside.

C Woah.

E Do you ever do that or do you just kill them?

C Daddy did.

E Daddy did?

C Yeah.

C (He make/ing, he make/ing uh) Daddy got it.

C And he kill him.

E Daddy got it and he kill him?

C I got a spider *preposition my home I saw him [EU].

E You saw the spider at your home?

C He/*'s tiny.

E He's tiny?

C Yeah.

C I can/'t see it.

E You just had a birthday!

C Yeah.

E And you turned.

C Five.

E What did you do for your birthday?

C I got three birthday, I got car/s and spiderman and T-Rex.

E You got three presents?

C I got one.

C I got two.

C I got (I got) LOTTA toy/s spiderman birthday [EU].

E For my birthday my parents got me a cake.

C What is it?

E It was a chocolate cake with vanilla frosting.

C I like chocolate cake.

E You like chocolate cake?

C Yeah.

C That/*'s my favorite.

E Did you have a cake for your birthday?

C Yeah.

E What kind of cake?

C Uh chocolate.

Appendix D (p. 3 of 3)*LN SALT Analysis*

E Did it have anything decorated on it?

C Yeah.

E What?

C (It is uh) Mine is bubble.

C (Uh uh) I got bubble.

E Bubble?

C Yeah.

C I don't have one.

E And I wonder if there were candles on your cake?

C Yeah.

C (I got uh) I got my toy.

E How many candles on your cake?

C LOTTA T-Rex (um) candle/s three four like that.

E Like that?

C I got my candle/s.

C My car/s I got one car/s.

E Car/s?

C No.

C I got one candle.

E One candle?

C Car/s.

E I wonder if your family sang happy birthday to you?

C Yep.

Appendix E (p. 1 of 4)*AC SUGAR Analysis*

The Transcript

1. I wanna hug and him bring me lotta present.
2. Lotta present.
3. For I want a get.
4. I don't know what toy I get.
5. And my X and my present.
6. Well my mom wanted that.
7. Momma just want that one.
8. Well I don't know what I want to get.
9. I don't know I get the baby doll.
10. I don't what.
11. No.
12. I don't know I get.
13. Yeah I don't know I get inside of my present.
14. Yeah well I have a unicorn have pink hair.
15. But she in my room.
16. I don't know I get giving.
17. Well I don't know.
18. What?
19. What unicorn have a name?
20. My unicorn have a X pink name.
21. And I rainbow unicorn.
22. Santa bring you all of that?
23. Santa bring my mom playdough.
24. Well my mom want to make that.
25. I don't want to call it Thanksgiving no more.
26. Yeah and now it Christmas.
27. Well we didn't get present yet.
28. Santa almost build me a toys.
29. No one.
30. No.
31. She's building a toy.
32. I want nomnom I want Thanksgiving.
33. Nothing.
34. Nomnom is I don't know.
35. Nomnom eat candies.
36. Their don't eat food just candies.
37. Don't eat candies.
38. Well I want a Christmas candy.
39. We don't eat them all.
40. I want one but a Christmas candy is sold out.
41. Well no.
42. I don't have more in my house.
43. I don't have more.
44. Well I do.
45. Well not my mom made it.
46. My daddy eat some.
47. My dad name is Randy Boller.
48. Jacob Lela.
49. And Lilo and Nina.
50. And my mom and my dad.

Appendix E (p. 2 of 4)*AC SUGAR Analysis*

Total Number of Words and MLUs*TNW: 256**MLUs: 283/50 = 5.66*

I wan na hug and him bring me lot ta
 present.
 Lot ta present.
 For I want a get.
 I don 't know what toy I get.
 And my X and my present.
 Well my mom want ed that.
 Momma just want that one.
 Well I don 't know what I want to get.
 I don 't know I get the baby doll.
 I don 't what?
 No.
 I don 't know I get.
 Yeah I don 't know I get inside of my
 present.
 Yeah well I have a unicorn have pink hair.
 But she in my room.
 I don 't know I get giv ing.
 Well I don 't know.
 What?
 What unicorn have a name?
 My unicorn have a X pink name.
 And I rainbow unicorn.
 Santa bring you all of that?
 Jacob Lela.
 And Lilo and Nina.

Santa bring my mom playdough.
 Well my mom want to make that.
 I don 't want to call it Thanksgiving no
 more.
 Yeah and now it Christmas.
 Well we didn 't get present yet.
 Santa almost build me a toy s.
 No one.
 No.
 She 's build ing a toy.
 I want nomnom I want Thanksgiving.
 Nothing.
 Nomnom is I don 't know.
 Nomnom eat candie s.
 Their don 't eat food just candie s.
 Don 't eat candie s.
 Well I want a Christmas candy.
 We don 't eat them all.
 I want one but a Christmas candy is sold
 out.
 Well no.
 I don 't have more in my house.
 I don 't have more.
 Well I do.
 Well not my mom made it.
 My daddy eat some.
 My dad name is Randy Boller.

 And my mom and my dad.

Appendix E (p. 3 of 4)*AC SUGAR Analysis*

Identifying Sentences and WPS

TNW: 256

MLUs: $283/50 = 5.66$ *Sentences: 39**WPS: $254/39 = 6.51$*

1. I wan na hug and him bring me lot ta present
2. For I want a get
3. I don 't know what toy I get
4. Well my mom want ed that
5. Momma just want that one
6. Well I don 't know what I want to get
7. I don 't know I get the baby doll
8. I don 't what
9. I don 't know I get
10. Yeah I don 't know I get inside of my present
11. Yeah well I have a unicorn have pink hair
12. But she in my room
13. I don 't know I get giv ing
14. Well I don 't know
15. What unicorn have a name
16. My unicorn have a X pink name
17. And I rainbow unicorn
18. Santa bring you all of that
19. Santa bring my mom playdough
20. Well my mom want to make that
21. I don 't want to call it Thanksgiving no more
22. Yeah and now it Christmas
23. Well we didn 't get present yet
24. Santa almost build me a toy s
25. She 's build ing a toy
26. I want nomnom I want Thanksgiving
27. Nomnom is I don 't know
28. Nomnom eat candie s
29. Their don 't eat food just candie s
30. Don 't eat candie s
31. Well I want a Christmas candy
32. We don 't eat them all
33. I want one but a Christmas candy is sold out
34. I don 't have more in my house
35. I don 't have more
36. Well I do
37. Well not my mom made it
38. My daddy eat some
39. My dad name is Randy Boller

Appendix E (p. 4 of 4)*AC SUGAR Analysis*

Identifying Clauses and CPS

TNW: 256

MLUs: $283/50 = 5.66$

Sentences: 39

WPS: $254/39 = 6.51$ *Clauses: 47**CPS: $47/39 = 1.21$*

1. I wan na hug
 2. and him bring me lot ta present
 3. For I want a get
 4. I don 't know
 5. what toy I get
 6. Well my mom want ed that
 7. Momma just want that one
 8. Well I don 't know what
 9. I want to get
 10. I don 't know
 11. I get the baby doll
 12. I don 't what
 13. I don 't know I get
 14. Yeah I don 't know
 15. I get inside of my present
 16. Yeah well I have a unicorn
 17. have pink hair
 18. But she in my room
 19. I don 't know I get giv ing
 20. Well I don 't know
 21. What unicorn have a name
 22. My unicorn have a X pink name
 23. And I rainbow unicorn
 24. Santa bring you all of that
 25. Santa bring my mom playdough
 26. Well my mom want to make that
 27. I don 't want to call it Thanksgiving
no more
 28. Yeah and now it Christmas
 29. Well we didn 't get present yet
 30. Santa almost build me a toy s
 31. She 's build ing a toy
 32. I want nomnom
 33. I want Thanksgiving
 34. Nomnom is I don 't know
 35. Nomnom eat candie s
 36. Their don 't eat food just candie s
 37. Don 't eat candie s
 38. Well I want a Christmas candy
 39. We don 't eat them all
 40. I want one
 41. but a Christmas candy is sold out
 42. I don 't have more in my house
 43. I don 't have more
 44. Well I do
 45. Well not my mom made it
 46. My daddy eat some
 47. My dad name is Randy Boller
-

Appendix F (p. 1 of 4)*TM SUGAR Analysis*

The Transcript

1. The dog.
2. With my grandma.
3. Yeah my mommy he pick up me with grandma.
4. Yeah.
5. I sleep in my bedroom.
6. Yeah at my home.
7. Yeah in the closet.
8. Yeah the toy bucket.
9. I have a big car.
10. I got a big army.
11. I got a motorcycle.
12. I got a lego.
13. My X have toy.
14. My sister.
15. Yeah my sister have toy.
16. He have a big game.
17. Yeah I have my big game at my room.
18. I play a motorcycle.
19. I play a car.
20. Yeah my game.
21. My sister he let me play the walking_dead.
22. Yeah he let me play the lego game.
23. He play only the game.
24. My sister he play call_of_duty.
25. I play the fight game.
26. I play the walking_dead.
27. I play the walking_dead game and take it home.
28. He came home.
29. I play X the walking_dead game.
30. I play motorcycle game.
31. Motorcycle.
32. Me and mom we bought snack.
33. My mom tell me I can buy candy.
34. Yeah she let me have X the candy.
35. Yeah me and mom we eat chicken.
36. I eat a donut.
37. I eat a hot chip.
38. I ask my mommy can I eat cookie.
39. Me and mom we at the store and we bring food.
40. My mom tell me I can play toy.
41. My mommy say I can bring toy.
42. He say I can watch toy story.
43. Me and mom we watch the walking_dead.
44. Yeah it is.
45. My mom tell I can watch walking_dead.
46. He say I can watch scary movie.
47. My mom he say I can watch the X.
48. He tell me I can watch X.
49. My mom tell I can watch X.
50. My mom he tell me I can watch scary movie.

Appendix F (p. 2 of 4)*TM SUGAR Analysis*

Total Number of Words and MLUs*TNW: 280**MLUs: 280/50 = 5.6*

The dog.
 With my grandma.
 Yeah my mommy he pick up me with
 grandma.
 Yeah.
 I sleep in my bedroom.
 Yeah at my home.
 Yeah in the closet.
 Yeah the toy bucket.
 I have a big car.
 I got a big army.
 I got a motorcycle.
 I got a lego.
 My X have toy.
 My sister.
 Yeah my sister have toy.
 He have a big game.
 Yeah I have my big game at my room.
 I play a motorcycle.
 I play a car.
 Yeah my game.
 My sister he let me play the
 walking_dead.
 Yeah he let me play the lego game.
 He play only the game.
 My sister he play call_of_duty.
 I play the fight game.

I play the walking_dead.
 I play the walking_dead game and take it
 home.
 He came home.
 I play X the walking_dead game.
 I play motorcycle game.
 Motorcycle.
 Me and mom we bought snack.
 My mom tell me I can buy candy.
 Yeah she let me have X the candy.
 Yeah me and mom we eat chicken.
 I eat a donut.
 I eat a hot chip.
 I ask my mommy can I eat cookie.
 Me and mom we at the store and we bring
 food.
 My mom tell me I can play toy.
 My mommy say I can bring toy.
 He say I can watch toy story.
 Me and mom we watch the walking_dead.
 Yeah it is.
 My mom tell I can watch walking_dead.
 He say I can watch scary movie.
 My mom he say I can watch the X.
 He tell me I can watch X.
 My mom tell I can watch X.
 My mom he tell me I can watch scary
 movie.

Appendix F (p. 3 of 4)*TM SUGAR Analysis*

Identifying Sentences and WPS

TNW: 280

MLUs: $280/50 = 5.6$ *Sentences: 44**WPS: $268/44 = 6.09$*

Yeah my mommy he pick up me with
grandma.
I sleep in my bedroom.
Yeah at my home.
Yeah in the closet.
Yeah the toy bucket.
I have a big car.
I got a big army.
I got a motorcycle.
I got a lego.
My X have toy.
Yeah my sister have toy.
He have a big game.
Yeah I have my big game at my room.
I play a motorcycle.
I play a car.
My sister he let me play the
walking_dead.
Yeah he let me play the lego game.
He play only the game.
My sister he play call_of_duty.
I play the fight game.
I play the walking_dead.
I play the walking_dead game and take it
home.

He came home.
I play X the walking_dead game.
I play motorcycle game.
Me and mom we bought snack.
My mom tell me I can buy candy.
Yeah she let me have X the candy.
Yeah me and mom we eat chicken.
I eat a donut.
I eat a hot chip.
I ask my mommy can I eat cookie.
Me and mom we at the store and we bring
food.
My mom tell me I can play toy.
My mommy say I can bring toy.
He say I can watch toy story.
Me and mom we watch the walking_dead.
Yeah it is.
My mom tell I can watch walking_dead.
He say I can watch scary movie.
My mom he say I can watch the X.
He tell me I can watch X.
My mom tell I can watch X.
My mom he tell me I can watch scary
movie.

Appendix F (p. 4 of 4)*TM SUGAR Analysis*

Identifying Clauses and CPS

TNW: 280

MLUs: $280/50 = 5.6$

Sentences: 44

WPS: $268/44 = 6.09$ *Clauses: 51**CPS: $51/44 = 1.16$*

1. Yeah my mommy he pick up me with grandma.
 2. I sleep in my bedroom.
 3. Yeah at my home.
 4. Yeah in the closet.
 5. Yeah the toy bucket.
 6. I have a big car.
 7. I got a big army.
 8. I got a motorcycle.
 9. I got a lego.
 10. My X have toy.
 11. Yeah my sister have toy.
 12. He have a big game.
 13. Yeah I have my big game at my room.
 14. I play a motorcycle.
 15. I play a car.
 16. My sister he let me play the walking_dead.
 17. Yeah he let me play the lego game.
 18. He play only the game.
 19. My sister he play call_of_duty.
 20. I play the fight game.
 21. I play the walking_dead.
 22. I play the walking_dead game
 23. and take it home.
 24. He came home.
 25. I play X the walking_dead game.
 26. I play motorcycle game.
 27. Me and mom we bought snack.
 28. My mom tell me
 29. I can buy candy.
 30. Yeah she let me
 31. have X the candy.
 32. Yeah me and mom we eat chicken.
 33. I eat a donut.
 34. I eat a hot chip.
 35. I ask my mommy
 36. can I eat cookie.
 37. Me and mom we at the store
 38. and we bring food.
 39. My mom tell me
 40. I can play toy.
 41. My mommy say I can bring toy.
 42. He say I can watch toy story.
 43. Me and mom we watch the walking_dead.
 44. Yeah it is.
 45. My mom tell I can watch walking_dead.
 46. He say I can watch scary movie.
 47. My mom he say I can watch the X.
 48. He tell me I can watch X.
 49. My mom tell I can watch X.
 50. My mom he tell me
 51. I can watch scary movie.
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Appendix G (p. 1 of 4)*LN SUGAR Analysis*

The Transcript

1. Yeah bull he strong.
2. Yeah like that.
3. My daddy hurt right there.
4. No.
5. My daddy.
6. My daddy circle and a bull hit him.
7. Yeah bull hit leg.
8. I got my toy I got my home.
9. I go sleep and I close my eyes.
10. Yeah I got close my eyes I have two.
11. Yeah close my eyes.
12. I got two eyes.
13. Yeah.
14. Yeah.
15. Yeah I got my toy, my home, I got in my home is that one.
16. Yeah I go like that and like that.
17. It don't?
18. I saw a spider my home.
19. Yeah he dead.
20. Yeah my daddy kill it.
21. He's dead.
22. Yeah a spider bite me a tiny.
23. Woah.
24. Daddy did.
25. Yeah Daddy got it and he kill him.
26. I got a spider my home I saw him.
27. He tiny.
28. Yeah I can't see it.
29. Yeah.
30. Five.
31. I got three birthday, I got cars and spiderman and T-Rex.
32. I got one.
33. I got two.
34. I got lotta toys spiderman birthday.
35. What is it?
36. I like chocolate cake.
37. Yeah that my favorite.
38. Yeah.
39. Uh chocolate.
40. Yeah.
41. Mine is bubble.
42. I got bubble.
43. Yeah I don't have one.
44. Yeah I got my toy.
45. Lotta T-Rex candles three four like that.
46. I got my candles.
47. My cars I got one cars.
48. No I got one candle.
49. Cars.
50. Yep.

Appendix G (p. 2 of 4)*LN SUGAR Analysis*

Total Number of Words and MLUs*TNW: 217**MLUs: 234/50 = 4.68*

Yeah bull he strong.
 Yeah like that.
 My daddy hurt right there.
 No.
 My daddy.
 My daddy circle and a bull hit him.
 Yeah bull hit leg.
 I got my toy I got my home.
 I go sleep and I close my eye s.
 Yeah I got close my eye s I have two.
 Yeah close my eye s.
 I got two eye s.
 Yeah.
 Yeah.
 Yeah I got my toy, my home, I got in my home is that one.
 Yeah I go like that and like that.
 It don 't?
 I saw a spider my home.
 Yeah he dead.
 Yeah my daddy kill it.
 He 's dead.
 Yeah a spider bite me a tiny.
 Woah.

Daddy did.
 Yeah Daddy got it and he kill him.
 I got a spider my home I saw him.
 He tiny.
 Yeah I can 't see it.
 Yeah.
 Five.
 I got three birthday, I got car s and Spiderman and T-Rex.
 I got one.
 I got two.
 I got lot ta toy s spiderman birthday.
 What is it?
 I like chocolate cake.
 Yeah that my favorite.
 Yeah.
 Uh chocolate.
 Yeah.
 Mine is bubble.
 I got bubble.
 Yeah I don 't have one.
 Yeah I got my toy.
 Lot ta T-Rex candle s three four like that.
 I got my candle s
 My car s I got one car s.
 No I got one candle.
 Car s.
 Yep.

Appendix G (p. 3 of 4)*LN SUGAR Analysis*

Identifying Sentences and WPS

TNW: 217

MLUs: $234/50 = 4.68$ *Sentences: 37**WPS: $216/37 = 5.84$*

Yeah bull he strong.
 My daddy hurt right there.
 My daddy circle and a bull hit him.
 Yeah bull hit leg.
 I got my toy I got my home.
 I go sleep and I close my eye s.
 Yeah I got close my eye s I have two.
 Yeah close my eye s.
 I got two eye s.
 Yeah I got my toy, my home, I got in my home is that one.
 Yeah I go like that and like that.
 It don 't?
 I saw a spider my home.
 Yeah he dead.
 Yeah my daddy kill it.
 He 's dead.
 Yeah a spider bite me a tiny.
 Daddy did.
 Yeah Daddy got it and he kill him.

I got a spider my home I saw him.
 He tiny.
 Yeah I can 't see it.
 I got three birthday, I got car s and Spiderman and T-Rex.
 I got one.
 I got two.
 I got lot ta toy s spiderman birthday.
 What is it?
 I like chocolate cake.
 Yeah that my favorite.
 Mine is bubble.
 I got bubble.
 Yeah I don 't have one.
 Yeah I got my toy.
 Lot ta T-Rex candle s three four like that.
 I got my candle s
 My car s I got one car s.
 No I got one candle.

Appendix G (p. 4 of 4)*LN SUGAR Analysis*

Identifying Clauses and CPS

TNW: 217

MLUs: $234/50 = 4.68$

Sentences: 37

WPS: $216/37 = 5.84$ *Clauses: 45**CPS: $45/37 = 1.22$*

1. Yeah bull he strong.
 2. My daddy hurt right there.
 3. My daddy circle
 4. and a bull hit him.
 5. Yeah bull hit leg.
 6. I got my toy
 7. I got my home.
 8. I go sleep
 9. and I close my eye s.
 10. Yeah I got close my eye s
 11. I have two.
 12. Yeah close my eye s.
 13. I got two eye s.
 14. Yeah I got my toy, my home,
 15. I got in my home is that one.
 16. Yeah I go like that and like that.
 17. It don 't?
 18. I saw a spider my home.
 19. Yeah he dead.
 20. Yeah my daddy kill it.
 21. He 's dead.
 22. Yeah a spider bite me a tiny.
 23. Daddy did.
 24. Yeah Daddy got it
 25. and he kill him.
 26. I got a spider my home
 27. I saw him.
 28. He tiny.
 29. Yeah I can 't see it.
 30. I got three birthday,
 31. I got car s and Spiderman and T-Rex.
 32. I got one.
 33. I got two.
 34. I got lot ta toy s spiderman birthday.
 35. What is it?
 36. I like chocolate cake.
 37. Yeah that my favorite.
 38. Mine is bubble.
 39. I got bubble.
 40. Yeah I don 't have one.
 41. Yeah I got my toy.
 42. Lot ta T-Rex candle s three four like that.
 43. I got my candle s
 44. My car s I got one car s.
 45. No I got one candle.
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