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Effect of Animated Story Stimuli Versus Static Story Stimuli on the Narratives of Elementary Students with Language Impairment

by

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Abstract

Animated story stimuli may have positive effects on the characteristics of narratives produced by children. This pilot study explored the effects of static and animated story conditions on the macrostructure and microstructure quality of narrative story retells produced by 7 children, ages 9 to 12, who have language and/or literacy impairments. The participants viewed 2 visually presented stories in each condition and retold the stories to an examiner. The resulting narrative language samples were analyzed for story quality, productivity, complexity, accuracy, and lexical diversity. The results of the pilot study indicated that the story stimuli that were selected and developed would be appropriate for future use in this line of research. Although statistically significant results were not obtained with this small group of participants, several trends in favor of the use of animated story stimuli were identified and explored. Clinical implications and future research directions were discussed.

Keywords: animation, language disorder, narrative assessment, narrative language, story retell, visual stimuli, macrostructure, microstructure

Introduction

Assessment of a child's language abilities through narrative production has been well established as an important tool in an SLP's toolbox because it provides valuable and essential information about language skills, as well as pragmatic and social communication abilities (Klop & Englebrecht, 2013; Liles, 1993). The inherently flexible nature of language sample analysis and the ability to simultaneously examine general language use and specific linguistic aspects via narrative assessment is part of what makes it so valuable to SLPs (Justice et al., 2006; Scott & Windsor, 2000; Spencer & Petersen, 2020). Narrative assessments have proven to be one of the best predictors of language performance in younger children preparing to enter school because they can assess a range of skills that are not only used in narrative discourse, but also in overall speech intelligibility, grammatical structure, and lexical diversity (Culatta et al., 1983; Fazio et al., 1996; Gazella & Stockman, 2003; Liles, 1993). Research has shown that children with language impairments are less proficient in general at producing narratives when compared to their same age typically developing peers (Bishop & Donlan, 2005; Colozzo et. al. 2011; Fey, et. al 2005; Scott & Windsor 2000). Research has established that narrative measures can reliably differentiate between children with and without language impairments (Justice et al., 2006; Liles et al., 1995; Scott & Windsor, 2000). Narratives also provide clinicians and examiners with the ability to examine multiple linguistic features as well as document vocabulary and syntactic abilities from a relatively short, single sample (Heilmann et al., 2015; Westby, 2005).

However, there are multiple approaches to narrative assessment. The most common forms that appear in assessment are story retell tasks or self-generated narratives, either

one having the ability to be elicited by a variety of stimuli. Story retells appear to offer a certain advantage over story generation in assessment because they result in longer language samples, contain more story grammar elements, and are easier to transcribe due to the clinician's familiarity with the overall content (Gazella & Stockman, 2003; Merrit & Liles, 1989). Narrative retells also have an advantage because the stimuli and input (e.g., length, complexity and modality) are more easily controlled by the examiner, which means the assessment itself can remain consistent across multiple clients (Gazella & Stockman, 2003; Merrit & Liles, 1989; Petersen & Spencer, 2012). Story retells and story generation can be elicited using verbal stimuli alone or using visual stimuli such as single pictures, sequenced pictures, wordless picture books, regular picture books or videos. Visual stimuli can be presented with or without a verbal model. Several studies on narratives have used static visual stimuli. Although a few studies have used animated visual stimuli, the use of animated stimuli has not yet been thoroughly researched with respect to its impact on the quality of elicited narratives as compared to traditional static stimuli despite the increased availability of animated stimuli through Internet access. Animated story presentations could provide an advantage for increasing narrative quality because they portray temporal change and present more realistic representations of events compared to static picture presentations (Gazella & Stockman, 2003; Klop & Engelbrecht, 2013). Animated videos may further enhance children's narrative production due to clearer depiction of actions and relationships between characters and events and they therefore deserve further exploration by researchers and clinicians alike (Diehm et. al, 2020).

Little research has been done on the impact of animation on the quality of narrative production for children with language impairment. The research that has been conducted on animation has had variable results due to possible differences in methodology, populations, and other social factors. Although limited research on narratives elicited with animated stimuli as compared to static stimuli has been conducted with young, typically developing children, (Diehm et. al, 2020; Gazella & Stockman 2003; Klop & Engelbrecht, 2013), it has not been explored with older children or children with language impairment. Thus, the present study was a pilot study to help fill this gap in the literature. Specifically, the purposes of this study were to pilot test animated and static story stimuli and to explore whether the use of animated story stimuli encourages the production of longer and more complex story retells as compared to static wordless picture sequences in children with language impairment in grades 4 – 6.

Background

Narrative Structure

The use of narrative structure, both oral and written, is important for both academic and social success. In the academic context, the value of narratives is reflected in the specific inclusion of story grammar and language complexity in the Common Core State Standards, which are used as educational standards in most states (Gillam et al., 2017; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2011; Spencer & Petersen, 2020). Narratives themselves display many core linguistic skills that serve as a foundation for an array of academic abilities, such as what is needed for academic writing and classroom participation, as well as social abilities like social storytelling, relating to others' experiences and conversational

maintenance (Brinton & Fujiki, 2017; Spencer & Petersen, 2020; Westby, 1985). Communicating effectively with another person requires structured storytelling and sequencing abilities, which subsequently makes narrative production a pivotal social skill because it is how children/students relay information to their peers, teachers, and parents about daily events (Hadley, 1998; Schnieder & Dube, 2005; Spencer & Petersen, 2020).

Narratives are typically analyzed at two levels: macrostructure level and the microstructure level. *Macrostructure* is defined as the overall structure of a story, namely its setting and at least one episode, or series, of events. It consists of the story grammar elements that help keep the story organized. Generally accepted story grammar elements include character(s), setting, initiating event, action, consequence, and ending (Colozzo, 2011; Diehm et al., 2020; Justice et al., 2006; Mills et al., 2015; Spencer & Petersen, 2020; Schneider & Dube, 2005). Narrative macrostructure skills must be used efficiently and effectively in order to create a cohesive narrative, making it a crucial part of assessment for children with language difficulties (Heilmann et al., 2010). *Microstructure*, on the other hand, consists of the actual words and sentences that make up the story, indicating that much of a narrative's quality depends on proper microstructural forms (Mills et al., 2015). While macrostructure is used for organizing the narrative story structure, microstructure involves the syntax, morphology, and semantics that make up story details (Heilmann et al., 2010). An increased use of literate and academic language forms is a critical part of microstructure development for children during the school-age years (Gillam et al., 2017; Westby, 2005).

Some researchers value microstructure analysis over macrostructure because the specificity of microstructure offers a better index of narrative performance overall and is

more sensitive to developmental differences between typically developing children and those with language impairment (Liles et al., 1995; Mills et al., 2015). However, others report that separating and analyzing both microstructure and macrostructure offers better insight because vocabulary and grammar are assessed through microstructure and broader organizational skills are examined through macrostructure (Westby, 2005). Therefore, detailed analysis from both can offer insight into a child's overall narrative language. Macrostructure and microstructure are also closely related to each other because growth in narrative organization skills leads to advanced skills in the use of grammatical forms, lexical forms, and other forms of highly literate language (Berman & Slobin, 1994; Bishop & Donlan, 2005; Gazella & Stockman, 2003; Heilmann et al., 2010).

In school-age children with typical language development, narratives are complex and contain multiple causal relationships between characters, initiating and complicating events, and consequences as well as temporal relationships. These are all held together by semantic and syntactic organization (Gillam et. al., 2017). Ideas are organized into a coherent framework that serves the plot. The organized ideas then shape the storyteller's utterances, guiding word choice and sentence patterns that best convey each piece of the story effectively (Colozzo et al., 2010).

Language Impairment and Narratives

Children with language impairment have difficulty in learning and using language in general and are almost always in need of support in language development to build their foundation for academic success compared to typically developing peers (Justice et al., 2006). The present line of research is interested particularly in children with Developmental Language Disorder (DLD) and their language characteristics as described

below. However, due to this study being a pilot study, other children with language impairment were included. Features of DLD in school-age children can be found in each aspect of language: phonology, morphology, semantics, syntax, and pragmatics. Phonological problems can appear in difficulties with phonological awareness, memory, and retrieval tasks that are important to academic processes like reading. Morphological problems may be a carryover from issues developed in the preschool years, such as not resolving issues with grammatical morphemes and having difficulty learning and using derivational morphemes (Leonard et al., 2000). Semantic characteristics of DLD include a slower learning of new words and difficulty retaining new words as well as an overall restricted vocabulary and reduced depth of word meaning. Syntactic characteristics of DLD involve reduced verb phrase elaboration, using nonspecific verbs, use of less mature grammatical forms and limited use of complex sentence forms (Bishop & Donlan, 2005). Semantics and syntax are two areas that are most noticeably affected by DLD. Studies have shown that the difficulties with complex syntax and causal relationships will uniquely predict a child's ability to organize oral narratives (Bishop & Donlan, 2005; Heilmann et al., 2010). DLD also affects children's pragmatic skills. Pragmatics, being the use of language across various situations, involves different types of discourse including conversation and narrative discourse. Narratives can be particularly difficult for children with DLD. They can have difficulties understanding expectations and using scripts, which may cause them to use less detail, be less organized, and confuse temporal and causal relationships in their storytelling (Norbury et al., 2013). In other words, they do not effectively know how to use micro- and macrostructural elements to create a cohesive narrative.

Examining children with language impairment or other learning difficulties revealed that they often scored lower on normed narrative measures than typically developing peers (Schneider & Dube, 2005). Effective story retells using traditional elicitation methods have been found to be directly related to the number of causal relationships found in a story. This indicates that if the quality of lexical representations and the ability to manipulate the causal and temporal relationships in stories is negatively impacted by language impairment, then the overall narrative production will also be negatively affected (Colozzo et al., 2010). The impact of DLD also affects the micro- and macrostructural elements used in children's narrative retells. The relationship between these elements means that children with DLD typically have substantial difficulty using appropriate grammar and vocabulary as well as text-level organization when telling stories. Narrative proficiency assessment has shown that children with DLD have difficulty with story content and linguistic form. This means that, in general, the narratives tend to be shorter and lower in overall macro- and microstructural quality compared to the narratives of typically developing children (Colozzo et al., 2010; Schneider & Dube, 2005). However, they may also demonstrate relative weakness in one over the other (macrostructure or microstructure) and vice versa. For example, Colozzo et al. (2010) assessed narrative use in children with typical language (TL) and children with DLD in two different sample groups and found in both that the children with DLD fell below age expectations when it came to content elaboration and/or grammar use; more specifically, they found that stories in children with DLD either had poor content but were grammatically accurate, or they had elaborated content but were more grammatically inaccurate. Others have found that stories told by children with DLD tend

to include fewer story grammar elements (macrostructure), less cohesive relationships, and more grammatical errors (Fey et al., 2005; Gillam & Liles, 1985; Liles et al., 1995; Johnston, 1992). Complex literate and academic language, such as elaborated noun phrases or metacognitive and metalinguistic verbs, also appear less frequently in narratives produced by children with DLD (Gillam et al., 2017). Many characteristics of DLD are also seen in children who have language impairment that is due to other causes as well.

Narrative Assessment

Stimuli Use

Narrative assessment can be completed using a variety of stimuli, and it is important to know how various aspects of the stimuli affect narrative performance. Schnieder and Dube (2005) found that younger children had more complex output, i.e., they included more story grammar elements, when asked to retell a story after being presented a story with picture stimuli compared to a story without pictures. However, studies have not consistently supported the use of one stimulus type over another, such as visual over auditory and vice versa, and their effect on narrative production (Gazella & Stockman 2003; Mills et al., 2015). Stimulus use and type is also only one part of the narrative assessment equation. Narrative production can be elicited by either a spontaneous story generation or a story retell, either of which can be affected by the stimulus given.

Generation vs. Retell

Spontaneous generation of a narrative happens when a child creates a story from their own mind or experience while using story grammar elements to do so. This can be

something as simple as talking about what they did at school or with a friend. A narrative retell is where a child retells either a familiar story or a story that is presented to them with or without verbal models and other various stimuli. The type of stimuli can affect both spontaneous generation and retell depending on the presentation of the stimulus. A visual stimulus without a verbal or written prompt asks the child to independently generate a story using their own linguistic resources. This should be more representative of what the child is able to generate individually without the scaffolding provided by a model. In some studies, when given a picture stimulus, children with TL told longer stories compared to when they were only given a verbal input and told to retell what they heard (Schneider & Dube, 2005). However, not all studies agree that stories generated using visual stimuli are the best measure of a child's narrative ability because other studies have produced results that show that children may craft better microstructural and macrostructural elements when given a verbal stimulus than they do when given visual stimuli alone. This is because of the possibility that a verbal stimulus models language structure more specifically than a visual stimulus only and as a result helps the child generate better spontaneous stories (Mills et al., 2015). Therefore, if children must rely on their own linguistic knowledge, a generation task could prove to be more difficult even with a visual stimulus, especially in children with language impairment, although it is perhaps a better measure of unsupported skill.

Story retells can be elicited with or without an accompanying verbal model. A verbal model on its own provides children with a linguistic model that may support word choices and presents correctly produced language structure to a child. Using this model can evaluate if the child can replicate the word choices and linguistic structures that they

heard in their narrative retells (Mills et al., 2015). Static visual stimuli, like what is seen in wordless picture books, are typically presented with additional verbal stimuli. On rare occasions are they presented without verbal stimuli, but these occasions are usually where the child is already familiar with the story presented in the visual or they have been told the story previously as Schneider and Dube (1997) reported. However, they also suggested that younger children actually had difficulty telling stories from just pictures alone compared to when they were given an additional auditory stimulus and asked to retell the story. They argued that younger children, in general, do not yet have an understanding that pictures can act as representations of themes rather than just words or objects and this causes difficulty with producing a retell. On the other hand, it could also be reasonable to hypothesize that a verbal model provides too much of an indirect model for a child's retell and they could be engaging less of their own linguistic ability to produce their own narrative language because they are simply restating the model provided by the clinician, accounting for the higher success in these models.

This is where dynamic visuals, can possibly add a new level to the story retell assessment. Narrative retells elicited with dynamic stimuli can also be presented with or without a verbal model. For example, Gazella and Stockman (2003) conducted a study in which they evaluated a group of preschool children's microstructural performance when given dynamic visual stimuli in the form of a video recorded puppet story combined with a voice narration. They compared this to a group that was presented the same story in an audio-only condition. Ultimately it was determined that the differences as a result of modality presentation were not statistically significant between performance within the

two groups. However, it highlighted the need for further research into the use of dynamic stimuli and its impact on narrative retell, with or without additional audio stimuli.

Animation as a Stimulus

One of the newest dynamic stimuli to be explored further is the use of a fully animated video presentation. Animations can help visualize difficult concepts, such as temporal change, better than static images. This suggests that they may be better suited to convey more dynamic information and may not always need accompanying auditory stimuli to do so (Betrancourt & Chossot, 2008). Using animation for learning purposes has also been shown to improve overall topic comprehension and it provides a personal connection that creates a more enjoyable experience for the learner than simply reading or listening (Betrancourt & Tversky, 2000). These ideas have led to the study of animation on the effect of symbol and single word recognition and use during development. Schlosser et al. (2014) found that symbols were more readily named by preschool children when the symbols were animated compared to static images. They also found that older children performed better than younger children across their measures. However, they measured different symbol types within the dynamic stimulus themselves by comparing different types of AAC symbol sets. One symbol set was more readily recognizable than the other so this could have had an influence on their results as a whole.

Klop and Engelbrecht (2013) studied the use of animation in relation to its influence on language by analyzing its impact on full narrative productions. They recruited 20 typically developing children in grade 3 and had each of them complete a narrative assessment where they were asked to produce a narrative by using either a

wordless picture book or a silent animated video that was generated using the same sequence of pictures as the wordless picture book (animation was added by a graphic designer to create a silent 2-minute video). Their goal was to find what differences there were between the narratives of children who viewed the silent video and the children who viewed the picture book in terms of both micro- and macrostructure. No model story or audio input was given since the focus was on the effect of the visual presentation. They tested children between the ages of 8 years, 5 months and 9 years, 4 months without any history of language disorders or other primary or secondary disorders, and each child was exposed to both types of stimuli. In summary, they found no significant differences between the narratives produced in the video and static conditions. However, they acknowledge there were limitations to their study. For instance, the participants elicited their narratives to the same clinicians that presented the narratives in the first place. This means they could have assumed that their listener already understood the goals alluded to in their action or attempt statements and as a result did not feel the need to directly state those goals. The authors also acknowledge that the intentional omission of audio input or the small sample size might have contributed to the lack of differences between narrative productions.

Diehm et al. (2020) investigated the effects of story format (i.e., animated videos and static story books) on various microstructural and macrostructural elements in 73 preschool-aged children's narrative language using a within-subjects design. It is important to note that each story format condition included an auditorily presented script. First, the authors found animated stories that they could control across several variables (e.g., developmentally appropriate, 3-minute duration, engaging animation, and children

did not have previous exposure to the story). From those animated stories, they took screenshots to create corresponding picture books. The authors devised and recorded a verbal script for each story that they presented within the animation and with the picture book as a verbal model. They used the Narrative Assessment Protocol (NAP; Pence et al., 2007) to measure the microstructure and macrostructure elements in each retell production. Like the other studies, they did not find any significant differences in the narrative productions as measured by the NAP in terms of macrostructure. However, there were significant differences on measures of microstructure. For example, they found a greater number of total words and different words as well as more complex syntax in the animated condition when compared to the static picture book. Additionally, after running an ANOVA on the results and applying a Bonferroni post-hoc analysis to see which condition was superior, there was a small practical effect according to Cohen's measures of effect size (d = 0.26; Cohen, 1988) in favor of the animated presentation over the picture book. The authors acknowledge that there are limitations to the study, such as whether selection of the still frames from the animation were the most engaging or as meaningful as static pictures. The inclusion of a verbal script may have had a significant effect on the result. Several studies including one conducted by Morrison et al. (2000) noted that the experimental conditions in modality research (animation vs. static) must have no other extraneous factors present in the stimuli. In the case of Diehm et al. (2020), adding an auditory script does not allow for a conclusion that the animation was solely responsible for the results as it is possible that their results were significant due to the combination of the auditory script and the animated stimuli. A specific script was also developed for each story, meaning the examiners could have been subconsciously

looking for specific matches to those scripts that may not have been generated from the visual stimuli alone.

Current Study

A commonality among some of the studies is that they were conducted on the preschool or younger school aged population (Diehm et. al, 2019; Gazella & Stockman 2003). Very little research exists on the impact of the older school-aged population's narrative production (both typically developing and with DLD) in response to animated stimuli. Therefore, the primary purpose of this study is to examine how story format (i.e., animated stimuli and static picture stimuli) with no auditory input would influence the story retells of older children (4th through 6th grade) with language impairment. Because some studies, like Schlosser et al. (2014) suggest that typical older children react more positively towards animated stimuli than younger children, as well as the stipulation that animation can better express abstract concepts (temporal relationships, representations of themes, etc.) it is feasible that animated story presentations could have an impact on the content of the story retells produced by this population with language impairment as well. Animated stimuli may more clearly depict semantic relationships between characters and events, making it easier to generate more complex story language with greater productivity in a retell task without the inclusion of auditory stimuli. The dynamic nature of animated stimuli might also reduce the difficulty that comes from translating images into diverse lexical forms, which means a child can devote more resources to generating accurate and semantically rich stories. Animation may also be more likely to increase the lexical diversity in a story because animation may facilitate better understanding and use of different verb types compared to static stimuli through its dynamic portrayal of these

verbs. This line of research seeks to answer the question of what the differences are in characteristics of narratives elicited using static wordless stimuli (picture book) compared to wordless animated stimuli (video) without a verbal model for children in grades 4 – 6 with language impairment. To address this question, we determined that there were two purposes for this particular pilot study. The first was to determine if the stories chosen were similar enough in story characteristics that they would produce narratives of comparable length so that they could be combined within in each condition to create larger datasets for analysis. Clinicians are often recommended to collect 100 utterance samples in order to obtain a rich representation of a child's language abilities. However, recent studies have provided evidence that shorter language samples were still relatively comparable in reliability measure compared to their longer counterparts (Heilmann et al., 2010). One study by Pavelko et al. (2020) found that reliable language sample results can be obtained from 50- down to 25-utterance samples without having to alter assessment methods. Shorter language samples are also more feasible than the recommended length in a clinical setting. In this pilot study we wanted to use multiple short stories instead of one long story to gather our samples so that we would have adequate length for analysis, but without it being so taxing on the children's' memory.

Our second purpose was to examine the effects of static vs. animated conditions and if the animated condition, without a verbal model, would support better narrative retells in terms of higher quality macrostructural elements, and greater overall use and increase of the microstructural elements of productivity, accuracy, complexity, and semantics. We hypothesized that stories retold from an animated stimulus format would elicit narratives with more robust story grammar elements compared to those elicited

from static visual stimuli. We predicted that the mean Monitoring Indicators of Scholarly Language (MISL; Gilliam et al., 2017) macrostructure scores for the narratives told in response to animated condition would be greater compared to static stimuli scores. We hypothesized that stories produced in response to the animated stimuli would be more productive in terms of number of utterances and the number of words. We hypothesized that stories produced in the response to animated stimuli would have greater accuracy and complexity compared to their static counterparts. We predicted that stories from the animated condition would use more complex syntactical structures with a smaller number of total errors compared to their static counterparts. And we hypothesized that retells from animated stimuli would yield greater overall semantic richness and lexical diversity. We predicted that the animation was likely to increase the amount of detail captured in the visual stimuli as related to different number and types of verbs used in the story retell. We also predicted that the animated condition would facilitate greater specificity in verb selection resulting in greater verb diversity in the animated vs. the static condition.

Method

Participants

This pilot study is part of a larger study, with the focus of this paper being on children with language or literacy impairment. The study was approved by the Institutional Review Board (study number FY2021-224). The present study consisted of seven male children between the ages of 9-12 and in grades 4 through 6. Participants were recruited into the language/literacy disorder group on the basis of a history of language or literacy disorder, their parents being concerned about language/literacy difficulties their child was experiencing and wanted to have these skills tested, or they

were initially recruited for the typical language group in the larger study, but their assessment results suggested a language or literacy disorder. These participants were recruited from southeastern Idaho and northern Utah. The study was approved by the Idaho State University Institutional Review Board. The parents of all of the children who participated completed the informed consent process and all of the children also completed the assent process. The history form that was completed at the beginning of the study indicated whether a child was previously diagnosed with any learning disabilities or developmental language disorder or if the parents had any concerns about language or literacy prior to participating in the study. Each child received a $10 gift card for each individual session that they completed. The children each completed 4 sessions each, with the exception of one participant who required an additional session to complete the assessment portion.

Each participant was assessed using the subtests of the Test of Integrated Language and Literacy Skills (TILLS; Nelson et al., 2016) that were needed to obtain the Core Identification Score, the Sound-Word Composite Score, and the Written Language Composite score, as well as the subtests that comprise the Expressive Language Index (ELI) of the Clinical Evaluation of Language Fundamentals 5th Edition (CELF-5; Wiig et al., 2013). The purpose of using these evaluations was to determine the participants' current level of language skills and to either confirm the presence of a previous diagnosis or to address parent concerns about language and/or literacy difficulties. The participants were also administered the Test of Nonverbal Intelligence 4th Edition (TONI-4; Brown et al., 2010) to screen non-verbal cognition and rule out intellectual disabilities.

As this was a pilot study, 3 children were included in the language impaired group even though they did not have a previous diagnosis of a language or literacy disorder, but they demonstrated characteristics of spoken or written language difficulties during the assessment stage of the study. One child with autism spectrum disorder (ASD) was also included. The resulting group of children in this pilot study consisted of 4 participants who were previously diagnosed with a language or language-based learning disability according to their history forms (DLD), one of whom had an additional diagnosis of Autism Spectrum Disorder (ASD), as well as 3 additional participants who did not have a previous diagnosis of a language or language-based learning disability, but whose performance on the assessments strongly indicated the presence of a language or literacy disorder. The parents of those children were recommended to seek further assessment. Two of the participants were provided additional testing that also supported their inclusion in the language/literacy impaired group in this study. The additional testing supported the determination that their language difficulties were more related to literacy than to spoken language. However, they also had some challenges in higher level spoken language tasks. The participant characteristics and the results of their assessments are listed in Table 1.

Table 1

Participant Characteristics and Test Scores

Participant Number[a]	Sex	Age	TILLS Core Identification Raw Score (CIS)[b]	CIS %ile Rank	TILLS Sound-Word Composite Score (SWC)	SWC %ile Rank	TILLS Written Language Composite Score (WLC)	WLC %ile Rank	CELF-5 Expressive Language Index Score (ELI)	ELI %ile Rank	TONI-4 Score	TONI-4 %ile Rank
1	M	9;2	10	1	61	1	43	0	67	1	98	45
2	M	10;9	18	2	65	1	54	0	70	2	92	30
3	M	9;8	17	2	49	0	54	0	76	5	98	45
4	M	11;5	29	7	92	27	78	7	89	23	113	81
5	M	10;8	20	4	54	1	61	0	78	7	106	66
6	M	10;2	23	2	83	11	75	9	85	16	114	83
7	M	11;5	27	5	67	3	83	13	93	32	114	83

Note. The TILLS total standard score, the ELI on the CELF-5, and the TONI-4 are scaled with a mean of 100 and a standard deviation of 15. Percentile ranks reflect the percentage of students of the same age as the test taker who received a lower score than the one earned by that student.

[a]The pilot study placed each participant into groups based on their history forms that indicated they were language impaired. Participant 4 entered the study without being clearly defined by his history form and was placed in this group based on his assessment results. Participants 6 and 7 were originally placed into the typical learning group of the larger study but were moved to this study after their assessment results revealed that they had the presence of a language or literacy disorder.

[b]The TILLS core identification score listed here is the raw score because the raw score is what created the cutoff scores the test makers deemed necessary to meet to not indicate the presence of language or literacy disorder (Nelson et al., 2016).

Setting

The study was completed via the Zoom video conferencing application. A total of four sessions was completed with each participant, with the exception of the child with ASD who required an additional assessment session. The first two sessions consisted of testing and the remaining sessions were used to complete unfinished testing and to elicit the narrative retell language samples. Each participant's parent was asked to have them complete each session on a computer or laptop in a quiet room with limited distractions. Parents were present at the beginning of each session and they were welcome to stay throughout testing and data collection if they chose to be there. Many parents did choose

to stay with their children throughout the session, which may have affected their performance during assessment or retell. For instance, one participant's parent occasionally provided encouragement to the participant to continue working hard on each assessment section during the assessment period and another parent had to redirect the participant from external distractions back to retelling his story during the narrative retell sessions.

Materials

Selected story stimuli were either animated or static stimuli that were chosen from existing video shorts on the internet. More than 30 different animated video shorts were initially considered and analyzed to determine if they would fit the desired requirements for this study. The parameters used for evaluating potential animated videos included shorts that were not too long in length. Short stories were evaluated in order to maintain participant attention during viewing and to ease short-term memory requirements, while also ensuring that each short contained enough content to produce adequate language production for analysis. Another parameter was that the shorts were wordless or silent shorts so that the focus would be on the role of animation in the stories on the language output and would not be confounded by any spoken language or sound effects contained in the video. Each short was less than 5-minutes long; the original selected shorts were edited to exclude the end credits in order to fit that time criteria. Each short was also assessed for the presence of story grammar elements that included character, setting, initiating event, plan, multiple actions, and consequences. Our goal was to find one story with a "helper" theme and one with an "accomplishment" theme for both conditions.

Four different story shorts were selected that fit all of the criteria listed above. These shorts were titled *Bellyflop* (Collins & Dillon, 2018)*, Lifted* (Rydstrom, 2006)*, Soar* (Tzue, 2014)*,* and *Dust Buddies* (Tomashek & Wade, 2016). *Bellyflop* and *Lifted* were both characterized as "accomplishment" stories and *Dust Buddies* and *Soar* were characterized as "helper" stories. The four shorts were then paired across type within condition so that each condition had one helper story and one accomplishment story. *Bellyflop* was paired with *Dust Buddies* and *Lifted* was paired with *Soar*. These pairings remained the same whether they were presented in the static or animated condition and all four stories were viewed by each participant. For example, if a participant viewed *Bellyflop* and *Dust Buddies* in the animated condition, they would view *Lifted* and *Soar* in the static condition. This was done so that each participant would always see one "helper" story and one "accomplishment" story in each condition. The idea was that regardless of the condition (static or animated) each participant would see each type of story.

The four animated shorts were then used to create both the animated and static presentations shown to participants, meaning each story had two versions in the end, animated and static. The animated versions were slightly edited from their original length using editing software to fit the time requirement and the soundtrack was removed so that both the static and animated stimuli would be presented completely silent. For the static versions, the software program Snagit was used to take screen shots from each short that would convey the key elements and details of each story. The screenshots were then placed into a PowerPoint presentation. This process was done according to an agreed

upon set of rules that are as follows (see Figure 1 for visual representations of these rules):

1. When creating the static stories, the images were kept in chronological order as they appeared in the animated short.
2. The PowerPoint was meant to read like a book from left to right, including if there was more than one image on a page. Each PowerPoint slide had 1-4 pictures per slide. Multiple pictures were needed at times to convey perspective, sequencing, or perspective and sequencing together. Details regarding this and an example of these concepts are explained below:
    a. Perspective: perspective frames show the same scene or event in a different frame, which adds detail to the static story. For example, one girl watching another girl jump off the diving board (see Figure 1A). In this case, images were displayed horizontally, side by side, and were the same size.
        i. There were a couple instances where it was necessary to have three perspective pictures. It was necessary when three completely different consecutive frames in the video related to tell the story. For example, in the story of *Bellyflop* a girl who goes swimming at the pool sees how much attention a blonde girl who does perfect dives is getting. She decides she wants attention as well and tries it herself, but she bellyflops instead of dives and is unsuccessful in gaining that attention. Figure 1B shows this perspective portrayed on the slide as the girl looks

around after her bellyflop to see no one has noticed her. The images were displayed with 2 images stacked vertically either on the left or right side and the third centered on the opposite side. All 3 images were the same size.

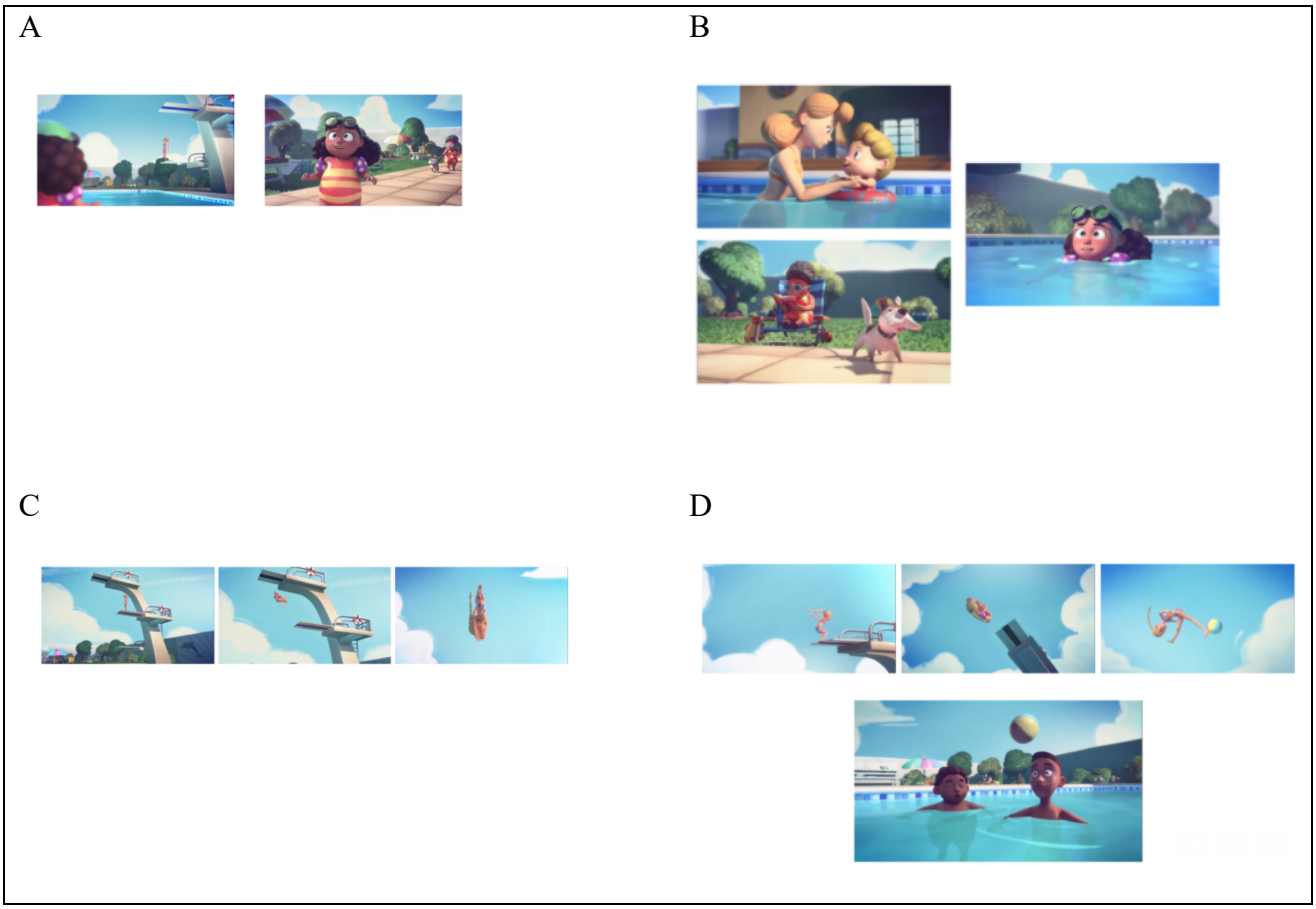
b. Sequence: When an event essential to the story happened that could not be portrayed by one image, it was necessary that the viewer have three images in order to gain understanding of the event. The images were displayed chronologically in a sequence horizontally. All 3 images were the same size and centered on the page. For example, Figure 1C shows the sequence of the blonde girl from *Bellyflop* jumping off the diving board, doing a front flip, and perfectly entering the water. This was important to the story because it showed how each time the blonde girl dived, the dives became more intricate.

c. Sequence and Perspective: When it was necessary to portray a perspective in regard to a sequence, the sequence displayed images in the upper half of the page in chronological order with each image being the same size. The perspective image was displayed underneath the sequence at a larger ratio in size than the upper images. For example, in Figure 1D, the blonde girl from *Bellyflop* is once again performing a dive. This time she flips and kicks a beach ball back to its throwers. The top three pictures show this sequence while the bottom picture shows the throwers' reaction to her kicking their ball back.

3. Each static story, PowerPoint was set on automatic play using the slideshow presentation mode and was timed to match the time of their animated counterpart.

Figure 1

Visual examples of established rules for static story presentation



To provide familiarization with the study procedure, the same process for creating static and animated presentations was completed on two shorter animated shorts, *A Joy Story* (Buschor, et al., 2018) and *For the Birds* (Eggleston, 2000), that were used for familiarizing the participants to the task. Unlike the task stimuli, the example stimuli,

both animated short and PowerPoint, were approximately 2-minutes long, but still contained the necessary story grammar elements to provide models to the participants.

Procedure

Participants for the study were recruited through a digital flyer sent through referral sources that included school SLPs, private practice SLPs, and professional colleagues. The participants' parents were initially asked to contact the Idaho State University Child Language Lab research team to express initial interest in their child participating in the study and receive details about the study. If parents agreed, they were contacted individually via telephone by a member of the research team to begin the informed consent process, first by receiving general information about the study, including procedures for using Zoom, and asking any questions they had. They were also sent the history and consent forms to go over any questions they had about the forms during the phone meeting. If they agreed to participate, they completed the informed consent process by signing and sending those forms back via Docusign. After the forms were received, dates for the four study sessions were then set. Each session was given a 1-hour time limit in order to keep the participant engaged without feeling overwhelmed or fatigued so it would not negatively affect their test performance, scores, or storytelling abilities. For example, during the testing sessions, if the participant had not fully finished an assessment, testing was paused at the end of the hour limit and resumed in the next study session.

The first two study sessions were devoted to language testing. The first assessment administered was the TILLS (Nelson et al., 2016). Subtests were used that would provide a Core Identification Score for the targeted age group as well as the

Sound-Word Composite Score and the Written Composite Score. The Core Identification Score cutoff would be used to help confirm or determine if a participant fell into the typically developing range or the language/literacy disorder range. If the TILLS was incomplete by the end of the hour long first session, administration continued into the second session. During the second session, the subtests that make up the Expressive Language Index (ELI) of the CELF-5 (Wiig et al., 2013) were administered. This index was used to assess the participants' expressive language skills and act as a supplement measure to the skills measured by the TILLS because the TILLS did not have specific measures for expressive syntax. The language testing was typically completed within the first two sessions, although the participant with ASD required a third session to finish language testing before continuing to the story telling sessions. The participants' tests were scored, and it was determined if they met the inclusion criteria on the TILLS and the CELF-5. For the TILLS, this required that they score below the cutoff raw score of 34 for the children aged 9-11, and 42 for the children aged 12 in the Identification Core subtests. For the CELF-5, they needed a score that fell 1 SD below the mean, or a standard score lower than 85. Summary reports of the participants test scores were sent to parents/guardians, with recommendations, if needed.

Two participants from the larger study were provided with additional testing due to not having a previous diagnosis of a language or language-based learning disability but having scores below the cutoff on the TILLS and several concerning characteristics (refer to Table 1 above for assessment scores). This testing included the Language Content Index and the Reading and Writing Supplement of the CELF-5. The results suggested that the participants had language and literacy difficulties, but it was not clear if they

would meet the criteria for developmental language disorder or a literacy disorder as full diagnostic assessments for learning disabilities was beyond the scope of the present study. As this is a pilot study, these two participants and a third participant with more consistent scores in the low range and below the cut off, were included in the language/literacy impairment group

The second two sessions were devoted to the narrative retells of either the static or the animated stimuli as well as the administration of the TONI-4 (Brown et al., 2010). During the first session, the child viewed either two static stories or two animated stories and then switched conditions in the next session. A script was created for the narrative data collection process that included instructions on how to watch and retell each story as well as a script and model for each presentation type. Participants were assigned to which modality they would view first and which story pairs they would view. Assignment was done via a counterbalancing process that assigned students to story pairs based on the date their contact form was completed. They were assigned to a modality first (animated or static) and then initial story pairs were counterbalanced according to our pairing process as mentioned above across participants. It should be noted that due to an initial error in the counterbalancing process, the first participant in the study was presented with two *helper* stories in one session and two *accomplishment* stories in another. These stories were the static modalities for *Bellyflop* and *Lifted,* and the animated modalities for *Dust Buddies* and *Soar.*

Before the experimental retell task began, the researcher familiarized the participant with the task by presenting an example story for each condition, animated or static, followed by an example of a story retell using a script. The stories used were the

two 2-minute stories listed previously. The researcher modelled a story retell after each example story using a predetermined script and demonstrated that each story had a beginning, middle, and an end with all the required story elements.

During each experimental session, the participants were shown two static or two animated stories. The static stories were presented via PowerPoint presentation on the researcher's computer with their screen shared through Zoom. The animated stories were presented via a YouTube link that was provided to the participant in the Zoom chat. This was done so they could be viewed without any time delays that could occur due to the videoconferencing process. The participant was instructed to open the link and taught how to share their screen so they could view the story with the researcher. This was done in order to prevent any feedback delay and make for a smooth uninterrupted presentation of the animated short to help maximize retell ability for the participant.

Before each story was presented, the participant was given the following instructions:

> *During the next two sessions, we are going to watch some stories on the computer. Two of the stories will be presented as sets of pictures in a slide show and two will be animated videos. Do you know what a slide show is? <u>If no:</u> A slideshow is similar to a book but instead of pages, you'll see different pictures on each slide on the computer. Pay close attention because these stories also don't have any words. After you watch the story, you will retell it in your own words. Today we are going to start with pictures/videos.*
> *Today (name of other research team member) is going to be with us on and off. They are going to help us with the project. They're going to leave and I'm going to show you some stories. When they come back, I'm going to have you be the storyteller and tell the story back to them when they come back. Remember that a story has a beginning, a middle, and an end."*

The participant was given further instructions and then the example story for each modality. The following are the instructions for each instance. The animated instructions also include instructions on how to open the animated short on the participants computer:

Static: "I'm going to show you a set of pictures. I want you to look at the pictures on the screen while the slide show plays. Pay very close attention to the story because after you watch it, you're going to retell the story. My friend (name of researcher) is going to join us and you are going to retell the story to my friend who didn't watch it. We'll only be able to see the story one time, so you'll need to watch carefully. I'm going to show you what I mean with an example story."

Animated: "I'm going to send you the link to the video in the chat. Instructions for opening video stimuli:

1. *Make sure the Zoom app or Zoom website is the only window you have open.*
2. *Double click on the link in the chat.*
3. *Right after you click on the link, make sure that you pause the video right*
4. *away.*
5. *Come back to Zoom and click the green "share screen" button at the bottom of Zoom.*
6. *When it asks you what you want to share, click on the box with the video.*
7. *Make the video full screen by clicking the box in the bottom right corner of the video.*
8. *Push play when prompted to do so.*

Now we're going to watch some short, animated videos. Pay very close attention to the story because after you watch it, you're going to retell the story. A friend of mine is going to join us and you are going to retell the story to my friend who didn't watch it. We'll only be able to watch it once, so you'll need to watch closely. I'm going to show you what I mean with an example story."

After the presentation of the example story, the participant was then told that it was their turn and were given a brief introduction to each story before they were told to watch and retell (see Appendix A for individual story introductions). After viewing 2 of the stories in each modality, the instructions were reiterated to the participant:

Thank you for paying attention to the story. Now my friend (researcher's name) is going to come on. They are here to listen to you tell them the story you just watched, so now you are the storyteller. When you're ready, tell them the story and include as many details from the story that you can. Remember that a story has a beginning, a middle, and an end. I'm going to go away for a little bit, but I'll be back when you're done telling the story to (researchers' name). Ready?

The use of a second researcher who would enter and leave the meeting between stories reduced the likelihood that the participant would think that the listener was already familiar with the story. This was thought to create a more ecologically valid context for retelling the story to a listener who was unfamiliar with the story and provide a pragmatically appropriate context for retelling the story with as much detail as possible. Each Zoom session was video recorded for the purpose of transcribing the participants' story retells after the sessions ended.

Data transcription, coding and scoring

The researchers involved in the study were provided with general training in language sample transcription and coding, as well as specific training using story retells based on the study's stimulus materials that were produced by adult volunteers. Three graduate SLP students and one undergraduate SLP student transcribed and coded the volunteers' narrative retells according to the Systematic Analysis of Language Transcripts (SALT) conventions (Miller & Iglesias, 2012) and additional project specific codes that were established. The project specific codes are provided in Appendix B. Study personnel were also trained in the use of the MISL rubric (Gilliam et al., 2017). The MISL rubric is a tool used to measure specific aspects of macrostructure and microstructure elements of story retells that results in a macrostructure and microstructure score (see Appendix C for full rubric). Given that more detailed microstructure information was being gathered from the SALT coding, the primary function of the MISL was to obtain a macrostructure score for each story in a systematic manner. As part of training, each story used in the study and produced by an adult volunteer was scored by each researcher and then the scoring of each was compared and

discussed with reference to the instructions provided by the authors of the MISL (Gilliam et al., 2017) until consensus was reached. This process helped to calibrate the researchers' scoring to the stories that are being used in the study, independent of the actual stories produced by the study participants.

All participant transcripts were coded by a graduate student member of the research team and then were reviewed by a second trained research assistant. Any discrepancies in the coding were resolved through discussion between the researcher and assistant. Any issues that could not be easily resolved were discussed and resolved by research team leader, an experienced SLP and professor of child language. Transcript data were analyzed using the SALT software program that provided several output files with data for further analysis. Some of the specific codes that were used were directly linked to criteria on the MISL rubric. The team followed a similar review process where a member of the research team would score each transcript using the MISL rubric while a second research assistant would also score each story. The two scoring rubrics were compared and had discrepancies resolved via individual and team meetings for a final overall score. Using the data collected from the SALT analysis and the MISL score, the goal was to compare and contrast the differences between stories presented via animated presentation versus static presentation to see if there were measurable differences. Initial scoring discrepancies were generally considered minor and can be seen in the table in Appendix D.

Data Analysis

Data analysis for this study was divided up by the individual measures outlined in our purposes and hypotheses. For the first purpose of analyzing potential differences in

story length, we conducted an ANOVA analysis to determine the mean length of each of the stories across the conditions. For the second purpose of analyzing potential differences between the static and animated condition, aspects of macrostructure, productivity, accuracy, complexity, and semantics were analyzed. Post hoc analyses were also conducted on other semantic categories (adverb use, subordinating conjunction use, and use of elaborated noun phrases that contained more than one modifier). These measures were analyzed using one-tailed paired-sample *t*-tests. Given the small sample size (N=7), we did not anticipate many statistically significant results. However, statistical tests were conducted in order to help explore possible trends in the data that would help refine future studies and focus future analyses. For all statistical tests, the alpha level was set to .05 unless it needed to be corrected for multiple tests with a Bonferroni adjustment.

Results

Story Stimulus Similarity

In order to determine if any of the individual story stimuli had characteristics that caused them to result in longer or shorter stories, regardless of condition, the total number of utterances in the narratives produced in response to each of the four stories was compared. A one-way ANOVA was conducted on the stories in both conditions across participants to determine if the stories within a condition could be combined for analysis. If there were differences between the story lengths, it would not be appropriate to combine the stories. If there were no significant differences between story lengths, it would be appropriate to combine the stories within each condition. The ANOVA with stimulus story (regardless of condition) as the independent variable, and total number of

utterances per story as the dependent variable, resulted in no statistically significant differences in the lengths of the stimulus stories across the conditions, $F(3) = .34$, $p = .80$. Based on this result it was determined that the two animated stories and the two static stories could be combined in order to form longer language samples, even in the case of the participant who was administered the incorrect counterbalanced pairs initially. This result also showed that the individual stories selected were conditions similar enough productivity and would be appropriate for use in future studies and in comparison to each other.

Comparison Between Static and Animated Conditions

To examine the effects of the static vs. animated conditions on aspects of the narrative production, repeated paired-sample *t*-tests were conducted on various measures of macrostructure, productivity, accuracy, complexity, and semantics to explore potential differences between conditions for children with language impairments. When multiple tests were conducted on a given measure (e.g., productivity), a Bonferroni correction was applied to adjust the alpha level to control for Type 1 error. See Appendix E for a table summarizing the statistical results of all the paired-sample *t*-tests. Because this is a pilot study with a small group of participants and it is exploratory in nature, some nonsignificant results that suggest potential differences between conditions will be highlighted as possible appropriate dependent variables to explore in future research.

Macrostructure

In terms of macrostructure, we predicted that story retells from the animated condition would result in higher macrostructure scores on the MISL rubric compared to the stories from the static condition. The results indicated a marginally significant

difference in macrostructure scores in favor of the animated condition (M = 11.93, SD = 2.79) over the static condition (M = 10.43, SD = 4.41) in this small group, $t(6) = -1.53$, p = .089. Although the results were not statistically significant here, given that there were only 7 participants in this group and that this was an exploratory pilot study, the relatively low p-value may indicate a possible trend for the animated stimuli to promote higher overall macrostructure scores in stories produced by children with language impairment. Because of this indicated trend, it may be worth exploring in a larger study for possible statistical significance. Table 2 displays the individual MISL macrostructure scores of each participant and their resulting mean scores within each condition.

Table 2

Individual Participant MISL Macrostructure Scores & Means

Participant Number	Static	Animated
1	8.50	13.50
2	7.00	11.00
3	3.50	6.00
4	13.50	13.50
5	10.50	12.50
6	14.00	13.00
7	16.00	14.00
Mean	10.43	11.93

Productivity

Productivity was measured by comparing the total number of complete utterances and the number of total words used in each story from the static condition as compared to the stories in the animated condition. We predicted that the animated condition would yield greater productivity in stories in terms of more utterances and greater number of

total words used. Table 3 shows the results of the individual participants within story conditions for each of these measures.

Table 3

Individual Participant Productivity & Means

Participant Number	Total Number of Utterances		Number of Total Words	
	Static	Animated	Static	Animated
1	36.00	47.00	256.00	375.00
2	26.00	36.00	170.00	234.00
3	23.00	26.00	91.00	159.00
4	79.00	87.00	658.00	776.00
5	35.00	36.00	288.00	276.00
6	43.00	38.00	379.00	301.00
7	55.00	55.00	466.00	507.00
Mean	42.43	46.43	329.71	375.43

Since multiple paired sample *t*-tests were used to analyze these measures, a Bonferroni correction was used to reset the alpha level to $\alpha < .025$. The results then indicated a marginally significant difference between the total number of utterances in the static condition ($M = 42.43$, $SD = 19.32$) and in the animated condition ($M = 46.43$, $SD = 20.11$), $t(6) = -1.80$, $p = .069$. The results also indicated a marginally significant difference between the total number of words used in the static condition ($M = 329.71$, $SD = 190.81$) and in the animated condition ($M = 375.43$, $SD = 208.18$), $t(6) = -1.71$, $p = .061$. While there were no statistically significant differences in either of these measures within this small group, the *p* value in both measures is relatively low and this may still indicate the possibility of a trend that favors the animated condition in facilitating greater use of total number of utterances and total number of words used in story retells in children with language impairment, and this trend may be worth exploring in a larger

study to get a more robust idea of what productivity actually looks like in this population when using an animated condition for story retell purposes.

Accuracy & Complexity

The accuracy of the utterances produced in the narratives across each story condition was measured by the proportion of total number of utterances that contained no errors. We predicted that stories produced from the animated condition would have a higher accuracy compared to the static condition. No statistically significant difference was seen in the results for the accuracy measure. Table 4 displays the measures used to determine accuracy across participants and within conditions as well as the complexity measures used.

Table 4

Individual Participant Accuracy & Complexity Measures & Means

Participant Number	Proportion of Grammatical Utterances		Subordination Index		Proportion of Complex Sentences - Finite Clauses		Proportion of Complex Sentences - Finite & Nonfinite Clauses	
	Static	Animated	Static	Animated	Static	Animated	Static	Animated
1	0.92	0.85	0.94	1.04	0.17	0.17	0.25	0.30
2	0.96	1.00	0.96	1.00	0.00	0.06	0.19	0.28
3	1.00	0.82	1.05	1.05	0.13	0.19	0.13	0.27
4	0.92	0.9	1.08	1.01	0.20	0.23	0.38	0.46
5	0.91	0.92	0.88	0.94	0.03	0.03	0.34	0.31
6	0.77	0.87	1.05	1.03	0.21	0.16	0.44	0.53
7	0.93	0.94	1.11	1.07	0.31	0.29	0.53	0.45
Mean	0.92	0.90	1.01	1.02	0.15	0.16	0.32	0.37

The impact of the story stimulus condition on complexity was measured using the subordination index, the proportion of complex sentences used with finite clauses, and the proportion of complex sentences used with finite and nonfinite clauses in each story

across conditions. Our prediction was that the animated condition would produce more complex syntactic structures. The subordination index (SI) produces a ratio of total number of clauses (main and subordinate) to the total number of T-units in a story. The SI analysis counts clauses and provides a measure of clausal density. With a Bonferroni correction applied to reset the alpha, $\alpha < .017$, for the 3 tests that were conducted in the complexity category, the results indicated that there was no statistically significant difference between the SI of the stories in the static condition versus the stories in the animated condition. The difference in the proportion of complex sentences with finite clauses also was not statistically significant. However, there was a possible trend in favor of the animated condition ($M = .37$, $SD = .11$) in the proportion of complex sentences with finite and nonfinite clauses compared to the static condition ($M = .32$, $SD = .14$), $t(6) = -1.64$, $p = .076$. This possible trend in such a small pilot group could indicate that the animated condition could promote higher overall complexity in the sentence construction of story retells and may warrant further investigation in a larger study (refer to Table 4 for individual results).

Semantics

Measures for semantics were divided into two subcategories: verb types and lexical diversity. The verb types measured were the total number of action verbs, mental verbs, and stative verbs used in the stories in each condition with each of those totals averaged to get the mean results. Linguistic verbs were originally included as part of the measure but were ultimately not included because the story presentations themselves were either wordless or silent without dialogue. Therefore, very few linguistic verbs were used. We predicted that the animated condition would produce stories with increased

amount of detail as related to motion. We also predicted that the animated condition would facilitate greater specificity in verb selection resulting in greater verb diversity. A Bonferroni correction was added to these three measures to reset the alpha as $\alpha < .017$. The results indicated no statistically significant difference between the total action verbs used in the static condition compared to the animated condition. Mental and stative verbs also did not show any statistically significant difference across the conditions. These verb measures may still be considered as measurable factors in a larger study because our exploratory pilot may not have revealed enough to show statistical significance at this time. See Table 5 for the individual results in each of these measures.

Table 5

Individual Participant Use of Different Verb Types & Means

Participant Number	Action Verbs		Mental Verbs		Stative Verbs		Total Lexical Verbs	
	Static	Animated	Static	Animated	Static	Animated	Static	Animated
1	31.00	37.00	0.00	4.00	0.00	3.00	31.00	44.00
2	19.00	28.00	3.00	1.00	1.00	3.00	23.00	33.00
3	17.00	27.00	0.00	0.00	0.00	0.00	17.00	27.00
4	54.00	90.00	8.00	4.00	4.00	6.00	68.00	101.00
5	34.00	34.00	2.00	2.00	2.00	2.00	38.00	38.00
6	43.00	37.00	4.00	1.00	4.00	1.00	53.00	40.00
7	53.00	49.00	4.00	2.00	15.00	3.00	73.00	55.00
Mean	35.86	43.14	3.00	2.00	3.71	2.57	43.29	48.29

Lexical diversity measures looked at the number of total different words used in the participants' narrative stories in each of the conditions as well as the total number of different verbs used. This is different than the measures used for the number of action, mental, and stative verbs because this measure looked at the total number of different

types of verbs used rather than simply looking at the total number of all verbs used. We hypothesized that the animated condition would produce stories with greater verb and word diversity compared to the static condition. The individual results for each participant in these measures are listed in Table 6.

Table 6

Individual Participant Lexical Diversity Measures & Means

Participant Number	Number of Different Words		Total Number of Different Verbs	
	Static	Animated	Static	Animated
1	105.00	125.00	17.00	30.00
2	72.00	83.00	14.00	19.00
3	46.00	65.00	9.00	15.00
4	196.00	205.00	50.00	48.00
5	99.00	107.00	20.00	19.00
6	140.00	120.00	31.00	24.00
7	149.00	177.00	32.00	35.00
Mean	115.29	126.00	24.71	27.14

With a Bonferroni correction added to these two measures, the alpha resets to $\alpha < .025$. The results indicated that with this correction there was a marginally significant difference between the total number of different words used in the static condition (M = 115.29, SD = 50.51) compared to the animated condition (M = 126.00, SD = 49.68), $t(6) = -1.85$, $p = .057$. Considering the small size of this group and that it was an initial exploratory study, this small p value indicates a possible trend that favors the animated condition in promoting higher use of different words in story retells and may be worth exploring in a larger study to see if this trend continues. The reason for this possible facilitation will be addressed later in the discussion portion of this study. As for the total number of different verbs used, no statistically significant difference was seen between

the number used in the static condition compared to the number used in the animated condition.

Other Lexical Categories

During the data gathering process and because this was an exploratory study, there were other possible trends in favor of the animated condition over the static condition that we noticed during initial analysis, and that we determined may be worth exploring. These data points were not part of our original predictions but are included here as post-hoc analyses because they may be relevant in future studies. These categories included the average total number of adverbs used in participants' stories within each condition, the average total of subordinating conjunctions used, and the average total of elaborated noun phrases that were used that included a modifier and a determiner before the noun. The individual results are recorded in Table 7.

Table 7

Individual Participants' Use of Other Lexical Categories

Participant Number	Adverbs		Subordinating Conjunctions		Elaborated Noun Phrase+	
	Static	Animated	Static	Animated	Static	Animated
1	29.00	45.00	4.00	3.00	9.00	15.00
2	17.00	24.00	0.00	2.00	9.00	12.00
3	17.00	22.00	1.00	5.00	0.00	2.00
4	60.00	52.00	7.00	13.00	36.00	37.00
5	30.00	30.00	0.00	0.00	8.00	8.00
6	37.00	30.00	4.00	5.00	14.00	15.00
7	35.00	52.00	15.00	12.00	23.00	18.00
Mean	32.14	36.43	4.43	5.71	14.14	15.29

There were no statistically significant differences in any of these categories, but there was a possibility of a trend that favored the animated condition in facilitating each of these

lexical categories in the story retells, which is why we decided to include them and do an analysis of each of these categories. Because the use of adverbs and elaborated noun phrases can add to the perceived quality of narrative these could be included in future studies.

Discussion

While our predictions resulted in no clear statistically significant differences between the two stimulus conditions in this pilot study with a small sample, a few areas did have interesting results and suggested some possible trends that may warrant further investigation. Differences between the stimulus conditions may be revealed in several measures in future studies that are more appropriately powered. First, our findings suggest that the animated condition may allow for children with DLD or other language/literacy disorders to generate a greater number of different words compared to the static counterparts. Despite there being no statistical significance in this area, our results did show that there is a possibility for finding this same or similar result in another study for multiple reasons. On the one hand, in a study with more power, we may see similar differences that indicate the animated condition does facilitate greater total verb use in children with language impairment. On the other hand, we have to consider that, because these are children with language impairment, that they may have difficulty in generating a variety of verbs in either condition. It may be possible that animation will improve their verb diversity in narratives only if they are also provided with an accompanying verbal model. The effect of animated story presentation on narratives alone should still be considered as some studies have suggested that animation may have a broad effect on learning in general and recalling learned concepts from memory, which

would include learned vocabulary, without creating greater demands on memory. In other words, animation in educational or assessment situations could provide opportunities for learners to be more selective of available information stored in memory while simultaneously avoiding working memory demands because the dynamic depiction of the information makes it easier to retrieve (Lowe, 2004). The availability and ubiquitous nature of animated presentations in a child's world could mean that children have more experience interpreting animated graphics than they do static presentations and therefore may be able to access and use their stored lexicon and the variety of words they already know more readily for narrative use because of that experience (Mineo et al., 2008).

What our results do indicate, therefore, is that there is a real need for further research in this area using studies with appropriate power to determine the impact of animation on verb production in children with language impairment. A larger study group may still demonstrate that animation does have an impact on verb use and recognition like what Schlosser et al. found (2019). The other trends that were suggested in this pilot study, including those that were analyzed post-hoc, could also support the previous research suggesting that animated presentations help improve the understanding and use of complex concepts, like semantic and syntactical concepts (Bétrancourt & Schlosser et al., 2014; Tversky, 2000; Tversky et al., 2002), and it might be easier for children to form mental relationships between semantic categories and their use of lexical diversity (Gazella & Stockman, 2003; Klop & Engelbrecht, 2013).

Individual Characteristics and Results

To further understand the potential implication of these results and trends, it may be beneficial to examine some of the individual participants' performance and data in

relation to the different conditions. Three of the participants (participants 2, 3, & 5) were already diagnosed with a language disorder. Participant 4 entered the study without a diagnosis, but with concerns from his mother that he may have some language difficulty because he was having trouble with reading at school. His assessment results on the TILLS revealed that he did have difficulty with receptive language skills and literacy skills because he scored below the designated cutoff score (see Table 1). His expressive language skills measured by the CELF-5 ELI were also borderline. Additional testing completed with him revealed he had difficulty with written language and some other areas of semantics. He was placed into the language impaired group for those reasons. His data results from the different story conditions do reflect that his main difficulty appears to be in literacy and receptive language rather than clearly in expressive language. For example, his average total number of utterances in both conditions were much larger than the other participants by about 20-30 utterances (refer to Table 3 for specific results for this participant in this area) showing that he had little difficulty using his expressive language to tell the stories. Because there were no statistically significant differences in the average total number of utterances across the conditions, his total average does not appear to have affected the results in an overwhelming way. However, a more interesting data point is his total number of lexical verbs. In the static condition his average was much more comparable to the other participants, particularly the other participants that also joined the language impaired group due to assessment results showing difficulty with literacy skills. However, in the animated condition, his average number of lexical verbs jumped from 68 in the static condition, to 101 in the animated condition (refer to Table 5 for specific numbers for this individual in this area). This

could account in part for the trend towards greater overall action, mental, and stative verb use in response to the animated condition over the static condition as shown in the statistical results because it was such a jump compared to the other participants across the conditions. If a larger study were conducted that did not exclude children with only literacy impairments like participant 4, it would be interesting to see if the trend were to continue or change. If a study evaluated children with primary literacy impairments only, it might reveal that this group demonstrates characteristics different from both the typical language group and from the children with spoken and written language difficulties.

Results like this participant's then require a closer look into other individual results, particularly those participants that had a literacy disorder or other learning disorder instead of a comprehensive language disorder. For instance, participants 6 and 7 were brought into this group due to their assessment results and not due to initial concerns regarding language skills. Their assessment results also showed that they were below the cutoff score on the TILLS and were borderline on the on the CELF-5-ELI. Participant 1 was included in this group as well with a primary diagnosis of autism spectrum disorder, and a language disorder therefore being secondary to that. However, while each of these participants' individual results did not appear to be vastly different from their DLD diagnosed peers in several measures, looking at their individual scores does reveal some interesting information that should be noted for future research into this subject (see Tables 2 - 7 for examples). What can be determined when looking at these individual results is that out of the three or four children that did seem to consistently benefit from the animated condition in producing stories, three of those participants had spoken language impairments related to either DLD or Autism. The children with literacy

disorders did see improvement, but the differences varied depending on the category and the individual participant, meaning there was no discernable pattern to these differences. Participant 1 with Autism saw an almost consistent improvement in the animated condition compared to the static condition in almost every category. Thus, this trend might influence the direction of future studies and the participants that take part in it. One direction could be that participants with a primary language disorder, participants with a secondary language disorder to another disorder, and those that only appeared to have a literacy disorder can all be included as part of this study but should be separated into individual groups in order to truly understand the differences in results. In a different direction participants with literacy disorder may still have similar enough characteristics to DLD to include them alongside their fellow participants with DLD without too much variance affecting the overall averages and statistical results because of the similarities. In this case it would be important to use terminology that reflects a broader inclusion group, such as children with language and/or literacy disorders. A larger study conducted using the same conditions could still include participants with literacy disorders or other primary disorders such as autism spectrum disorder and have valid results that are perhaps more comprehensive because of these participants' inclusion. One caveat, however, would be that their assessment scores or the severity of their primary disorder should be considered before including them as part of the study as was done with each of the participants included here before they were placed definitively in the language impaired group. There may need to be some specific parameters set on a larger study to include certain participants, such as specific ranges of scores on assessments or an initial interview to determine if they could successfully participant in the study without

potentially skewing the results. In this case, separating the groups may still result in better and more robust results and would therefore be preferrable.

Comparison to Previous Studies

The results of the Klop and Engelbrecht study (2013), which most closely paralleled the current study, found no significant differences between stories told in response to static and animated stimulus conditions. Most of our results were similar. However, because we chose to make more detailed analyses compared to what they analyzed, we did see that there were some trends that have potential to demonstrate differences in a study of adequate power. Additionally, that study was looking at children with typical language skills. It is possible that children's typical language skills may not see any marked benefit from animation because their skills are already at a high level. On the other hand children with language impairment may be able to get more benefit from animation than would children with typical language. This is certainly an important area in need of further exploration.

We also compared our results to the study done by Diehm et al. (2020). Their findings suggested that typically developing children responded better to the animated condition by producing longer narratives in terms of total number of words used, using more diverse vocabulary in terms of number of different words used, and using more complex syntax in terms of MLU. While we did not find a significant difference in number of total words used or number of different words, we did note a possible trend in favor on the animated condition to facilitate more diverse vocabulary produced in retells from children with language impairment. This could support the idea that animated conditions may help produce better and more fuller narratives compared to a traditional

static condition for both typical learning and developmentally disordered individuals from a variety of age groups. This also shows that there is still a need for more research on the subject to determine if even more comparable results between studies can be found and a definitive answer revealed about the potential that animated story presentations can offer.

It is important to remember that in the Diehm et al. study (2020) they did use a verbal script in conjunction with their conditions. This result is a point of interest considering that we saw the possibility of similar trends in a language impaired group with no verbal script included. This brings into question whether an inclusion of a verbal script in addition to animated stimuli would be beneficial specifically to participants with language impairment. The results of Diehm et al. (2020) suggest that the addition of a verbal script and model could increase the quality of the narrative produced. However, this should still be carefully considered before being added as part of the study because it is possible that while it increases the length and complexity, the reason for improvement may be the linguistic modelling and not just the animation. This may not allow the child to demonstrate their linguistic skills as much as it allows them to imitate an adult linguistic model, meaning it measures less of their actual linguistic ability. Therefore, the addition of a verbal script should be carefully considered before being added to a study of similar nature. It would be important for future studies to look both at animation, verbal models, and the combination of the two on the narrative production of children with language impairments. That could lead to information that would potentially improve both assessment and intervention for this population. For example, a future study could separate participants with DLD into two groups, one that viewed the animated stimuli

with a verbal script and one that did not and this could help determine if the possible benefits are from the animated condition, the additional verbal stimulus, or the combination of the two.

Clinical Implications

This study offers some implications that could be useful for practicing clinicians. For one thing, although formal narrative assessment still relies on traditional static story presentation, animated presentation can still be used in terms of a criterion referenced assessment or even an informal probe of a client's story telling abilities even though the research is incomplete. Clients with language impairments are diverse in nature and some children may see greater success with dynamic animated stimuli then they would static stimuli. The individual results of our study demonstrate this diversity and how some children, depending on the exact nature of their language impairment, may react more positively towards the use of animated stimuli than traditional static. Using animated stimuli in this way may reveal that to the clinician, which in turn could influence their treatment plan. Treatment for clients with language impairment is also diverse. Because of the possible implications of this study, clinicians should not rely only on static measures and should try to incorporate more animated resources when trying to help their clients improve their story telling abilities throughout the treatment process. The successes and even failures they see in treatment using an animated condition could also be useful in continuing and directing this research in the future.

Limitations

We recognize that there are limits to this study and the results should therefore be interpreted cautiously. The biggest limitation this study has is that it is a pilot study and

had very few participants. While we saw some potential trends and some notable differences in the results from this small group, we do acknowledge that a larger study needs to be completed to determine if the trends we see are real trends and continue in the direction of favoring the animated condition for story retells. Another limitation is the fact that the group was a mix comprised of children with a language disorder, a literacy disorder, or language disorder secondary to another developmental disorder. While we already concluded that according to the results this did not appear to have a major effect on our analyses, we do also acknowledge that in larger group it could have an impact on the results. More research may need to be conducted on children with language impairments that does not include literacy impairments in order to obtain more accurate results

Future Research

This study should be replicated on a larger scale and include more children with language disorders as well as those with literacy disorders in a separate group. Narrative production continues to be a valuable tool in both assessment and treatment of children with language impairments and even though intervention was not the focus of our study, some of the features we found to be advantageous for narrative production may also provide support during the instructional and therapy part of treatment. Given the trends that we saw in this pilot study, it would be best to separate groups into children with primary DLD and those with literacy based or other types of language disorders. A larger and more comprehensive study can help reveal if these possible advantages we found can in fact translate into better assessments and treatment techniques used by clinicians to best help their clients.

We determined that the stories we used as part of our study work well for gathering the necessary data needed to make these conclusions and encourage the use of these stories in a larger study group because of what comparisons they allow. Our measures also have the potential to be impactful in a larger study because of the possible trends we observed. We also now understand that there are other measures that should be added to a larger study due to the possible trends we observed that were not part of our original predictions, but that still have potential to be in favor of the animated condition, including measures of complexity like adverb use, subordinating conjunction use, and elaborated noun phrase use in each story across the conditions. It would also be informative to compare these results to the group that participated as typical children to contrast the trends observed here with what was observed there, and if there are any other implications that can be drawn from those comparisons. This comparison can also be replicated in a larger study to see if trends on both sides continue into larger groups and to determine if one condition over the other truly benefits one group, the other, or both.

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Appendices

Appendix A – Story Introductions

Here are the introductions for each story:

Belly Flop: This story is called *Belly Flop*. It is a story about playing at the pool and diving. Do you like to dive? [I don't dive but I like to watch people who are good at it.]

Lifted: This story is called *Lifted*. It's about aliens. What do you know about aliens? [In movies, aliens come from outer space in spaceships.]

Soar: This story is called *Soar*. It is about flying planes. Do you like flying? [Well I've been in a plane a couple of times and I thought it was fun.]

Dust Buddies: This story is called *Dust Bunnies*. It is about dust bunnies. What do you know about dust bunnies? [Dust bunnies are little clumps of dust and other stuff that get bunched together on the floor. Some people think they look like fluffy bunny rabbits, that's why they are called dust bunnies. You might be able to find some under furniture.]

"That's what this story is about. Remember to pay close attention to the story because I'm going to have you tell this story to (researcher's name) after we are done watching it. We will only watch the story once. Do you have any questions before we begin? Okay, let's begin."

Appendix B – MISL Rubric

Monitoring Indicators of Scholarly Language
Gillam & Gillam (2010)

Story Grammar Element	Description	Examples	Description	Examples	Description	Examples	Description	Examples
Character **Salt Code = CH**	**0 Points:** No character is included, or only **ambiguous pronouns** are used.	They were walking. She and him were walking.	**1 Point:** Includes at least one character using **non-specific labels** (pronouns, nouns) **WITH a determiner** "the" or "a").	Once there was a boy walking. **The boy was** walking.	**2 Points:** Includes at least 1 character using a **"name"** for the character **Note:** *Only code each character one time.*	Once there was a boy named Charles.	**3 points:** Includes **more than 1** character using specific name	There was a boy named Charles, a girl named Connie, and a mom named Jody.
Setting **Salt Code = S**	**0 Points:** No reference to a specific time or place.	The boy and girl were walking.	**1 Point:** Includes reference to a general place **or** time (*not necessarily related to a "story")	The boy and the girl were outside. The space ship came from outer space.	**2 points**: 1 reference to a **specific** place **or** time in the same story. (*must be related specifically to the story).	Once there was a boy and a girl walking in Central Park.	**3 points:** Includes 2 or more references to **specific** places and/or times (in the same story).	Last week there was a boy and a girl walking in Central Park. They lived in Logan.
Initiating Event **Salt Code = IE** **Event that motivates/elicits action "starts the story"** *Note: The IE must be explicitly stated by the child, not inferred by the scorer.	**0 Points:** A problem or "starting" event is not stated.	The girl looked at the boy. The boy and girl were walking in the park. The boy is next to a car. There is a tree.	**1 Point:** Includes at least one event or problem that **does not** motivate/elicit an action from the character	A spaceship landed in the park (potential **initiating event**). There were aliens laughing and a dog running and a table…(no action/attempts related to potential IE)	**2 points:** Includes at least one event or problem that **elicits** an active response from the character(s).	A spaceship landed in the park (**IE**). The girl ran (**A**) out to say "hi" to the aliens.	**3 points:** 2 or more IE's in one story (complex episode)	A spaceship landed in the park (**IE**) The girl ran (**A**) out to say "hi" to them. They became friends (**C**). Then, the spaceship caught on fire (**IE**). They ran to get some water.

Internal Response **Salt Code = IR** (eg., afraid, surprised, happy, excited, sad; NOT "liked" "had fun") *Note: Adjective or adverb that expresses a mental state related to emotion	**0 Points:** There are no feelings, desires or thoughts explicitly stated	The girl and boy saw the aliens land and they ran out to meet them.	**1 Point:** Words are used that describe feelings that are <u>not directly</u> related to the IE.	The boy saw a spaceship land in the park (IE). There was a happy dog.	**2 points**: The feelings, desires or thoughts of the character are explicitly stated and <u>relate to the IE</u> (One stated IR)	The spaceship landed (IE). The girl was <u>afraid (IR)</u> of meeting the aliens.	**3 points: Two or more** feelings, desires or thoughts are explicitly stated and <u>relate to the IE</u> (2 or more stated IRs)	The spaceship landed. The girl was <u>excited</u> to meet the aliens. She was <u>happy</u> when they greeted her nicely.
Plan **Salt Code: P** *Key words:* wanted, thought, decided, pondered, considered	**0 Points:** No statement or wording that relates to planning to take action that can be directly tied to the IE. Decided, wanted, thought are **NOT included**	The aliens landed. The girl ran out to meet them.	**1 point:** Terms are used or statements are made that use "gonna, going to" or a cognitive/mental state verb NOT related to how the character may react to the IE. The statement is NOT directly related to the IE.	The girl <u>decided</u> to have a picnic with her brother.	**2 points:** There is a statement about planning to act and it is tied directly to the IE. Must be made by the main character.	The spaceship came down (IE). The aliens came out (A). The girl <u>wanted</u> to go (P) meet them.	**3 points:** There is more than one statement about planning to act and it is tied directly to the IE. Must be made by the main character.	The aliens landed. The girl <u>decided</u> to go meet them. She ran over and said, "Hi." The boy <u>thought</u> he would sneak away. He went home and no one saw him go.
Action/Attempt **Salt Code = A** Note: Cognitive state verbs NOT included (thought, decided, wanted , said, saw)	**0 Points:** No actions are taken by the main character(s) (no action verbs contained in the story). Basically, a series of random descriptions.	There is a girl. There is a boy. It is sunny.	**1 point:** Actions are taken by the main character(s) that are not directly related to the IE. Descriptive actions	The spaceship landed. The boy and the girl were <u>going</u> to a park.	**2 Points:** One or more actions is taken by the main character(s) that **IS** directly related to the **IE**.	The spaceship of aliens landed in the park **(IE).** The girl <u>ran</u> out to meet them. She went up and said, "Hi."	**3 Points:** The addition of a complicating action that interferes with the character's actions in response to the IE.	The aliens landed in the park (IE). The girl wanted to be their friend (P). She walked over to say hi (A). <u>They snarled at her</u> (Complication). She ran home to tell her parents what happened (C).

Consequence **Salt Code = CO** Outcome of attempt/action related to IE; Action that "ends" the episode or brings it to a logical conclusion (may also be the IE for a following episode).	**0 Points:** No outcome of the action/attempt is explicitly stated.	The spaceship landed (IE). The aliens go out (A). The boy was afraid (IR). *An internal response may not serve as a consequence.	**1 point**: One consequence with no IE. *The consequence is linked only to an action.	The girl ran over there (A). She fell and got hurt (C).	**2 Points:** One consequence directly linked to IE.	The spaceship came from space and landed (IE) in the park. The aliens got out to (A) look at the earth (A) and then they flew back to their home (C).	**3 Points:** Two or more consequences. To get a 3: IE #1 must match up with Conseq #1; IE #2 must match up with Conseq #2	The spaceship landed (IE). The aliens got out (A) and looked at the earth (A) and flew home (C/IE). On the way they hit a meteor (A). They fixed the hole (A) and flew on home (C).

Literate Language	**Description**	**Example**	**Description**	**Example**	**Description**	**Example**	**Description**	**Example**
Coordinating Conjunctions **FANBOYS** *(for, and, nor*, but, *or, yet, so*) Can coordinate nouns, verbs, or clauses. 'so excited' = adverb	**0 points**	No coordinating conjunctions in story For, an, nor, but, or, yet, so NOT included	**1 point**: One coordinating conjunction used in story.	The girl was afraid and the boy ran away as fast as he could.	**2 points**: Two different coordinating conjunctions used in story.	John walked to the store but it was closed.	**3 points**: Three or more different coordinating conjunctions used in story.	Sally ran home but their mom wasn't there, so they went back to the park.
Subordinating Conjunctions (*when, while, because, after, if, since, before)* 'that day' = adjective	**0 points**	No subordinating conjunctions	**1 point**: <u>One</u> subordinating conjunction used in the story	<u>When</u> the aliens landed the girl ran.	**2 points**: Two different subordinating conjunctions used in the story	The girl saw the aliens <u>while</u> she was playing in the park. She ran home <u>because</u> she was <u>afraid</u>.	**3 points**: Three or more different subordinating conjunctions used in the story	<u>After</u> the aliens landed, they walked out of the spaceship. John said, <u>if</u> they have ray guns they will kill us. Sally said, I don't think they do <u>since</u> they look so nice.

Mental verbs **Salt Code: M** Mental Verbs: decided, thought, wanted	**0 points**	No mental verbs.	**1 point:** 1 mental verb.	The boy thought it was hot.	**2 points:** 2 DIFFERENT mental verbs explicitly stated.	He decided to go and meet the aliens. He planned to get to them.	**3 points**: 3 or more different mental verbs explicitly stated.	He decided to go and meet the aliens. The girl thought he was brave and he decided to act that way.
Linguistic verbs **Salt Code: L** Linguistic Verbs: said, told, yelled	**0 points**	No linguistic verbs.	**1 point:** 1 linguistic verb.	The boy said, "NO!"	**2 points:** 2 DIFFERENT linguistic verbs explicitly stated.	The boy said, "no," and the girl yelled, "stop!"	**3 points**: 3 or more different linguistic verbs explicitly stated.	The girl told him he was brave. He said, "thanks," and she said, "you are welcome."
Adverbs **Salt Code: ADV** Note: Additional examples below chart.	**0 points**	No adverbs	**1 point**: One adverb that conveys tone, attitude, time, or manner, degree or reason and modifies a verb, adjective, negation, or another adverb.	Sometimes, they like to watch aliens. He is very good.	**2 points:** Two different adverbs	The boy and the girl were very scared. They left quickly.	**3 points**: 3 or more different adverbs.	The aliens yelled loudly, "Don't come over here." Surprisingly, the kids went anyway. After that, they were all friends.
Elaborated Noun Phrases **Salt Code: ENP** (articles, possessives, determiners, quantifiers, wh-words, big, black, funny) **Note: Additional Examples below chart**	**0 points**	No noun phrase elaboration. He saw spaceship.	**1 point**: A noun phrase contains one modifier that precedes the noun	Her brother saw the spaceship. The dog is happy. Two aliens came out.	**2 points:** A noun phrase that contains **2 different modifiers** that precedes the noun.	The black dog saw the spaceship.	**3 points:** Noun phrases in which 3 or more different modifiers precede the noun.	The old, black dog was sick.
Grammaticality	**0 points**	3 or more grammatical errors	**1 point**	2 grammatical errors	**2 points**	1 grammatical error	**3 points**	No grammatical errors
Tense	**0 points**	3 or more tense changes	**1 point**	2 tense changes	**2 points**	1 tense change	**3 points**	No tense changes

Based on the research and contributions of many including: Anderson, 2010; Curenton &Justice, 2004; Greenhalgh & Strong, 2001; Hughes, McGillivray & Schmidek, 1997; Petersen, Gillam & Gillam, 2008; Pellegrini, 1985.
*Contributions from Michelle Merrill, Karen Turnbow, Brittney Lamb, Sara Hegsted, Julise Jager, Allison Hancock, Abbie Olszewski.

Date_____
Story used to elicit narrative_____
Total macrostructure score_____
Total microstructure score_____

Additional Examples of Microstructure elements (not an exhaustive list)

Coordinating conjunctions may include and, and then, then, for, or, yet, but, nor, and so. They are used to coordinate clauses (The boy ran back home but he got there too late). We do not give credit when they are used to coordinate nouns in a noun phrase (The boy and the girl) or verbs in a verb phrase (They were running and playing).

Subordinating conjunctions include *after, although, as, because, if, for, like, once, since, that (but that, in that, in order that, such that), unless, when, where, while.* These words set up a hierarchical relationship between clauses. You must have 2 clauses to have a subordinating conjunction. "That" in the sentence, "I saw that." is not subordinating. "That" in the sentence, "I saw that you really liked him," is subordinating.

Adverbs may relate to time (e.g., *all of a sudden, suddenly, again, now, tomorrow, yesterday, then)*, manner (e.g., *somehow*, *well*, *slowly*, *accidentally*), degree (e.g., *very, each, some, almost, barely, much*), number (e.g., *first*, *second*), affirmation or negation (e.g., *definitely*, *really*, *never*, *not*).

Elaborated Noun Phrases are a group of words comprising of a noun with one or more modifiers providing additional information about the noun. Modifiers may include articles (e.g., *a, an, the*), possessives (e.g., *my, his, their*), demonstratives (e.g., *this, that, those*), quantifiers (e.g., *every, each, some*), wh-words (e.g., *what, which, whichever*), and true adjectives (e.g., *tall, long, ugly*).

Simple Elaborated Noun Phrases consist of a single modifier and a noun. Examples include *one* day, big *doggy* (adjective + noun), *that girl* (determiner + noun), and *those ones* (demonstrative + noun). **Complex Elaborated Noun Phrase** (CENP) consist of two or more modifiers and a noun. Examples include *big red house* (adjective + adjective + noun), *a tall tree* (article + adjective + noun), and *some mean boys* (quantifier + adjective + noun).

Mental Verbs are a type of verb that are used differently than active verbs and are not used in progressive tenses. Mental verbs may include *think, know, believe, imagine, feel, consider, suppose, decide, forget, see, hear,* and *remember*.

Linguistic Verbs target the verbs that relate to the acts of writing and speaking which may include *read, write, say, tell, speak, shout, answer, call, reply, whisper,* and *yell.*

Appendix C – Transcription Codes List

ALL TRANSCRIPT CODES **ALPHABETIZED PULLED FROM MASTER LIST**

[ADV]=Adverbs
[ADVCl]=Adverb Clause
[AUX]=auxiliary be or do
[COMPCl]=Comparative Clause
[COP]=copula be form
[DERR: ____]= determiner error: correction
[DERR:ADD]= determiner: addition
[DET:DART]=determiner: definite article
[DET:IART]=determiner: indefinite article
[DET:PRO]=determiner=pronoun
[DET:QUANT] =determiner: quantifier
[ENP]=Elaborated Noun Phrase
[ENP+]=Elaborated Noun Phrase PLUS
[EO:___]=overgeneralization
[EW:___]=word-level error:correction
[INFCl]=Infinitive Clause
[IRR_PAST]=irregular past
[NCL-C]=Complement Noun Clause
[NCL-O/Q]= Object Noun Clause/Quote
[NCL-O]=Object Noun Clause
[NCL-S]=Subject Noun Clause
[NFCL-#]= number of nonfinite clauses, doesn't include gerunds or single w part
[PARTCl]=Participle Clause
[PAST_PART]=past participle
[PCE:___]=pronoun case error
[PCE:O-P]=Objective for Possessive
[PCE:O-S]=Objective for Subjective
[PCE:P-O]=Possessive for Objective
[PCE:P-S]=Possessive for Subjective
[PRO:DI]=dialect difference in pronoun use
[PCE:S-O]= Subjective for Objective
[PCE:S-P]=Subjective for Possessive
[PE]=preposition error
[PRES_PART]=present participle
[RELCl-O]=Object Relative Clause
[RELCl-S]=Subject Relative Clause
[SCON]= Subordinating Conjunction
[SI-#]=SALT subordination index
[TAE:___]=tense and/or agreement error: error type or corrected agreement form
[VP-#]=total number of verb phrases, both finite and nonfinite

Appendix D - Initial MISL Scoring Discrepancies Table

		Proportion of Agreement in MISL Scores Across Stories			
Participant Original #	Participant #	Bellyflop	Dust Buddies	Lifted	Soar
500	1	100%	100%	100%	85.71%
501	2	71.43%	42.86%	85.71%	85.71%
502	3	57.14%	85.71%	100%	100%
503	4	28.57%	71.43%	57.14%	100%
504	5	100%	100%	71.43%	71.43%
505-100	6	100%	57.14%	100%	100%
506-105	7	100%	100%	85.71%	85.71%

Note. Macrostructure is divided into seven categories on the MISL rubric. We took the number of categories that the researcher and assistant had scoring differences in (not agreed upon) and divided that number by seven total number of categories. This number yielded the percentage of agreement that is listed here.

Appendix E – Statistical Results of Paired Sample *t*-tests

Measure	Paired Sample Mean Data by Condition		Standard Deviation		Paired Sample Mean Data by Condition		Significance
	Static	Animated	Static	Animated	*t* value	*df*	*p*-value
			MISL Score				
Macrostructure	10.43	11.93	4.41	2.79	-1.53	6	.089
			Productivity				
Total # of Utterances	42.43	46.43	19.32	20.11	-1.80	6	.061
Total # of Words	329.71	375.43	190.81	208.18	-1.71	6	.069
			Accuracy				
Prop. of Grammatical Utterances	.92	.90	.07	.06	.50	6	.319
			Complexity				
Subordination Index (SI)	1.01	1.02	.08	.04	-.44	6	.337
Prop. of Complex Sentences - Finite Clauses	.15	.16	.11	.09	-.73	6	.247
Prop. of Complex Sentences - Finite & Nonfinite Clauses	.32	.37	.14	.11	-1.64	6	.076
			Semantics				
			Verb Types				
Action Verbs	35.86	43.14	14.95	21.91	-1.37	6	.110
Mental Verbs	3.00	2.00	2.77	1.53	1.00	6	.178
Stative Verbs	3.71	2.57	5.25	1.90	.58	6	.290
			Lexical Diversity				
Total # of Different Words	115.29	126.00	50.51	49.68	-1.85	6	.057
Total # of Different Verbs	24.71	27.14	14.00	11.51	-1.00	6	.180
			Other Lexical Categories				
Adverbs	32.14	36.43	14.61	12.93	-1.13	6	.151
Subordinating Conjunctions	4.43	5.71	5.32	4.96	-1.12	6	.153
Elaborated Noun Phrase+ (Mod + Det + Noun)	14.14	15.29	11.89	10.95	-.91	6	.200