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Verb argument structure in children on a story retell task: Comparing performance and potential clinical utility from unprompted responses versus graduated prompting.

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Assessment of verb argument structure in children using a story retell task: comparing performance and potential clinical utility from unprompted responses versus graduated prompting.

Authors: Carol – Anne Murphy & Victoria Akehurst

Background: Children with language impairment have particular difficulty with verbs and verb argument structures, (Thordardottir and Weismer, 2002; Ebbels, Van der Lely and Dockrell, 2007). A story retell task, (Murphy 2014, unpublished), ‘Captain Grey and the Greedy Aliens’ was designed to assess a range of verbs at sentence level. Following initial telling, graduated prompting was used to elicit responses on the target verbs not produced in the first telling. However, the use of prompting lengthened assessment time in a study of n=91 typically developing children using the tool and younger children in particular needed greater prompting, with concerns this affected their ability to attend

Objectives: To further ascertain potential clinical utility of the tool. The current study aimed to identify whether a range of verb classes from across the target verbs were elicited on the first telling without prompting and whether scores from the initial telling were sensitive to development across the age range.

Methods: Secondary analysis of data from 91 typically developing children aged 4:06 – 12:00. Correlations with age and scores from verb argument structure accuracy and mean sentence complexity from data with prompting and initial unprompted telling were compared.

Results: Verb argument structure accuracy (VAS) and mean sentence complexity (MSC) from the initial unprompted telling were moderately correlated with age. There was no statistically significant difference, ($p = .652$) (VAS%), ($p = .148$), (MSC), between the two conditions. A range of verb types were elicited

Conclusions: Data from the first telling of this story retell tool without graduated prompting provides sufficient assessment of verb argument structure accuracy and mean sentence complexity in typically developing children, adding to its clinical utility as an assessment tool.

Keywords: Specific language impairment, language development, verb argument structure, mean sentence complexity.

Introduction.

It has been widely documented that children with language impairment have particular difficulty with verbs and verb argument structures, (Thordardottir and Weismer, 2002; Ebbels, Van der Lely and Dockrell, 2007). To date, there is no suitable clinical tool that specifically examines verb comprehension and production in children with language impairment.

Methods of assessing children's understanding and use of verbs can be examined through sentence generation tasks, sentence imitation or language sampling, (Ebert, Danahy, Scott, 2014).

A previous study (Murphy et al 2014) used a story retell task incorporating graduated prompting in order to ensure all target verbs were elicited to comprehensively evaluate verb knowledge. Arising from the results of that standardisation exercise the current study proposes to look at the results of the unprompted data, in order to evaluate the usefulness of the data when compared to the prompted information.

This review will outline verb development in typically developing children and the difficulties children with language impairment can have with verbs. It will examine the role of assessment in clinical practice and the varying methods of elicitation used to assess verb knowledge. Finally, concerns arising from the previous study will be discussed and the objectives of the current study will be outlined.

Verb development in typically developing children.

Understanding the role of verbs in a sentence is imperative to language development. They provide a link between the semantic and syntactic parts of a sentence. For example, when considering the verb 'give' there is the giver, the object given, and the receiver, and these roles provide a framework for organizing the remaining parts of the sentence, (Conti-Ramsden and Jones, 1997)

As a child's lexicon develops, so does their understanding of verb classes, (semantics) and verb argument structures, (syntax). Therefore, as specific verbs are learned, a child is able to identify the rules that govern a particular class of verbs and that influences syntactical roles, (Gropen, 2000). Basic verb lexicon begins to be acquired in the developmental range of age 2 to 6 years, (Bowerman, 1982), with understanding of

semantic roles continuing to be developed and acquired until the age of 12, (Bowerman and Croft, 2007). The development of argument structures for complex verbs also appears to extend into adolescence, (Nagles, Fowler and Helm, 1992).

Valian, (1991) found that there is a developmental trajectory in which verbs are acquired. Intransitive frames are acquired at an earlier stage of language development than transitive frames. This is due to the fact that intransitive verbs do not need a direct object argument, for example, 'I slept'. Transitive verbs are first produced by children in an intransitive frame without a direct object, for example, 'I want', (Bowerman and Croft, 2007). At around 3 years of age a child begins to develop complex sentences and the ditransitive frame begins to emerge. For example, 'He put the book on the table', (Tomasello, 2006).

Studies have shown that over-generalisation errors where children use inappropriate transitivity frames occur in children of all ages, (Bowerman, 1982). For example, 'Don't giggle me' instead of 'Don't make me giggle', (Bowerman, 1982). However, these errors tend to decrease as language matures and the correct verb constructions are reinforced. Ambridge, Pine, Rowland & Young, (2008) have shown that verb argument structure generalisation errors are more likely to occur with low frequency verbs than high frequency verbs.

Theories of Verb Acquisition.

Generative theory.

According to generative linguistics, children have an innate knowledge that helps them 'bootstrap' into beginning to understand argument structures. 'Syntactic bootstrapping' states that a child acquires verb meanings using the syntactic information that appears with the verb, (Gleitman, 1990). This information acts as a cue to facilitate the understanding of the verb used. Alternatively, Gropen, Pinker, Hollander and Goldberg (1991), suggest that a child uses their knowledge of the meaning of the verb to infer its syntactical category, a process called 'semantic bootstrapping'. Naigles, Bavin and Smith (2002), found that children need to have mastered a verb's meaning before it is generalised to other syntactic frames. This implies that during early language development children use a set of linking rules that make connections between verb semantics and syntax (Pinker, 1989).

Usage-based learning.

In contrast to the generative approach, is the usage-based approach to language acquisition. This theory argues that children learn the grammar of a language using their general cognitive learning abilities, (Kidd, Lieven & Tomasello, 2010). Children learn verbs on an individual basis and initially only use specific verbs within the syntactic frame in which they have heard them (Tomasello, 2000). For example if a child hears a verb in a transitive frame, they can only produce that verb within that context. Over time these verbs generalise to include other representations and syntactic structures. In other words children do not possess an abstract Subject-Verb-Object template that can be applied to any verb, rather they use verb-specific information, (Tomasello, 2000).

Lievin (1997) argues that this initial lexical inflexibility demonstrates that children's lexical frames are redefined as their language develops into a more adult like form. This would tie in with the idea of frequency effects. In other words, accurate imitation of a verb in its correct syntactic frame is dependent on how often it is heard, (Kidd et al 2006). Children also perform better when asked to imitate a sentence with a high frequency verb compared to a sentence with a low frequency verb, (Kidd et al, 2006). Clearly, frequency effects play a role in a child's syntactic development but is not the only factor when considering verb learning and understanding.

Despite ongoing research, it is still unclear whether children learn verb argument structures in a generalised way and then identify more specific features or if they are acquired on an individual basis, (Tomasello, 2003)

Verb Difficulties for Children with Language Impairment.

Thordardottir and Wismer (2002), argue that assessing verb knowledge in children is important because it is an area of difficulty for children with language impairment. Deficits include semantic, syntactic and morphological aspects of verb acquisition, (Conti-Ramsden and Jones 1997). As verbs do not occur in isolation and require arguments, these deficiencies in verb learning in will have syntactic consequences, (Fletcher, 2009). Difficulties with incorrect ordering of arguments, omission of arguments and less sophisticated argument structures may all be manifestations of verb difficulties, (Thordardottir and Weismer, 2002).

King (2000) found that children with SLI tended to omit more optional arguments and use verbs that require fewer obligatory arguments, demonstrating limited verb diversity. As a consequence of these omissions, children with SLI produce shorter sentences than their peers and therefore have reduced sentence complexity. Research investigating verb diversity in children with language impairment has yielded mixed results. Evaluation of video material showing children with language impairment interacting with a parent showed that children with SLI used fewer verbs and fewer different verbs when compared to their language controls, (Conti-Ramsden et al, 1997). However, Kelly, (1997) reported no difference in the number of verbs and types of verbs used by children with SLI and their peers when matched on age and MLU. Rice and Bode, (1993), found that preschool children with SLI demonstrated smaller verb inventories and relied on a small set of general all purpose (GAP) verbs. In contrast, Thordardottir and Weismer (2002), found that verb diversity did not emerge as an area of difficulty for children with SLI and that GAP verbs were not used to any increasing degree when compared to their typically developing peers. Despite the difference in findings, research appears to suggest that the high frequency GAP verbs continue to be used by both SLI and typically developing children into their school years, (Thordardottir and Weismer, 2001).

Children with SLI make more semantic errors which may indicate an incomplete understanding of how the verbs are used, (Kelly 1997). They are also slower to establish semantic representations when compared to controls, (Dockrell, Messer and George, 2001). These semantic errors are demonstrated by linking verb arguments to incorrect syntactic positions (Ebbels, Dockrell and Van der Lely 2012). Gropen, Pinker, Hollander and Goldberg, (1991), suggest that this is due to errors assigning the correct thematic roles within the sentence. Based on this, it is clear that accurate semantic verb knowledge and representations are essential for correct syntactic structures.

Van der Lely (1994) suggests that the fundamental difficulty with language for children with SLI is due to problems with syntax. This was based on a study where children with SLI heard a sentence containing a novel verb and had to act out the meaning of the sentence. Results showed that children with SLI found this task more difficult than language controls. Van der Lely proposes that the syntactic difficulties experienced by the children were due to an inability to identify the grammatical roles of subject and object. O'Hara and Johnston (1997) repeated this experiment and produced similar findings but

argued that the difficulty was not with identifying the grammatical roles, but rather the processing load was too great. Bishop, Adams and Rosen, (2006) suggest that the language difficulties experienced by children with language impairment lies in a limited ability to interpret the syntactic cues in a sentence, leading to comprehension difficulties. Despite the lack of agreement, it is clear that verb learning and correct verb argument structure is an area of difficulty for children with SLI and whether these linguistic difficulties are with argument structure (syntax) or in identifying correct semantic roles is still unclear and requires further investigation, (Schwartz, 2009).

Research has shown that children with SLI have a significant difficulty with using di-transitive verbs compared with intransitive and transitive verbs, (Thordardottir and Weismer, 2002). This may be attributed to the increased processing load required when considering the need for multiple argument structures. It has also been suggested that complex verbs may be only partially represented and therefore lead to errors, (Thordardottir and Weismer, 2002). A study by Ebbels (2005), found that older school age pupils with SLI omitted more obligatory arguments when using di-transitive verbs, for example, 'put' when compared to their vocabulary and age matched peers .

Cognitive state verbs (CSVs) are another set of complex verbs that are challenging for children with SLI. This is due to their cognitive, semantic and syntactic demands, and the fact that they represent abstract unobservable events, (Owen Van Horne & Lin, 2011). CSVs provide information about mental states and actions, for example, pretend, thought, hope. In addition to their complexity, this type of verb often co-occurs with complement clauses, (Gleitman, 1990). Johnston et al (2001), found that pre-school children with SLI used cognitive state verbs less often when compared to their mental age matched peers, however, a study using children aged 6 to 10 years of age with SLI found no difference in the use of these type of verbs when compared to their peers in conversational language, (Norbury and Bishop 2003). What is known, is that cognitive state verbs are particularly challenging for both typically developing children and children with SLI, (Owen and Leonard, 2007).

Role of assessment in clinical practice.

Assessment in clinical practice is vital to discover and understand whether there is a problem using or understanding language, (Paul and Norbury, 2007). The roles of assessment are to screen for difficulties, establish baseline function, set intervention

goals and measure change, Westby, Stevens, Dominguez and Oetter, 1996 (cited in Paul and Norbury, 2012). When assessing, it is important that the clinical tool we use is reliable and gives the clinician the information required. Examining verb argument structure can provide insight into a child's use of syntactic, semantic and pragmatic language. Gropen, (2000) states that it is one of the most challenging areas of language to study.

Currently, there are verb assessments for use with adults who have aphasia. The Verb and Sentence Test, (VAST) assesses comprehension and production of verbs and sentences, (Bastiaans, Edwards, Mass and Rispens, 2003). The Verb and Noun assessment (VAN) is a naming test designed to identify specific word class deficits for verbs and nouns, (Webster and Bird, 2000). However, at present there is a lack of verb specific tests for children with language impairment.

Methods of Assessment.

Standardised assessment.

Standardised assessments enable comparison of a child's scores with their peers, facilitating the identification of language disorders, (Paul and Norbury, 2012). However, the methods of elicitation involved can lack ecological validity, (Ebert, Danahy and Scott, 2014). For example, a child who may not demonstrate specific verb knowledge in a sentence generation task, or a sentence repetition activity, may be able to express the target word in a less decontextualised setting. This formal assessment structure is highly prescriptive in its expected responses and unfortunately for children it is the most difficult to complete, (Ambridge, 2012).

When using standardised assessments with children who have a language impairment, it has been shown that the child's performance is not representative or reliable, (Hasson and Joffe, 2007; Hasson and Botting, 2010). Limitations in working memory and processing capabilities can mask a child's abilities and not give an accurate picture of their language skills, (Hasson, Dodd and Botting, 2012). One example of a formal standardised assessment is the Clinical Evaluation of Language Fundamentals (CELF 4). This is a comprehensive tool for measuring both receptive and expressive language abilities, but contains very few verbs.

Informal assessment.

Language sampling can offer an alternative source of information regarding verb knowledge and can provide in-depth information about a child's use of language in real life situations, (Costanza-Smith, 2010), resulting in stronger ecological validity. However, this type of informal elicitation may not be wholly reliable. Using conversational prompts may initiate dialogue but factors such as topic choice, length of time and the child's own syntactic performance may not lead the child to spontaneously produce the target form, (Fletcher, 2009). The child also may not necessarily use the complex language they are capable of or produce the sentence features of interest.

Story retelling as an assessment approach.

Assessing verb knowledge in sentences using a structured story retell task could provide a method of elicitation that is not as decontextualised as sentence repetition and more targeted than relying on free conversational. Retelling a story can elicit linguistic knowledge and demonstrate a child's understanding of semantic-syntactic mapping at sentence level, (Reese, Sparks and Suggate, 2012). A story retell task draws on a child's semantic skills and also provides information about syntactic knowledge as sentence construction is fundamental to the task. It can give information about basic linguistic knowledge as well as higher-order language use such as identification of cause and effect events, (Reese, Sparks and Suggate, 2012).

Another advantage of using a narrative task is that children enjoy telling stories. Therefore as a research tool, it provides a more relaxed, fun method of assessment. Due to this more natural communicative context, a story retell task may provide more valid information about a child's syntactic abilities and verb knowledge, (Reese et al, 2012).

One example of a story retell task is the Expression, Reception, and Recall of Narrative Instrument (ERRNI), devised by Bishop, (2004). This tool was devised to examine language comprehension and expression, in particular narrative content and sentence length and complexity. A set of picture prompts are used whilst the story is being told and the child is then asked to recall the narrative. However, this assessment relies on memory capabilities to retell the story and therefore has limitations for a child with language impairment. It is also not examining verb knowledge rather the ability to relate and understand a story and does not incorporate a comprehensive set of verbs.

Background to Current Study.

A previous study assessed knowledge of a range of verbs at sentence level using a newly developed story retell task. 'Captain Grey and the greedy Aliens' is a wordless picture story devised by Murphy (2013) including a series of 14 picture scenes. It was designed to assess verb knowledge and understanding of correct verb argument structures as well as examine sentence complexity. The story incorporates 48 verbs from a range of verb classes including cognitive state verbs and both high and low frequency verbs.

A cohort of 91 children aged from 4;06 – 12;00 in Murphy,(2013), Murphy, C., Bridgemann, E., Flynn, D., Martin, K., O'Brien, S., & Rhatigan, N (2014) ""Captain Grey and the Greedy Aliens": Obtaining normative data on a new narrative assessment for the production of verbs at sentence level in children", were told the story from a script whilst looking at the pictures. They were then asked to retell the story using the pictures as prompts. This original study took a dynamic assessment approach using graduated prompts in order to ensure that the child's lexical knowledge was accessed across the full set of verbs. Therefore, if the verb was not elicited on the initial telling of the story, a series of prompts were given to elicit the remaining verbs. The first prompt was given as, 'can you tell me more about the picture'. If the verb was still not elicited, the target verb was given to the child and they were asked to make a sentence using the verb and the picture.

A range of verb types were included in the story to identify possible strengths and weaknesses of verb knowledge. The target verbs included intransitive, transitive and di-transitive types. In terms of semantic classes, there were; manner of motion, directed motion, change of state, change of location and verbs communicating /manner of speaking as well as a number of cognitive state verbs.

The target verbs were: live, steal, chase, sweep, destroy, clear, empty, phone, flew, email, lean (x2), push, run, pour, spread, fall, pick up, peel, grate, cover (x2), turn into, fill, give, stuff, leave, land, cover, stay, yawn, take, shake, jump, drop, groan, throw, sink, crawl, bring back, put, think, tell, shout, march, bet.

The goal of dynamic assessment is to measure the process and potential for learning, (Haywood and Lidz, 2007). In the previous study, concerns were raised over the length of time needed to complete the assessment, (between 20-50 minutes) by the time the initial

telling and graduated prompting were complete. The younger children needed a greater amount of prompting and the time taken was considered to affect their ability to attend to the task. This has raised questions concerning the potential clinical utility of the tool.

Current Study

In light of these findings, the current study seeks to further ascertain the potential clinical utility of the tool by analysing if there is a correlation between age in years and percentage of verb argument structure correct (VAS%) and age in years and mean sentence complexity (MSC) in the unprompted data only. This will provide information as to whether the measures derived from the unprompted condition are sensitive to developmental progression across the age bands and so reduce the need for prompting.

The unprompted initial telling scores (hereafter referred to as *unprompted* condition) and the scores from the complete assessment including initial telling and graduated prompting, (hereafter referred to as *with prompting*), condition will then be compared to establish if there is any difference between the two conditions.

Methodology.

Participants.

This study examined the data from 91 typically developing primary school age children. Participants were selected from four schools in the south of Ireland. Inclusion criteria included; English as their primary language, no previous or current speech and language difficulties, no indication of intellectual disabilities and no hearing impairment. 52 of the participants were female and 39 were male. The participants were grouped in the following age bands, (see table 1).

Age band	No of participants.
4;06 – 5;05	7
5;06 -6;05	17
6;06 – 7;05	17
7;06 – 8;05	9
8;06 – 9;05	9
9;06 – 10;05	12
10;06 – 12;00	20

Table 1. Summary of age bands and number of participants within each group.

Design.

The current cross-sectional study involves secondary analysis of the original data set. The original study included both the unprompted and with prompting data to derive scores. This current study initially examined the scores derived from the unprompted data only. Each of the 91 scripts were re-examined and only the unprompted responses on each script were analysed and scored. The independent variable is age in months. The dependent variables are: percentage of verb argument structures correct and mean sentence complexity. The relationship between the independent and dependent variables, (derived from the unprompted telling only), is examined to assess whether the measures are sensitive to age related progressions. A second within subjects comparison of original scores from the with prompting condition with the unprompted telling only is also undertaken in order to determine if there are significant differences between the scores from the two conditions.

Scoring rubric.

For each script, the verbs elicited without a prompt were identified and counted. Each utterance produced around the verb was then examined for verb argument accuracy and mean sentence complexity. The percentage of verb argument structures correct was calculated as a proportion of the total number of verbs elicited in the unprompted telling.

The mean sentence complexity for the Unprompted utterances was calculated using a previously designed rubric, where each utterance was given a score ranging from 1 – 6 reflecting the number of arguments, adjuncts and sentence complexity if appropriate.

Examples from the rubric are outlined below in table 2.

Example	Score
Captain grey lived on planet Bog	1-3 arguments/adjuncts score – 2
The aliens came to planet bog and stole the food.	(Coordination - two or more main clauses with coordinating conjunction) score - 4
The soldier pretended to be dead.	(Cognitive state verb with sentence complement) score - 4
She peeled the apples, grated the cheese and spread butter on the bread,	(Multiple clauses listed with one conjoining) score - 5
At the meeting he leaned against the table and told them that they had to get rid of the aliens,	(Coordination and embedding occurring in the same utterance) score - 6.

Table. 2. Examples from the rubric and the scoring criteria.

The complete rubric for calculating mean sentence complexity is given in appendix 1.

The scores for each utterance were added together to get a total length score. The mean sentence complexity score was obtained by dividing the total length score by the number of utterances.

Inter-rater reliability.

In order to ensure reliability and accuracy of scoring, both the researcher and supervisor independently scored a random sample of scripts spanning across the age ranges, (22% of the total). Number of verbs elicited, scoring of VAS% correct and mean sentence

complexity were independently rated by both the student and the supervisor. These scores were then discussed and analysed further if any discrepancies were found. As a result of the process the original scoring rubric was updated to incorporate changes in the scoring around cognitive state verbs and scoring of utterances involving multiple clauses without conjunctions. To ensure consistency, the supervisor re-scored utterances from the with prompting condition, which had not incorporated the original rubric.

Statistical analysis

The data was analysed using SPSS version 22. Descriptive statistics including mean, standard deviation and range were obtained for the whole group across the following variables; number of verbs elicited, percentage of VAS correct, and mean sentence complexity. A second analysis was run including the variable, 'age groups' as a factor and the mean, standard deviation and range obtained for each age band.

The Kolmogorov-Smirnov test for normality was used to calculate the probability that the data followed a Normal distribution.

Correlations between age in years and verb argument structure correct, (VAS%) and age in years and mean sentence complexity (MSC) from the unprompted data were explored using Pearson's R. These correlations were compared to the with prompting condition.

In order to calculate if there was a significant difference between the two conditions, a parametric paired samples t-test was used for within subject comparison of the unprompted versus with prompting data for both VAS% and MSC.

Qualitative data

Qualitative analysis of the unprompted data set was also undertaken.

A separate spreadsheet was set up with each of the 46 verbs listed and a score of 1 entered if the child used the target verb. The frequency of verbs across verb tokens were then analysed and the most and least produced verbs were identified.

Results.

	Mean	Median	S.D	Max score	Min score
No of verbs elicited unprompted	21.25	20	5.975	37	8
VAS %	96.33	100	4.964	100	79
M.S.C	3.11	3.14	0.474	4.88	2.00

Table. 1 Main descriptive statistics derived from the scores from the *unprompted* condition.

	Mean	Median	S.D	Max score	Min score
No of verbs elicited with prompting.	46.73	47	1.76	48	40
VAS%	95.93	97.92	9.10	100	27.08
M. S.C	3.05	3.09	0.504	4.07	1.46

Table. 2 Main descriptive statistics derived from scores from the *with prompting* condition.

Tables 1 and 2 show a summary of the normative data for the key measures; number of verbs elicited, percentage of verb argument structures correct and mean sentence complexity for both unprompted and with prompting condition. The Kolgorov-Smirnov Normality test showed that the results for VAS% and MSC were both positively skewed in the unprompted data.

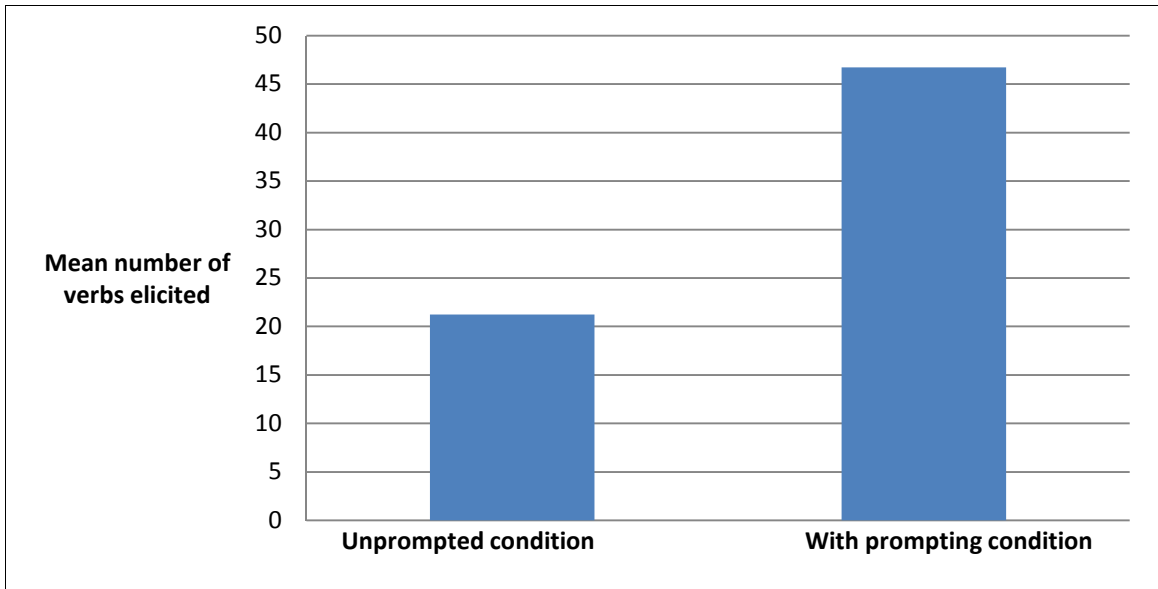


Chart 1. Mean number of verbs elicited in the unprompted and prompted condition.

The bar graph in chart 1. shows scores for the number of verbs elicited from each condition. As a prompt was given if the verb was not elicited on the first telling, the *with prompting* scores are close to the maximum number of 48 target verbs.

Age Range	Percentage of verb argument structures correct					
	Mean	Median	S.D	Max score	Min score	Skewness
4;06 – 5;05	90.14	88	7.51	100	79	.264
5;06 – 6;05	94.59	95	5.45	100	82	-.927
6;06 – 7;05	95	95	5.43	100	82	-.944
7;06 – 8;05	96.11	96	4.106	100	90	-.367
8;06 – 9;05	98.11	100	2.315	100	95	-.483
9;06 – 10;05	99	100	2.66	100	91	-2.946
10;06 – 12;00	98.80	100	2.167	100	94	-1.370

Table 3. Summary data for percentage of verb argument structures correct across groups as a factor from the *unprompted* condition.

	Percentage of verb argument structures correct.					
Age Range	Mean	Median	S.D	Max	Min	Skewness
4;06 – 5;05	81.28	95.45	25.71	97.87	27.08	-2.04
5;06 -6;05	92.44	95.83	7.71	100	72.73	-1.156
6;06 – 7;05	96.32	97.92	3.78	100	89.58	-.550
7;06 – 8;05	98.36	97.93	1.41	100	95.75	-.302
8;06 – 9;05	99.29	100	1.50	100	95.74	-2.121
9;06 – 10;05	98.92	100	1.73	100	95.45	-1.333
10;06 – 12;00	99.26	100	1.23	100	95.83	-1.494

Table 4. Summary data for percentage of verb argument structures correct across groups as a factor from the *with prompting* condition.

Tables 3 and 4 show the summary data for VAS% for the two conditions. Notice the outlier in the age band 4.06 – 5.05 who scored 27.08 in the *with prompting* condition. In the *unprompted* condition some children in each age band reached ceiling for correct VAS%. Further detailed analysis of the data showed that 2 children in the youngest group achieved 100% accuracy in the unprompted condition, whereas no child achieved ceiling in the youngest group in the *with prompting* condition. In the unprompted data, all age bands were negatively skewed with the exception of the youngest group, 4;06-5;05.

	Mean sentence complexity scores.					
Age Range	Mean	Median	S.D	Max score	Min score	Skewnes
4;06 – 5;05	2.714	2.57	0.408	3.38	2.27	.99
5;06 – 6;05	2.818	2.73	0.428	3.53	2.00	-.282
6;06 – 7;05	2.964	2.92	0.408	3.95	2.40	.006
7;06 – 8;05	3.242	3.28	0.447	4.31	2.83	-.440
8;06 – 9;05	3.585	3.44	0.538	4.88	3.00	.462
9;06 – 10;05	3.253	3.29	0.331	3.80.	2.63	.201
10;06 – 12;00	3.030	3.35	0.359	3.88	2.63	.164

Table 5. Summary data for means sentence complexity *unprompted* across groups as a factor.

	Mean sentence complexity scores.					
Age Range	Mean	Median	S.D	Max score	Min score	Skewness
4;06 – 5;05	2.37	2.34	.703	3.37	1.46	-1.428
5;06 – 6;05	2.64	2.71	.318	3.12	2.16	-.282
6;06 – 7;05	2.89	2.87	.396	3.65	2.04	.006
7;06 – 8;05	3.25	3.31	.434	3.81	2.53	-.440
8;06 – 9;05	3.48	3.46	.313	4.09	3.06	.462
9;06 – 10;05	3.29	3.37	.388	4.07	2.71	.201
10;06 -12;00	3.33	3.26	.239	3.75	2.84	-.164

Table 6. Summary data for means sentence complexity *with prompting* across age groups as a factor.

Tables 5 and 6 show the summary data of scores for mean sentence complexity. The unprompted data in table 5 shows that the age bands 5;06-6;05 and 7;06-8;05 were negatively skewed. The remaining groups were positively skewed.

Correlational analysis of age and the dependent variables.

	Correlations with age
VAS% correct unprompted	$r = .483^{**}$ (Moderate relationship)
VAS% correct with Prompting condition	$r = .461^{**}$ (Moderate relationship)
MSC unprompted	$r = .488^{**}$ (Moderate relationship)
MSC with Prompting condition.	$r = .633^{**}$ (Moderate relationship)

** Correlation is significant at $p < 0.01$ level.

Table 7. Summary data of Pearson's R correlational analysis.

Table 7 shows the results of Pearson R correlational analysis. Both the *unprompted* and *with prompting* condition for VAS% correct and MSC show a moderate relationship.

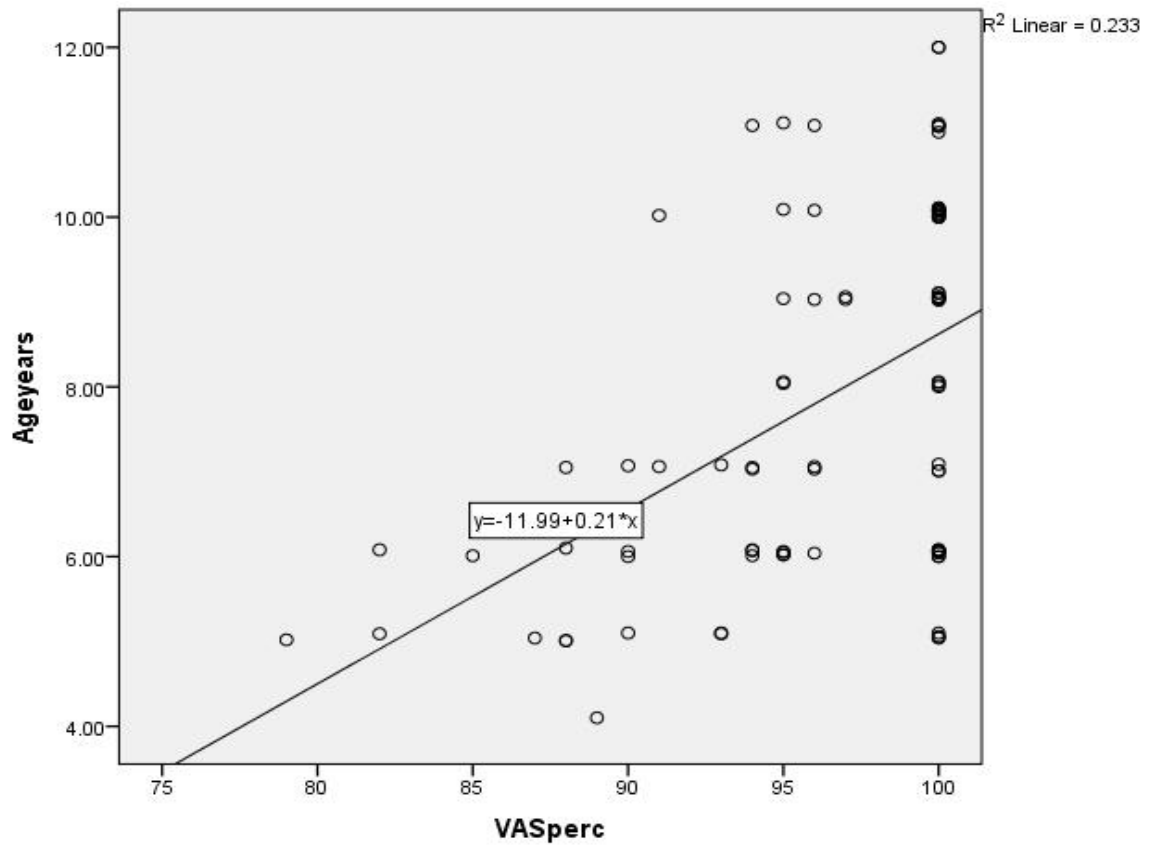


Fig 1. Age related progression in percentage of verb argument structure correct from the *unprompted* telling.

Figure 1 shows a moderate positive correlation with statistical significance between age and percentage of VAS correct, ($r = .483$, $r^2 = .233$, $n = 91$, $p = .000$). Children from every age band achieved ceiling (100%) and therefore demonstrated accurate VAS.

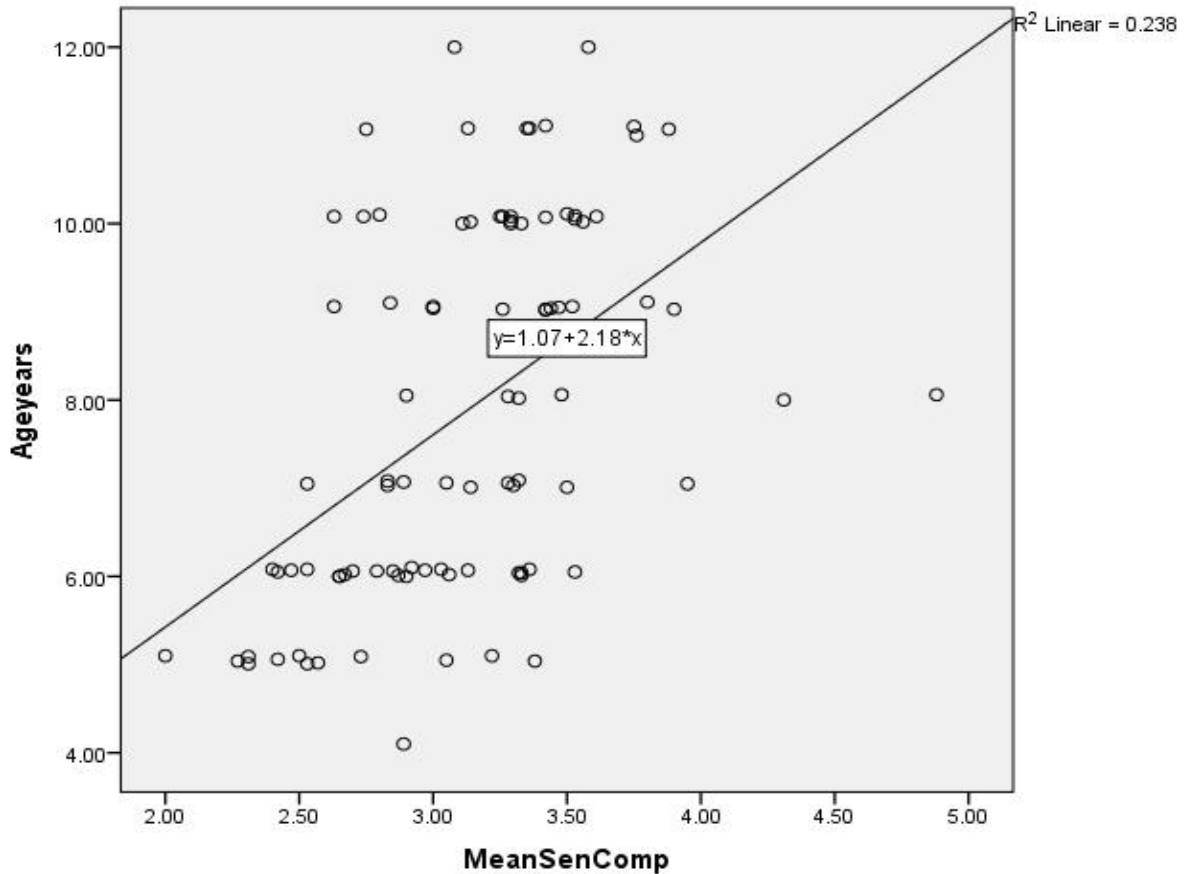


Fig 2. Age related progression in mean sentence complexity from *with prompting* condition.

Figure 2 shows a moderate positive correlation with statistical significance between age and mean sentence complexity, ($r = .488$, $r^2 = .238$, $n=91$, $p = .000$). Note the outlier from the age band 8;06 -9;05 who achieved the highest score across all the participants of 4.88.

Comparison between the unprompted and with prompting conditions.

A paired-samples t-test was conducted to compare mean scores for the *unprompted* and *with prompting* condition for VAS% correct. There was no statistically significant difference in mean VAS% scores when comparing the *unprompted* VAS% mean score = 96.33, SD = 4.964, versus *with prompting* mean score = 95.93, SD = 9.101, $t(90) = 0.452$, $P = .652$ (2-tailed).

A paired-samples t-test was conducted to compare mean scores from the *unprompted* and *with prompting* condition for mean sentence complexity. There was no statistically significant difference in mean sentence complexity scores between the *unprompted* mean score = 3.11, SD = 0.474, versus *with prompting* mean score = 3.05, SD = 0.504, $t(90) = 1.459$, $P = .148$ (2-tailed).

Range of verb tokens and verb classes elicited.

Each of the 48 target verbs was elicited from at least some of the children during the first telling. The verbs elicited were spread across the chronology of the story.

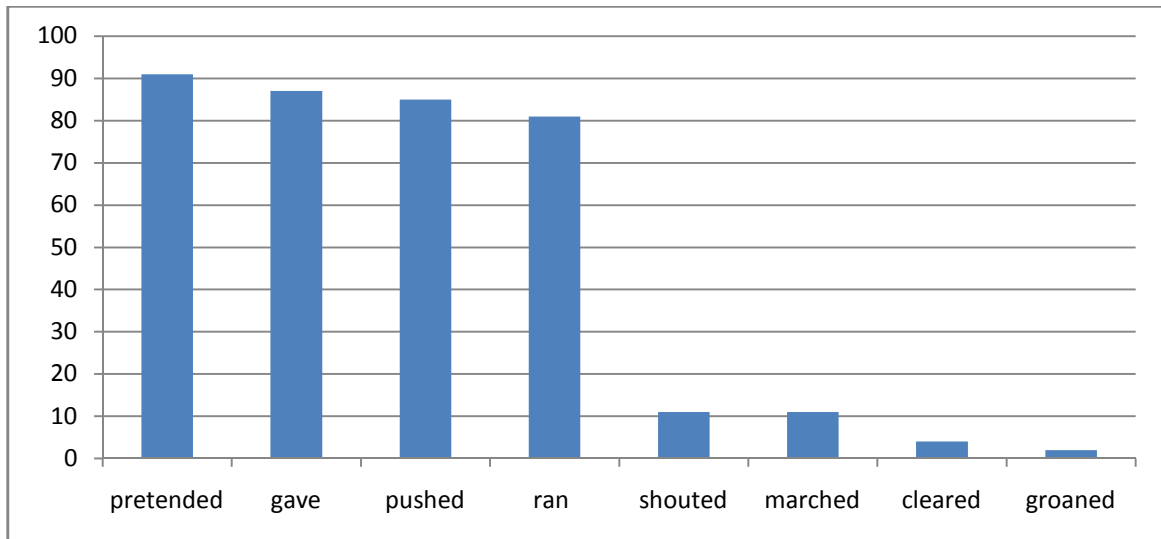


Chart 2. Bar graph showing the highest and lowest verbs that were elicited from the unprompted condition.

The results outlined in chart 2 show the highest 4 verbs produced. Pretend (91%) was the most produced and is a Cognitive State Verb. Gave (87%) is categorised as a Change of Possession type verb. Push (85%) is a transitive verb of its own title, the “push/Pull” verbs. Run (81%) is an intransitive verb that may be accompanied by a prepositional phrase. The four verbs least produced were, shouted (11%) which is a Manner of Speaking verb, marched (11%) which is an intransitive verb in the same category as run. Cleared (4%) is a Change of Location verb and lastly groaned (2%) which is a verb in the Manner of Speaking.

Discussion.

During the original assessment of ‘Captain Grey and the Greedy Aliens’ concerns were raised over the time taken to administer the task when initial telling and graduated prompting were incorporated. This was especially evident in the younger children as they needed a greater amount of prompting, especially towards the end of the story. This

could be due to lower levels of attention, memory and retrieval problems, (Gazella and Stockman 2003).

Given these concerns, the current study aimed to ascertain whether the measures derived from the unprompted telling of the story only were sensitive to developmental progression across the age bands. If this sensitivity was shown, the unprompted data could provide valid information when used with younger children or if time is limited. A comparison was made between the unprompted and with prompting conditions to establish if there was a significant difference between the two.

The range of verbs elicited across the story were evaluated in order to determine whether the unprompted telling would include a good range of verb classes and types.

Verb argument structure accuracy.

There was a positive moderate statistically significant correlation between verb argument structure accuracy and age when evaluating the unprompted data only. This was as strong as the correlation derived from the with prompting condition, (see table 7).

The scores for VAS% correct from the unprompted telling demonstrate a gradual progression across the age range with the mean score of 90.14% for the youngest age group increasing to 99% for the age band, 9;06 – 10;05. This score drops slightly for the oldest group, 10;06 – 12 (98.80%). This drop does not follow the expected pattern as school age children continue to add individual verbs and argument structures to their lexicon, (Thordardottir et al, 2002). It may be explained however by the larger sample size (20) and wider age band, such that greater variability is reflected in comparison to the other age bands, for example 9;06 – 10;05 (12).

Some children from each of the age bands reached ceiling for VAS% correct showing a wide variety in abilities across typically developing children.

There was no significant statistical difference in the mean scores for percentage of verb argument structures correct when comparing the unprompted and with prompted conditions. Both sets of data follow a developmental progression with ceiling reached in the unprompted data in the age group 9;06-10;05, (99). In the with prompting condition ceiling was reached in the age group 8;06 – 9;05, (99.29). This difference could be due to the prompt providing a stimulus to produce the verb.

Results from the with prompting condition showed an outlier in the age group 4;06 -5;05 who scored 27.08% for VAS% correct and omitted arguments predominantly when prompting was present. When the scores for this particular child are examined more closely, it reveals they were the youngest of the 91 participants at age 4;10. In the unprompted data, they produced 9 of the target verbs of which 8 contained a correct VAS, giving a score of 88%. This difference may be due to limited verb knowledge, with the additional prompting not providing an accurate reflection of their VAS% abilities. Further testing on a larger sample of younger children could provide more information on this.

Mean sentence complexity.

There was a positive moderate statistically significant correlation between mean sentence complexity and age for the unprompted data only. This was as strong as the correlation derived from the with prompting condition.

The scores from the initial telling demonstrate a developmental progression across the age ranges with the mean score of 2.71 for the youngest age group increasing to 3.58 for the age band 8:06 – 9:05. This score then drops slightly for the final two age bands, 9:06 – 10:05 (mean = 3.25) and the final group 10:06 – 12 (mean = 3.03). This dip in MSC scores would not follow an expected pattern of verb development as research has shown that verb knowledge continues to develop into the teenage years, (Ebbels et al 2012). Reasons for this maybe due to reaching ceiling on the task or that children in these two eldest age groups are not being sufficiently stretched by the task. The age band 8;06 – 9;05 was shown to have performed highly as 7 out of 9 participants achieved an MSC score above 3.42. This shows that there is a wide variety of abilities across typically developing children.

There was no significant difference in the mean scores for mean sentence complexity when comparing the unprompted and the with prompting condition. Both conditions reach a ceiling in the age group 8;06-9;05.

Number of verbs elicited.

When comparing the scores for the number of verbs elicited from the unprompted and with prompting condition, a significant difference is observed. This is to be expected as participants used fewer of the total verbs during the initial telling.

Further qualitative analysis indicates that all the verbs were elicited. All the children reached the end of the story and provided measurable data. The verbs at the end of the story were not less likely to be produced which might have been expected especially in the younger children due to their less developed memory capacity.

The verb most elicited in the initial telling was 'pretend'(91%). This verb was found towards the end of the story which indicates that the place of the verb in the story may not be a significant factor in whether it was elicited or not. As a cognitive state verb and therefore involving more complex knowledge, this result was surprising. One possible explanation may be the picture prompt provided a clear stimulus for this verb. Another possibility is that despite its potential complexity, this verb is acquired earlier.

Interestingly, when the original unprompted data is examined, all seven of the youngest age group 4;06-5;05 produced this verb. As some evidence suggests that younger children with SLI have difficulties with cognitive state verbs, (Owen van Horne and Linn, 2011), future development of this tool with children with SLI may provide further information about the use of these more complex verbs.

The next most frequently elicited verb was 'give,' 87%. This is an early acquired, high frequency Change of Possession type of verb and therefore not surprising that it was produced consistently through the story.

The verbs that had an elicitation rate of less than 20% were: landed, captured, leaned (3 arguments), sank, crawled, bet, shouted, marched, cleared and groaned. Cleared and groaned, were the least produced at 4% and 2% respectively.

Further examination of why certain verbs were elicited and others not, is beyond the scope of the current study but may be warranted in order to better ascertain the factors contributing to whether specific verbs were elicited or not. These factors may include the pictures themselves, age of acquisition, verb frequency and verb semantic class. This information would provide useful data when considering appropriate intervention targets.

Clinical utility.

The results show that the measures derived from the unprompted data only are sensitive to developmental progression across the age groups. Therefore the data from the initial

unprompted telling only provides sufficient assessment of verb argument structure accuracy and mean sentence complexity in typically developing children. Additionally, when the unprompted and with prompting conditions are compared, no significant difference between the scores for VAS% correct and mean sentence complexity scores was present. For a busy clinician this means shorter administration times and more effective use of their time. Heilmann et al (2008) found that even a short narrative retell (4minutes on average) can give reliable estimate of a child's oral language. In terms of participants, this shorter administration time can help to reduce the unwanted impact of wavering attention levels and memory problems on the potential scope of the assessment to give a valid picture of the child's sentence level ability. Clinicians could still use graduated prompting to elicit the full set of 48 verbs, but if time is limited or for use with a younger child, percentage of verb argument structure accuracy and mean sentence complexity scores from the unprompted telling have been shown to be sensitive to age related development. These factors add to the clinical utility of 'Captain Grey and the Greedy Aliens' as an assessment tool.

Limitations and suggestions for further research

A suggestion for further refinement to this assessment tool may be for younger children to retell the story to a puppet that has been hidden whilst the researcher tells the story. A puppet can then produced and the child is asked to tell the story to the puppet as the puppet was asleep during the initial telling. This provides a reason for the child to tell the story and has been shown to be an effective technique in engaging children in a story retell task, (Reese et al 2012). This has also been shown to help with attention problems in younger children with the puppet providing a calming effect and helping them to stay focussed, (Reese et al 2011).

Further research using larger sample sizes would help to improve the sensitivity of the tool. This is important as it helps to assure reliability of a test as well as represent outliers within the referenced population. Salvia and Ysseldyke, 2000 (cited in Paul and Norbury, 2012), recommend that each age band should contain at least 100 participants in order to achieve this.

As this data was collected using typically developing children, to further evaluate its clinical utility, data from children with language impairment needs to be collected and

analysed. Both qualitative and quantitative data will be useful to inform verb knowledge at sentence level.

Conclusion.

This current study has shown that the measures derived from the initial unprompted telling only are sensitive to development across the age bands. Correlational analysis provides statistical evidence that there is no difference in the strength of the relationship when correlating age and VAS% accuracy and age with MSC across the two conditions. Both the unprompted and with prompting conditions show a moderate relationship.

Therefore, data from the unprompted telling without graduated prompting provides sufficient assessment of verb argument structure accuracy and mean sentence complexity in typically developing children. No significant difference was found when the unprompted and with prompting conditions were compared which has implications for clinical use. "Captain Grey and the Greedy Aliens", is an assessment tool that provides valuable data regarding verb knowledge, accuracy of verb argument structures and sentence complexity. Further development will enhance its reliability and sensitivity as a story retell tool.

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Appendix 1.

REVISED RUBRIC FOR SCORING MEAN SENTENCE COMPLEXITY

Example	Type	Score
<u>She is eating</u>	1 argument	1
<u>The girl is bouncing the ball</u>	2 arguments	2
The lady's picking the strawberry off the plant	2 arguments + 1 adjunct	3
The man is giving the present to the girl She told him the news	3 arguments	3
She dropped a glass and smashed it. The boy was hungry so he bit an apple Captain Grey poured the juice into the bottles at the table	Coordination (two or more main clauses with coordinating conjunction) 2 arguments + 2 adjuncts; 3 arguments + adjunct	4
The man is climbing up the ladder to fix the roof She told him to go away The soldier pretended to be dead	Infinitive Cognitive state verb with sentence complement	4
She peeled the apples, grated the cheese and spread butter on the bread	Multiple clauses listed with one conjoining	5
I plant plants to make my garden look nice "Sometimes if that didn't work he chased them back to Planet Bog"	Infinitive different subject Embedding, unmarked infinitives , relative clauses	5
She is picking the strawberry to eat it and put it and put the other two ones into the bowl. Captain Grey came and said I think he might be dead. Captain Grey's mother phoned her son and told him to get rid of the aliens when she saw the mess outside. CG told him to stay by the spaceships and guard them"	Coordination and embedding occurring in the same utterance	6
When I went to a birthday party I was sad that I had to leave	Multiple embedding	6