Grammatical Accuracy of Narratives Produced by Typically Developing Children Ages 8-15 in Three Story Contexts

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Abstract

The purpose of the current study was to analyze the narrative samples of 468 typically developing children within the ages of eight and fifteen to determine typical scores for percent of grammatical c-units (PGCU) at each age level in three story contexts (retell, sequenced pictures, single scene). This knowledge may provide more information on the performance of typical children and how to accurately identify students with language impairments (LI). This study extends the literature by testing whether the findings remain the same with additional data from children age eight and whether the findings extend to children ages nine to fifteen. The data showed that grammaticality does differ across story context, but not age. The children were more grammatical when asked to create a story based on a series of pictures than when asked to retell a story or create a story based on a single picture. The grammatical errors that were made by the children were not significant for the story context or age group. Correlation coefficients were computed among PGCU scores and the total raw score for oral narrative proficiency. The results of this computation showed that the significance PGCU score was small but notable for all three story contexts.

Keywords: Grammaticality, Children, Narratives

1. Introduction

Guo & Schneider[1] explored different approaches to identifying grammatical impairments in 128 children developing typically (TL) and those with language impairments (LI) between the ages of six and eight. Their participants were 61 six-year-olds (50 TL, 11 LI), and 67 eight-year-olds (50 TL, 17 LI). The measures that they explored included: calculating the finite verb morphology composite (FVMC)[2], the number of errors per C-unit (Errors/CU), and the percent of grammatical C-units (PGCUs) in narrative samples. Each outcome measure was evaluated for its sensitivity and specificity. They found that all three outcome measures provided acceptable diagnostic accuracy when applied to six-year-olds, but PGCUs were found to be the most accurate tool with eight-year-olds. PGCUs provide significant data on how many grammatical errors were made by a child compared to how many utterances they made. This helps to determine how severe the child is struggling grammatically and provides a prediction of whether he/she has a Language Impairment or not. For this reason, calculating the PGCUs was a main focus for our study.

In this study, we tested 468 children using the Test of Narrative Language: Second Edition (TNL-2)[3]. The retell is referred to as the *McDonald's story*, the sequenced picture story is referred to as *Late for School* and the single scene narrative is titled *Aliens*.

The research questions were as follows:

1. Does grammaticality differ across ages eight to fifteen?
2. Does grammaticality differ as a function of story context (retell, sequenced picture, single scene)?
3. Is grammaticality related to overall narrative production proficiency as measured using the total raw score for oral narration on the TNL-2?
4. Is there a particular type of grammatical error that is more common than other types? This outcome is measured using a grammatical coding tool "GUCCI: Grammatical Utterances Complexity and Coding Instrument."

2. Methodology

2.1. Participants

The participants in this study included 99 eight-year-olds; 107 nine-year-olds; 97 ten-year-olds; 77 eleven-year-olds; 25 twelve-year olds; 28 thirteen-year-olds; 23 fourteen-year-olds; and 12 fifteen-year-olds. The participants were selected from the normative sample for the Test of Narrative Language-2.

2.2. Procedures

Children selected from the normative sample were asked to produce stories in three varying contexts. The stories were elicited using the Test of Narrative Language-2. The data from the McDonald's story (retell), Late for School (sequenced pictures) and Aliens (spontaneous story generation) subtests were used in the current study.

2.3. Transcription and Reliability

The stories were transcribed using Systematic Analysis of Language Transcripts (SALT)[4]. The transcriptions were double coded for grammaticality by two separate research assistants. Each assistant was assigned a group of stories to code for grammaticality. Each story would then be reviewed by a different assistant to make sure there were no mistakes. A final review then took place with two research assistants who weren't involved in the original coding. If any mistakes were seen, they were corrected. The utterances were designated as grammatical or ungrammatical based upon how comprehensible the utterance was to the individual coding it. Ungrammatical is defined as "not conforming to grammatical rules." [5] Opinions may vary upon what is deemed grammatical or ungrammatical. For this purpose, there were multiple assistants coding the same story.

Ungrammatical utterances were also coded for the type of grammatical error present using the Grammatical Utterances Complexity and Coding Instrument (GUCCI) [8] which was designed to code a number of grammatical errors typically produced by children. The categories are briefly described in Table 1. The full coding system is shown in the Appendix. The GUCCI was modified from a study performed by Guo and Schneider[1]. Guo and Schneider looked for tense marking errors, pronoun errors, grammatical morpheme errors, argument structure errors, and other syntactic errors. They also analyzed their samples for FVMC errors such as "third person singular -*s*, regular past tense -*ed*, and copula and auxiliary *be* (i.e., *am, are, is, was, were*) in obligatory contexts."[1] In their study, they used certain codes to represent different grammatical errors made by the child. The GUCCI was based on these same codes but was modified to the particular needs of this study.

Table 1. GUCCI Categories Summarized

Category	Description	Examples
[UG1] Tense Marking Errors	Omissions and incorrect usage of tense markers.	C He play with the alien/s. C She do want ice_cream.
[UG2] Pronoun Errors	Substitution errors and incorrect usage of pronouns and reflexive pronouns.	C They hurt theyselves. C That is the girl (omitted that) went to the store.
[UG3] Grammatical Morpheme Errors	Omissions or incorrect usage of grammatical morphemes other than pronouns and tense markers.	C There are a lot of alien. C He put the milk under the bowl.
[UG4] Argument Structure Errors	Omissions of required constituents (i.e. arguments) before or after the verb.	C Want/ed a hamburger. (Omitted subject) C The girl hug/ed (Omitted direct object)
[UG5] Other Errors	Any other syntactic errors or semantic irregularities.	C The boy was go/ing to pop. C The girl did not know what was the alien/s do/ing.
[G-X] Unintelligible Utterances	Unfinished and unintelligible utterances.	C They play/ed with the> C And they X up in the sky.

2.4. Inter-rater Reliability

Inter-rater reliability was determined in a similar way to Shriberg, Kwiatkowski, and Hoffman's[6] consensus procedure. It was determined by searching through the coded utterances and counting how many times the participants agreed on the codes assigned and how many times the participants did not agree. It was then calculated what percentage of the total utterances were agreed upon. The reliability score for grammaticality coding in the Aliens story was 97% and McDonald's and Late for School were both 99%. Any discrepancies in coding were corrected by the graduate research assistant.

3. Results

Table 2 shows the means and standard deviations for the percentage of grammatical utterances in all three story contexts.

Table 2. Means and (Standard Deviations) of Percent Grammatical in McDonald's Stories, Late for School Stories, and Aliens Stories by Age.

Age	Percent Grammatical McDonald's	Percent Grammatical LFS	Percent Grammatical Aliens
8 (n = 99)	79.50 (14.46)	83.97 (18.45)	83.58 (11.98)
9 (n = 107)	83.00 (12.05)	87.95 (12.97)	84.11 (13.01)
10 (n = 97)	83.32 (13.54)	87.46 (11.08)	82.05 (12.35)
11 (n = 77)	80.68 (15.32)	86.49 (10.96)	81.44 (14.86)
12 (n = 25)	84.21 (17.87)	89.42 (13.38)	80.04 (18.35)
13 (n = 28)	90.29 (8.68)	90.63 (12.26)	86.24 (13.43)
14 (n = 23)	86.59 (10.43)	87.45 (8.97)	83.83 (14.01)
15 (n = 12)	93.25 (5.99)	89.22 (9.25)	82.29 (15.66)

A one-way analysis of variance was conducted to evaluate the relationship between PCGU, story type (McDonalds, LFS, and Aliens) and age. There was a main effect for story type $F(1, 460) = 4.87$. $p = .028$; and age, $F(1, 460) = 2.25$, $p = .029$. There was also an interaction between story type and age, $F(7, 460) = .665$, $p = .013$.

Students were more grammatical in the LFS context (M = 87.83) followed by the McDonald's (M = 85.12) and the Aliens story context (M = 83.00). The eight year olds earned significantly lower PGCU scores than nine, thirteen and fifteen year olds. Ten and eleven year olds earned lower scores than thirteen year olds. No other differences were significant.

The interaction between story type and age group revealed that there was a significant difference in PGCU scores showing that eight and eleven year olds scored significantly lower than thirteen and fifteen year olds, only in the Aliens story context.
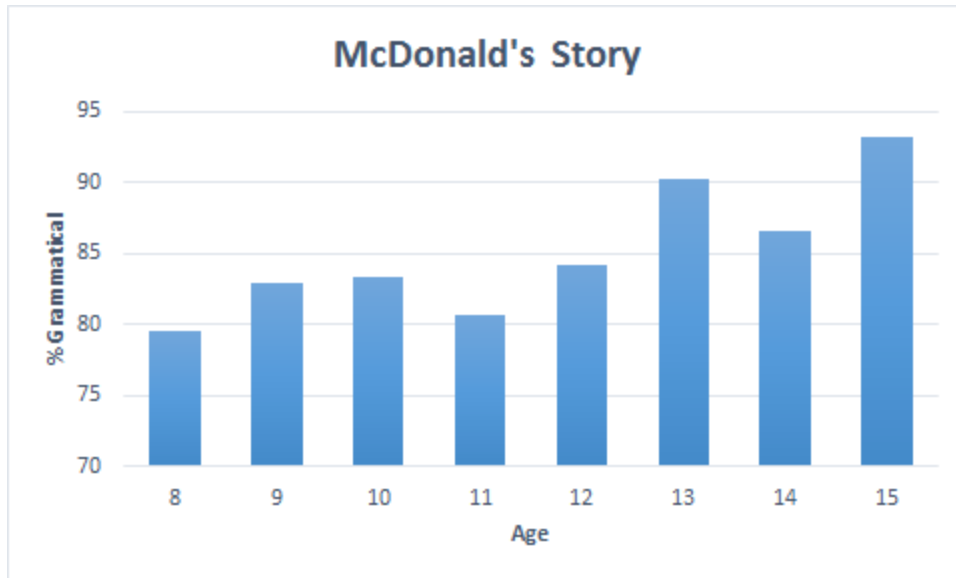
Figure 1. McDonald's Story mean percent grammatical by age.
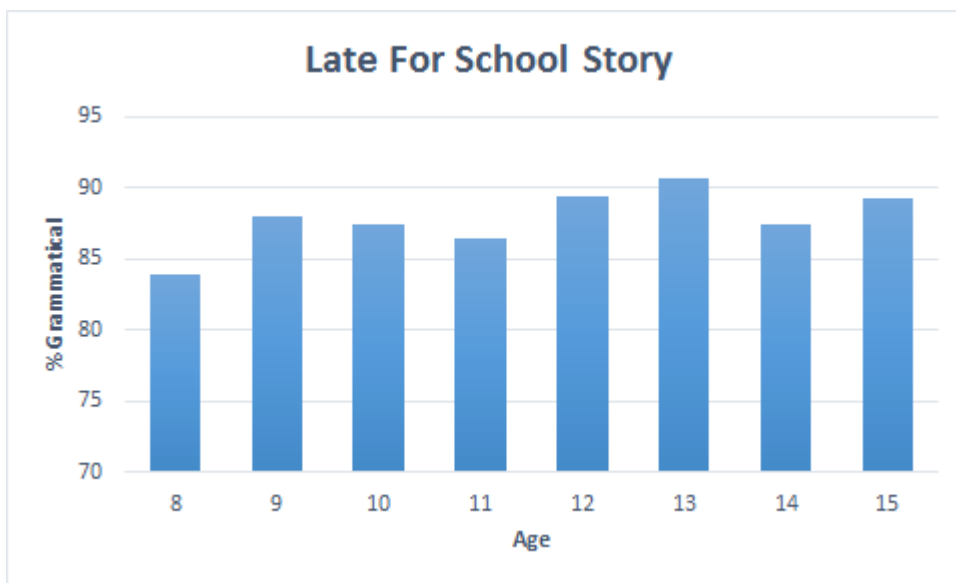

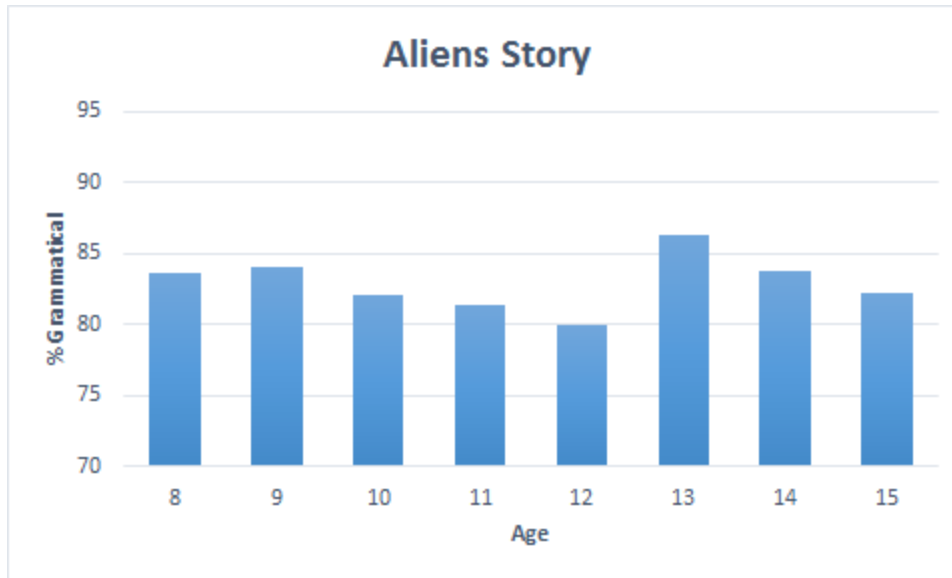Figure 2. Late For School Story mean percent grammatical by age.

Figure 3. Aliens Story mean percent grammatical by age.

Correlation coefficients were computed among PGCU scores and the total raw score for oral narrative proficiency. These correlations and their corresponding p values are shown in Table 3. The results of the correlational analyses show that PGCU was small but significant for all three story contexts (r = .12 - .27).

Table 3. Correlation Coefficients Between the McDonald's Story, the Late For School Story, and the Aliens (A) Story.

		TNL-2 Raw - Prod TNL	% Gram. McD	% Gram. LFS	% Gram. A
TNL-2 Raw - Prod TNL	Pearson Corr.	1	.267**	.155*	.196**
	Sig. (2-tailed)	-	0	0.001	0
	N	471	470	470	470
% Gram. McD	Pearson Corr.	.267**	1	.281**	.309**
	Sig. (2-tailed)	0	-	0	0
	N	470	470	469	469
% Gram. LFS	Pearson Corr.	.155**	.281**	1	.241**
	Sig. (2-tailed)	0.001	0	-	0
	N	470	469	470	469
% Gram. A	Pearson Corr.	.196**	.309**	.241**	1
	Sig. (2-tailed)	0	0	0	-
	N	470	469	469	471

**. Correlation is significant at the 0.01 level (2-tailed).
% Gram. McD = Percent Grammatical for the McDonald's Story
% Gram. LFS = Percent Grammatical for the Late for School Story
% Gram. A = Percent Grammatical for the Aliens Story

A one-way analysis of variance (ANOVA) was conducted to determine the effect of age on the types of grammatical errors (Types 1, 2, 3, 4, and 5) made in the each of the story contexts. No error type was significant for story type or age group.

4. Discussion

With respect to our first research question, we found that grammaticality does differ across the story contexts, but not according to age. All children were more grammatical in the Late for School story context. This may be because in this context, children are able to create their own story, with low level visual prompts for support, and do not have to recreate the grammar, syntax and content of a story told to them as in the McDonald context. Further, the Aliens context gives less visual support than LFS, so that the single scene context may place more demands on cognitive load than the McDonalds or LFS contexts.

Children who were eight scored similarly to their peers who were nine, ten, eleven, twelve and fourteen (80%-87%). This is interesting because they scored lower than their thirteen and fifteen-year-old peers. This may suggest that children experience some grammatical stability between eight and twelve, a significant period of growth at thirteen, followed by a dip at fourteen and a significant increase in grammaticality by age fifteen (93%). The sample size for the fourteen and fifteen year olds was significantly smaller however, so this interpretation must be stated with caution.

A similar pattern was observed for the eleven year olds, such that they scored similarly to their eight, nine, ten, twelve, and fourteen-year-old peers, with differences in PGCU only with the thirteen and fifteen year olds. These differences were not observed in the other story contexts (LFS, Aliens). This could be due to the fact that both LFS and Aliens contexts allow students to create their own story from pictures, rather than to use the language provided by the examiner and retell the story, as was the case in the McDonald's context. The older children conceivably demonstrated better language skills than their younger peers, allowing them to use more grammatically correct utterances as they participated in the retell condition.

To answer our second question, we found that grammaticality did differ as a function of story context, such that all children were more grammatical in the LFS story context (87%) than the McDonalds (83%) and Aliens story context (83%). Children who were eight had slightly more difficulty with maintaining grammatical accuracy in the Aliens context than their older peers, as did the 11 year olds, suggesting that they might be experiencing some level of "content-form" tradeoff. This means that they are developing more sophisticated skills in one area (narrative or grammar) while at the same time trying to maintain accuracy in the other (narrative or grammar).

PGCU was most highly correlated with the Aliens story context, however all of the correlations were small further supporting the notion that content (narrative) and grammaticality require slightly different cognitive skills thereby placing "more load" on the task of being grammatically accurate while at the same time constructing a well formed story. Relative to the final questions, there was no particular error type that was more common that the others for children ages 8-15. This may be because the language system, as it relates to the development of grammatical morphology, is mostly stable at around age 8 such that no particular error type would be expected. The errors related to grammar were most likely due to cognitive load issues related to creating a story in various contexts (retell, sequenced scenes, single scenes), although we did observed significant fluctuation at age 8, 11 and 14 as noted with slight dips in grammaticality during these times.

5. Future Plans

Next steps will include conducting more sophisticated analyses on the data, including collapsing age groups where no differences existed, and perhaps including growth curve modeling.

6. Acknowledgements

7. References

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