Exploring the Linguistic and Cognitive Processes Supporting Narrative Retell in School Age Children with Diverse Impairments

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Introduction

Language Impairment & Narratives

- Children with language impairment (LI) tend to perform below peers on narratives on measures of productivity (Scott & Windsor, 2000), fluency (Guo et al., 2008; Miranda et al.,1998), and grammaticality (Duinmeijer et al., 2012; Vandewalle et al., 2012)
- Therefore, performance on narrative retell is commonly exclusively attributed to linguistic skill.

Working Memory & Narratives

- Working memory may be involved in narrative retell:
  - Encoding, integrating and recalling story events (Botting, 2002; Montgomery et al., 2009)
  - Supporting language formulation (Martin & Slevc, 2014)
- Impact on language may be greater for those with WM deficits (Hartsuiker & Barkhuysen, 2006; Kemper et al., 2009)

Trade-off Effects

- Improvements in one area associated with decline in another area, such as:
  - Sentence complexity/length and verb accuracy (Grela & Leonard, 2000; Owen, 2010; Thordardottir, 2008)
  - Sentence length and fluency (Costanza-Smith, 2004; MacLachlan & Chapman, 1988; Rispoli & Hadley, 2001; Wagner et al., 2000)

Study Questions

- Can certain outcome measures from spontaneous speech better predict LI or WMI?
- Can interactions between measures predict better than single measures?
- How well can qualitative analysis of narrative sample predict impairment?

Methods

Narrative Language Sample

- Lost in Space (Warr-Leeper, 1990)
- Participants recalled the story after hearing it told to them

Participants

	LI	WMI	Controls
n	12 (9 males)	9 (5 males)	9 (6 males)
Age (yrs)	10.36 (1.12)	10.07 (1.26)	9.9 (1.05)
CLS	77.42 (2.78)	88.13 (11.48)	
WM	92.94 (12.49)	81.99 (6.42)	
PIQ	101.92 (12.46)	102.89 (7.98)	

WM: average of *Odd One Out*, *Spatial Recall*, and *Counting Recall* from *AWMA*.
NB: 4 participants met criteria for both LI and WMI.

Qualitative Procedure

- Descriptors were generated from linguistic features of narratives.
- Descriptors were developed through repetitive readings of narratives and comparison across participants.
- Samples from impairment groups were compared those from controls, examining for patterns of descriptors.

Coding

Quantitative Scoring

Productivity

C-units	Total no. C-units
NUW	No. unmazed words
Events	No. recalled events

Fluency

Pauses	No. pauses ≥ 2s per 100 NUW
%Maze	Ratio of mazed words* to NUW

Grammatical Complexity

MLUw	Unmazed words per C-unit
SubC-unit	Finite subordinate clauses per C-unit

Grammatical Accuracy

%GCU	Percent grammatically correct C-units
Errors	Morphosyntactic errors per C-unit

*Mazes: revisions, repetitions, fillers (e.g., "*and stuff*"), and hesitations (e.g., *uh, um*)

Model Testing

- Logistic regression in R† to predict LI status from MLUw, %GCU, Pauses, % Maze and WMI status from Events, SubC-units, Pauses, % Mazes.
- Used backward elimination to select predictors. Age added last.
- Fit of iterative models compared using AIC, McFadden's psuedo-R^2 and ANOVA.

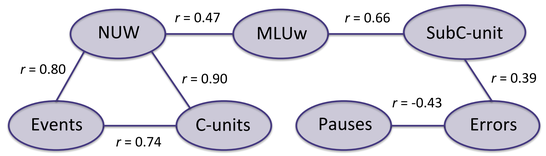
†Harrell, 2016; Heinze & Ploner, 2016; Jackman, 2015; R Core Team, 2016

Qualitative Descriptors

Fluency	Disfluencies, Hesitations, Effortful Recall, False Starts, Revisions, Blundering, Filler Phrases, Trailing Off
Content	Elaborate, Short, Missing Content, Repeated Content, Mixed Up Content, Added Content
Semantics	Expressive Vocabulary, Pauses, Odd Wording
Morphosyntax	Long Sentence, Short Sentences, Morphological Errors, Clumsy Links
Phonology	Low Attention to Phonological Detail

Analysis & Results

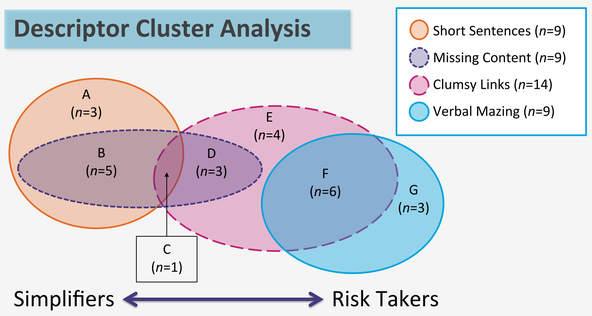
Correlations of Quantitative Coding



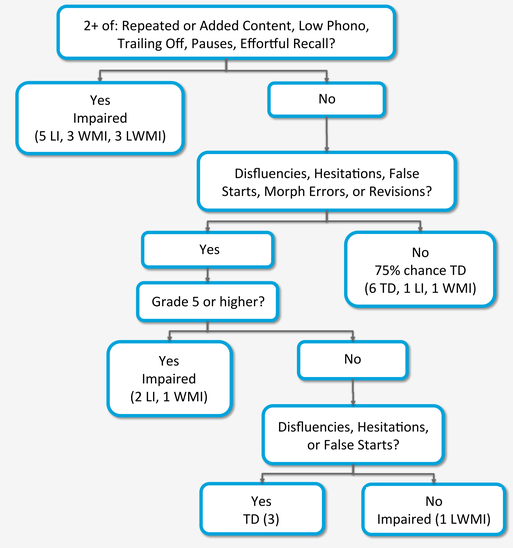
NB: Correlations significant at $p < .05$

Qualitative Results

Descriptor Cluster Analysis

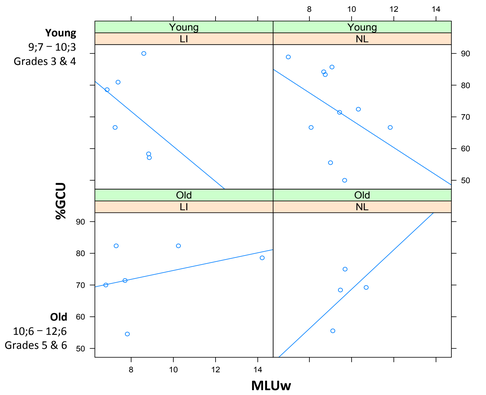


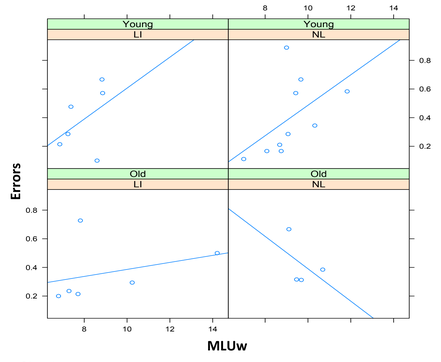
Decision tree



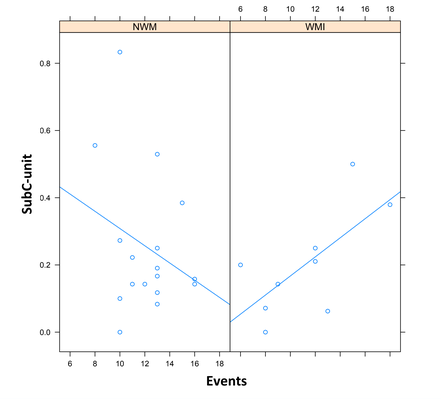
Quantitative Results

Predicting LI: LI status ~ MLUw * %GCU * age





Predicting WMI: WMI status ~ Events * SubC-unit



Conclusions

- **LI** was predicted by **linguistic factors** whereas **WMI** was predicted by **recall factors**.
- **Grammatical complexity:** LI was related to MLUw (and errors) whereas WMI was related to subordination.
- **Conceptual connections** between events may support recall.
- Qualitative descriptors of narratives differentiated children with and without impairment.
- The relationship between **mazing** and impairment may be mediated by other factors such as **monitoring ability** or willingness to **take risks** while speaking.

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