COGNITIVE CORRELATES OF NARRATIVE LENGTH, COMPLETENESS, AND ELABORATION FOLLOWING SEVERE TBI

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STORYTELLING / NARRATIVE DISCOURSE

- Narrative discourse involves telling a story through a series of causally connected, logically sequenced events
- Difficulty with narrative discourse is common in people with traumatic brain injury (TBI) [1,2,3]

"Tell us again, Grandpa, about the time you almost had Tarzan for lunch."

[1] Coelho, 2002; [2] Marini et al., 2017; [3] Stout et al., 2000

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IMPORTANCE OF NARRATIVE DISCOURSE IMPAIRMENTS IN TBI

- Essential for social participation
- Correlates with community reintegration / psychosocial outcomes [4,5]
- May be more strongly correlated with social integration than demographic variables [4]

[4] Galski et al., 1998; [5] Elbourn, Kenney, Power, & Togher, 2019

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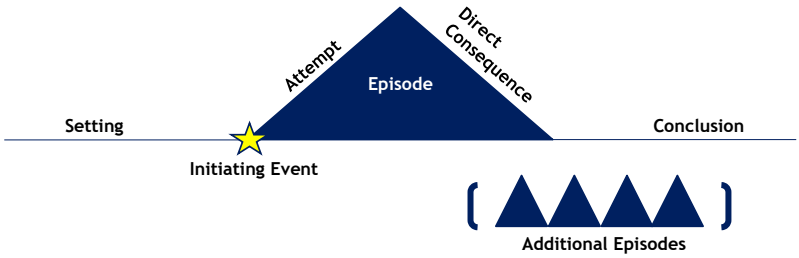
STORY GRAMMAR

- Story grammar [6] is a framework used in Western narratives to organize content in a predictable, linear event sequence.



[6] Stein & Glenn, 1975

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TBI & NARRATIVE MACROLINGUISTIC ANALYSIS

- Previous TBI research has addressed:
  - **Narrative length** [7,8]
  - **Completeness of content** [9, 10]
  - **Local/global coherence** [9, 11, 12]
  - Relationships between these measures and deficits in executive functions (EF) and declarative memory [12, 13]

[7] Hartley & Jensen, 1991; [8] Norman et al., 2022; [9] Carlomango et al., 2011; [10] Elbourn, Kenney, Power, Honan, et al., 2019; [11] Marini et al., 2011; [12] Marini et al., 2014; [13] Mozeiko et al., 2011

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TBI & NARRATIVE MACROLINGUISTIC ANALYSIS

- Minimal TBI research addresses:
  - Completeness of narratives (in terms of story grammar; SG)
  - Elaboration of narratives
  - Cognitive correlates of SG measures
  - Relationships between deficits in narrative discourse, EF, & declarative memory across different timepoints in TBI recovery

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RESEARCH QUESTIONS

- Do story grammar measures related to length, elaboration, & completeness at 6- & 12-months post-TBI correlate with EF & declarative memory at 6- & 12-months post-TBI?

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PARTICIPANTS

	Sex (M:F)	Age (years)	Years of Education	GCS Score	Length of PTA (days)	Primary Language	Monolingual
Total sample (*N*=54)	44:10	34.981 (±13.369) 16-66	13.722 (±2.993) 8-20	6.741 (±3.454) 3-15	53.463 (±39.887) 6-215	49 English 5 Other	43 Monolingual 11 Other (8 Bilingual, 3 Multilingual)

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METHODS

Step 1 Divide narratives into propositions (verb phrase/ predicator or relational word + related arguments)

Step 2 Assign story grammar codes

Step 3 Assign episode number and type (complete vs. incomplete, simple vs. elaborated)

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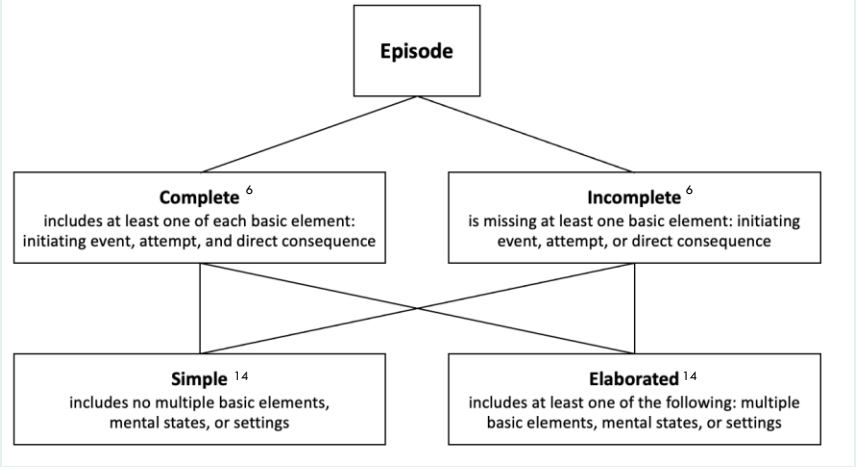

Episode Types:

Simple Complete (SC)
Simple Incomplete (SI)
Elaborated Complete (EC)
Elaborated Incomplete (EI)

[6] Lê et al., 2011; [14] Gillam et al., 2017

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EXAMPLE EPISODE

42so she got close to twelve o'clock .	IE	3	
43it was time for her to leave .	IE	3	
44and she &+b basically ran away from the [/] the prince .	A	3	
45and <left her shoe> [//] lost her shoe on the way back	DC	3	
that the 46prince then found .	DC	3	Ep3: EC-MB

IE = Initiating Event
A = Attempt
DC = Direct Consequence

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STORY GRAMMAR MEASURES

Total number of story grammar elements (length)

Total number of episodes (length)

Total number of elaborated complete episodes (episodic completeness/elaboration)

Number of story grammar elements per episode (elaboration)

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COGNITIVE MEASURES

EF MEASURE:

Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES)[15]

DECLARATIVE MEMORY MEASURES:

Hopkins Verbal Learning Test - Revised (HVLT-R)[16]

Brief Visuospatial Memory Test - Revised (BVMT-R)[17]

[15] MacDonald, 2005; [16] Brandt & Benedict, 1997; [17] Benedict, 1997

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ANALYSES:

Spearman's correlations were run between each narrative variable at 6- and 12-months:

- Number of story grammar elements
- Number of episodes
- Number of elaborated complete episodes
- Number of episodic elements per episode

And each Executive Functioning and Declarative Memory score at 6- and 12-months:

- FAVRES (Executive functioning): Scheduling Accuracy, Scheduling Rationale, Building Cases Accuracy, Building Cases Rationale, Total Accuracy, Total Rationale, Total Reasoning
- HVLT & BVMT (Declarative memory)

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RESULTS: STORY GRAMMAR & EF

	SG 6-months				SG 12-months			
	Number of SG elements	**Number of episodes**	**Number of EC episodes**	**Number of SG elements per episode**	**Number of SG elements**	**Number of episodes**	**Number of EC episodes**	**Number of SG elements per episode**
EF 6-months	Building a Case Accuracy* Total Reasoning Raw*	Total Reasoning Raw*	Building a Case Accuracy* Total Rationale* Total Reasoning Raw**	Scheduling Accuracy*; Total Reasoning Raw*	Total Reasoning Raw*	Total Reasoning Raw**		
EF 12-months		Scheduling Accuracy* Building a Case Accuracy*		Total Reasoning Raw*	Scheduling Accuracy* Building a Case Accuracy*	Building a Case Accuracy*		

* $p \leq .01$; ** $p \leq .001$

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WHAT CAUSAL REASONING LOOKS LIKE

Example A

one day that the king sent out a notice to every household noticing them to join the ball for his prince that for a potential wife .	IE	1	
all the girls are very excited as_well_as Cinderella .	MS	1	
&+a as soon as when she dressed up nicely	A	1	
and tried to go to the ball	A	1	
the [/] &+mo the older women along [/] along with her two 38daughters didn't want her to go .	MS/DC	1	
because she looked much better than they would .	MS/DC	1	
and thought that if she goes	MS/DC	1	
they would have no chance of charming the prince	MS/DC	1	
so they locked her up in the room	DC	1	
and left for the ball .	DC	1	Ep1: EC-MB, MS

Example B

&-um she went to the ball and her two sisters .	IE	1	Ep1: SI
and her mother wouldn't let her go for some reason .	IE	2	Ep2: SI
and then the two sisters &-um attacked her .	A	3	
and she runs out .	DC	3	Ep3: SI

MS = Mental State
IE = Initiating Event
A = Attempt
DC = Direct Consequence

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RESULTS: SG & DECLARATIVE MEMORY

	SG 6-months				SG 12-months			
	Number of SG elements	Number of episodes	Number of EC episodes	Number of SG elements per episode	Number of SG elements	Number of episodes	Number of EC episodes	Number of SG elements per episode
Declarative memory 6-months	HVLT-R* BVMT-R**	HVLT-R* BVMT-R*	BVMT-R*	N/A	BVMT-R*	HVLT-R** BVMT-R**		N/A
Declarative memory 12-months	HVLT-R** BVMT-R**	HVLT-R** BVMT-R**	HVLT-R** BVMT-R*	N/A	HVLT-R* BVMT-R*	HVLT-R** BVMT-R**	HVLT-R*	N/A

* $p \leq .01$; ** $p \leq .001$

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WHAT COMPLETENESS LOOKS LIKE

Example C

and &-um prince charming &-uh realizes	MS/IE	6	
there is the last lady of the house ,	MS/IE	6	
which the ugly stepmother does not want him to try the slipper on her .	MS/A	6	
&-um he actually does try the slipper on Cinderella's foot .	A	6	
and it fits perfectly .	DC	6	
therefore he realizes	MS/DC	6	
that Cinderella was the beautiful lady	MS/DC	6	
that he met at the ball .	MS/DC	6	Ep6: EC-MB, MS

Example D

so then in another book the king hadta find the wearer of the slipper	NSG		
and then went round the town	IE	4	
and tested	IE	4	
if your [*] foot fit the slipper or not .	IE	4	Ep4: EI-MB

MS = Mental State
IE = Initiating Event
A = Attempt
DC = Direct Consequence
NSG = Non-Story Grammar

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WHAT ELABORATION LOOKS LIKE

Example C

and &-um prince charming &-uh realizes	MS/IE	6	
there is the last lady of the house ,	MS/IE	6	
which the ugly stepmother does not want him to try the slipper on her .	MS/A	6	
&-um he actually does try the slipper on Cinderella's foot .	A	6	
and it fits perfectly .	DC	6	
therefore he realizes	MS/DC	6	
that Cinderella was the beautiful lady	MS/DC	6	
that he met at the ball .	MS/DC	6	Ep6: EC-MB, MS

Example E

And they (sisters) go out to this dance .	IE	1	Ep1: SI
&-um anyway and then there ends up being this [/] this man	IE	2	
who asks her to come .	A	2	
And so he [//] she ends up going to the dance .	DC	2	Ep2: SC

MS = Mental State
IE = Initiating Event
A = Attempt
DC = Direct Consequence

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DISCUSSION

Associations were found between narrative length, completeness & elaboration within a story grammar framework and…

1) Executive functioning: planning, organization
   - ❑ Even more with problem-solving & reasoning
   - ❑ Correlations mostly within timepoint
2) Declarative memory: memory for people, objects, and events
   - ❑ Correlations across timepoints

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LIMITATIONS

- Not all participants had data available at both timepoints
- Sample was not diverse in terms of race and ethnicity
- Sample included non-native English speakers

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FUTURE DIRECTIONS

Conducting regression analyses to determine which (if any) EF & declarative memory scores at 6-months predict narrative outcomes at 12-months

- Control for demographic variables

Analyzing mental state term use as one aspect of elaboration

Analyzing changes in story grammar measures across the first 2-years post-TBI (3, 6, 9, 12, 24-months) and comparing performance to controls

Developing methods for efficiently and effectively capturing these narrative impairments to harness their utility in clinical practice

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CONCLUSIONS

Findings support the use of story grammar measures to capture the functional impact of persisting EF & declarative memory impairments post-TBI

Developing efficient and effective methods for characterizing narrative impairments may improve clinical assessment & treatment, with the potential for far-reaching impacts on communicative participation & quality of life in this population

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