

The Relationship Between Discourse- and Sentence Level Processing During Narrative Production Following Traumatic Brain Injury

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Discourse Processing and TBI

- Individuals with TBI experience **macrolinguistic** and **microlinguistic** breakdowns in narrative discourse related to
 - Story completeness
 - Story cohesion
 - Sentence production
- The relationships among these 3 levels are not well known and several models of discourse processing have been proposed.
- Peach & Coelho (2016) demonstrated a significant relationship between the **production of cohesive ties** and instances of **intra-sentential impairment** in the narratives of individuals with TBI.
- These results suggest that speakers share resources for establishing story cohesion and producing sentences in narratives.
- To develop a more complete understanding of discourse, the relationships between these two levels and the macrolinguistic level of discourse processing need to be examined.

Objective

To investigate the **relationships among story completion, story cohesion, and sentence production** in individuals with TBI.

Methods

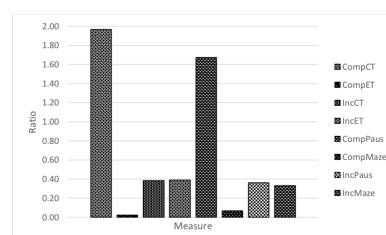
- Language samples of 24 participants were selected from TBIBank (MacWhinney, 2007) and analyzed
- Participants ranged from 16 to 54 years old, had 10 to 21 years of education, and were 2 to 29 months time post injury with an average of 7 months.
- Participants identified as having moderate to severe brain injury with no previous neurological or language disorders.
- Samples analyzed for:
 - Complete and incomplete episode structure
 - Accuracy of inter-sentential cohesive ties (correct vs. erroneous)
 - Frequency of extended intra-sentential pauses and sentence mazes

Results

- The descriptive statistics for the group by measures are presented below. To standardize the scores for each measure, the total numbers of cohesive ties (correct, erroneous), pauses, and mazes in each episode type were divided by the number of T-units in each episode. Individual patterns are also displayed.

Measures per Episode	Complete Episodes			Incomplete Episodes		
	Mean	SD	Range	Mean	SD	Range
T-Units	9.13	7.42	0-28	4.79	3.30	0-12
Correct Ties	20.0	15.6	0-48	9.42	8.0	0-30
Erroneous Ties	0.21	0.41	0-1	0.33	0.56	0-2
Pauses	3.83	4.70	0-16	2.17	2.78	0-9
Mazes	4.17	4.08	0-13	2.17	3.75	0-16

- A **one-way analysis of variance** was performed to determine if there were **differences** relating to the numbers of cohesive ties (correct, erroneous) and/or pauses and mazes in complete versus incomplete episodes.
- Post-hoc comparisons using Tukey's HSD test indicated that the **number of correct ties and pauses in complete episodes** were significantly greater than all other measures.



Pattern	# of Participants
Majority complete episodes	9
Greater number of pauses	7
Greater number of mazes	0
With cohesive deficits	9
Without cohesive deficits	0
Majority incomplete episodes	5
Greater number of pauses	5
Greater number of mazes	0
With cohesive deficits	2
Without cohesive deficits	3
Equal complete and incomplete episodes	10
Greater number of pauses	9
Greater number of mazes	1
With cohesive deficits	8
Without cohesive deficits	2

- These measures were entered into a logistic regression analysis as predictor variables. The model was statistically significant [$\chi^2(2) = 52.58$, $p = .000$] and explained 89% (Nagelkerke R^2) of the variance in complete episodes while correctly classifying 94% of the participants.

Discussion

- Complete episodes are associated with increasingly correct cohesive ties but increased pausing during sentence production
- Findings support a resource model in explaining discourse disturbances following TBI
- When more resources are expended to generate complete narratives, fewer resources are available for producing correct cohesive ties or for sentence planning
- This results in a **variable pattern of co-occurring disturbances at two or more levels of discourse processing** during narrative production.

Selected References

- Adornetti, I. (2014). A neuro-cognitive perspective on the production and comprehension of discourse coherence. In P. P. Chruszczewski, et al. (Eds.), *Ways to protolanguage 3* (pp. 9-24). Wroclaw: Wydawnictwo WSF.
- Coelho, C. A., Grela, B., Corso, M., Gamble, A., & Feinn, R. (2005). Microlinguistic deficits in the narrative discourse of adults with traumatic brain injury. *Brain Injury, 19*(13), 1139-1145.
- Cosentino, E., Adornetti, I., & Ferretti, F. (2013). Processing narrative coherence: Towards a top-down model of discourse. In OASIcs-OpenAccess Series in Informatics (Vol. 32). Schloss Dagstuhl-Leibniz-Zentrum fuer Informatik.
- Ellis, C., & Peach, R. K. (2009). Sentence planning following traumatic brain injury. *NeuroRehabilitation, 24*(3), 255-266.
- MacWhinney, B. (2007). The TalkBank Project. In J. C. Beal, K. P. Corrigan & H. L. Moisl (Eds.), *Creating and Digitizing Language Corpora: Synchronic Databases, Vol. 1* (pp. 163-180). Hounds mills: Palgrave-Macmillan.
- Marini, A., Galetto, V., Zampieri, E., Vorano, L., Zettin, M., & Carlomagno, S. (2011). Narrative language in traumatic brain injury. *Neuropsychologia, 49*(10), 2904-2910.
- Peach, R. K., & Coelho, C. A. (2016). Linking inter-and intra-sentential processes for narrative production following traumatic brain injury: Implications for a model of discourse processing. *Neuropsychologia, 80*, 157-164.
- Peach, R. K. (2013). The cognitive basis for sentence planning difficulties in discourse after traumatic brain injury. *American Journal of Speech-Language Pathology, 22*(2), S285- S297.