Patients with right hemisphere brain damage (RHD) have often been cited as having difficulties at the discourse level of communication, including grasping the main idea or theme of a story, revising initial interpretations, and appreciating the punch line of a joke (Birhle, Brownell, & Powelson, 1986; Rehak et al., 1992). RHD patients often have trouble integrating information into a coherent unit; rather, they may approach discourse in a literal, piecemeal fashion (Brownell & Martino, 1998).

In 1990, Hough conducted a study investigating the role of theme organization on discourse comprehension in adults with right hemisphere brain damage (RHD). She reported that participants with RHD performed significantly worse when the theme of a narrative was delayed, compared to when the theme was at the beginning. However, manipulations to delay the theme also resulted in narratives that lacked coherence and violated the rules of narrative structure. Thus, it cannot be determined if the RHD subjects in Hough's study performed poorly due to the delayed-theme structure or whether their poor performance was due to a lack of narrative coherence.

The goal of the current study was to determine if a lack of coherence-- rather than a delayed-theme organization-- accounted for poor narrative comprehension for the RHD group. Delayed-theme narratives were carefully manipulated to maintain coherence despite the shift of the main theme from the beginning of the narrative to the end. It was hypothesized that controlling for coherence would eliminate discrepancies in comprehension between canonical and delayed-theme narratives.

Method

Participants. Participants were 10 adults with unilateral RHD due to CVA and five non-brain-damaged (NBD) controls without reported neurologic impairment. All met strict inclusion criteria concerning hearing acuity, native language, and handedness. The groups did not differ on the demographic variables of age and education (see Table 1).

Task. Participants listened to narratives, each followed by three yes/no comprehension questions pertaining to main ideas and details. Participants answered the yes/no questions by pressing one of two labeled buttons presented vertically on a manual response box. Several ancillary tasks were also included to further classify participants and to analyze alternative explanations for performance. (See Table 1).

Stimuli. The experimental stimuli consisted of 12 canonical narratives from Hough's (1990) study and 12 coherence-controlled delayed-theme versions of these narratives created for this study. Narratives were each 8 sentences in length, and pertained to everyday situations. Narrative coherence in the delayed-theme stories was maintained despite the shift of the main idea from the beginning to the end of the narrative. This was accomplished in several ways, including maintaining referential specificity by manipulating proper names, pronouns and articles; establishing the setting minus the main idea when shifting the main idea eliminated the setting; adding content neutral phrases such as “after all” to connect the moved sentence with the preceding idea; maintaining temporal sequence to avoid temporal discontinuities; maintaining the active narrative line; and omitting redundant detail. Narrative length was maintained, as was the balance of proper names and pronouns. A pilot study was conducted to verify that the modifications improved perceived story coherence as judged by non-brain damaged adults.

Twelve filler stimuli included six different canonical narratives from Hough’s study and six delayed-theme versions of these narratives, created without regard to coherence. As described in the Hough study, the first sentence was moved to the end of the story if it contained the central theme, or the theme was taken from the first and second sentences and incorporated into the last sentence. No other manipulations were made.

Procedures. Testing took place during two sessions, lasting up to 75 minutes each, between one and two-weeks apart. Participants were tested in a quiet room, either in their homes or in the laboratory. All auditory stimuli were delivered via laptop computer, through high quality supraural earphones. The 36 trials for the narrative task were pseudorandomized into six blocks, each containing four experimental narratives and two filler narratives. Three blocks contained only canonical narratives and the other three blocks contained only delayed-theme narratives. All the narratives of one theme condition were presented on the same day (i.e. three blocks of delayed-theme narratives on Day 1 and three blocks of canonical narratives on Day 2), so that participants did not hear two versions of the same narrative in one session. Several additional measures were taken to disguise the repetition of the narratives. First, the names of characters in the narratives were different in the canonical and delayed-theme versions of the narratives. Second, experimental blocks were interspersed with ancillary measures. Additionally, filler passages were added to increase the amount of stimuli. The order of administration of the theme conditions (canonical, delayed) was counterbalanced across participants, and order of stimulus block presentation within sessions was randomized for each participant.

Results

Accuracy data was analyzed using paired *t*-test to assess our *a priori* hypothesis of no difference between original and coherence-controlled delayed-theme narratives. For the experimental tasks, there was no significant difference in performance on canonical narratives (M= 34, SD= 1.63) and coherence-controlled delayed-theme narratives (M=34, SD= 1.25), $t(9) = 0.00$, $p= 1.00$. For filler items, there was again no significant difference between performance on canonical narratives (M=16.70, SD= 1.34) and delayed-theme narratives (M=15.60, SD= 2.12), though there was a trend towards poorer comprehension of delayed-theme narratives, $t(9)= 2.09$, $p=0.07$.

Performance was also analyzed for coherence-controlled delayed-theme experimental and filler narratives by proportion correct. There was a significant difference between performance on coherence-controlled delayed-theme narratives (M=.94, SD= 0.03) compared to delayed-theme filler narratives (M=0.87, SD= 0.12), with better performance on experimental narratives, $t(9)= 2.43$, $p=0.04$. This confirmed the improvement afforded by the manipulations to enhance coherence in the experimental delayed-theme narratives.

Discussion

The RHD participants in this study performed as expected. There was no significant difference in comprehension of canonical narratives compared to coherence-controlled delayed-theme narratives.

In order to further validate these results, a number of filler stimuli were included, consisting of canonical narratives and their delayed-theme counterparts, which were constructed without regard to coherence. A discrepancy in performance was expected between these two conditions, as the original delayed-theme narratives lacked coherence. While there was no significant difference in performance between the two filler conditions, there was a trend for poorer comprehension of the delayed-theme narratives. As there were a smaller number of filler stimuli compared to experimental stimuli (6 pairs vs. 12 pairs, respectively), it is possible that a larger number of filler stimuli would have yielded statistically significant results.

Performance on coherence-controlled delayed-theme experimental narratives was also compared to performance on delayed-theme filler narratives by comparing the proportion correct in these two conditions. RHD participants performed significantly better on coherence-controlled delayed-theme narratives than filler delayed-theme narratives, further supporting the hypothesis that enhancing narrative coherence enhances comprehension for adults with RHD.

Interestingly, analysis of ancillary tasks revealed a significant correlation between estimated auditory working memory capacity and performance on delayed-theme narratives. These results imply that even with coherence accounted for, delaying the theme of a narrative is more taxing on mental processing, thus decreasing comprehension in RHD participants with particularly low working memory capacity.

We hope the data presented will aid in further defining the communication deficits associated with RHD and provide insight to the evaluation and treatment of this population.

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Table 1. Clinical Characteristics of Participant Groups

	RHD Group (N=10)	NBD Group (N=5)
Age (years)		
Mean	65.40	67.60
SD	13.48	6.73
Range	45-81	59-77
Education (years)		
Mean	14.80	14.4
SD	3.16	2.61
Range	12-20	12-18
Gender		
Male	4	2
Female	6	3
Months Post-Onset		
Mean	90.30	Not Applicable
SD	53.21	
Range	25-195	
Lesion Type		Not Applicable
Thromboembolic	5	
Hemorrhagic	5	
Lesion Site		Not Applicable
Right Cortical Posterior	4	
Right Cortical Mixed	2	
Right Subcortical	3	
Right MCA	1	
Auditory Working Memory for Language [a] (word recall errors)		
Mean	15.30	8.60
SD	7.53	5.73
Range	3-26	0-14
Discourse Comprehension Test [b]		
Mean	33.80	36
SD	3.29	4.12
Range	28-37	29-39
Discourse Comprehension Test-Implied Questions		
Mean	16.10	17.20
SD	2.56	3.11
Range	12-20	12-20
Caplan Syntax Task [c]		
Mean	14.20	15
SD	1.87	1.00
Range	10-16	14-16
Behavioural Inattention Test [d]		
Mean	136.60	143.80
SD	10.22	1.79
Range	110-143	142-146
*Auditory Double Simultaneous Stimulation[e]- Binaural Accuracy		

Mean	3.80	7.60
SD	3.46	0.55
Range	0-8	7-8

RHD=right hemisphere brain damage; NBD=non-brain damaged; anterior= anterior to Rolandic fissure; posterior= posterior to Rolandic fissure; [a] Tompkins et al. (1994; maximum errors=42); [b] Brookshire & Nicholas (1993; maximum score-total = 40, maximum score-implied = 20); [c]Caplan (1987; maximum score= 16); [d]Wilson, Cockburn, & Halligan (1987; maximum=146; neglect cut-off= 129) [e]adapted from Shisler et al. (2004) & Shisler (2005; maximum= 8). *= significant difference by independent t-test, $p<0.05$