Catcher in the Mind: An Examination of Visual and Verbal Patterns during Reading

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Abstract

This study examined the nature of individuals' thoughts during reading. We examined whether self-reports of thought characteristics (i.e., mind wandering, visual, verbal, valence) varied across time and task. In two sessions, participants (n=85) responded to thought probes across focused meditation and narrative reading tasks. Results showed that participants' thought patterns were stable across sessions. Further, reports of mind wandering, visual imagery, and valence varied based on task, whereas verbal thinking remained stable across tasks.

Keywords: visual imagery, comprehension processes, individual differences

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Research on discourse processing has established an understanding of the multiple parallel sub-processes contributing to comprehension. Collecting and analyzing individuals' thoughts during reading has allowed researchers to identify a number of beneficial comprehension processes and strategies, such as paraphrasing and bridging (McNamara, 2004; Millis, Magliano, & Todaro, 2006). Despite this vast literature, there remain a number of unanswered questions. For instance, little research has focused on individuals' phenomenological *experiences* during reading, especially in relation to patterns of visual imagery and verbal thinking. Although anecdotal evidence suggests that individuals vary in their experiences of reading, little to no research has been conducted to systematically investigate these differences.

Visual mental imagery refers to an individual's ability to create perceptual representations from stored information without the presence of any external stimuli (Borst & Kosslyn, 2008). Anecdotal reports suggest that individuals may vary in the degree to which they engage in visual imagery during reading; however, this claim has not been investigated empirically. Therefore, it is unclear how individuals differ in their experiences of visual imagery while reading and whether these phenomenological experiences have an influence on comprehension (cf., Moore & Schwitzgebel, 2018). Some research has suggested that individuals who have more vivid mental visual imagery immerse themselves in or become "transported" more in books than in visual media, suggesting that reading provides more opportunities for visual imagery (Green & Brock, 2002). However, others have found that there is no strong relationship between readers' experiences of visual imagery and their memory for visual text information (Moore & Schwitzgebel, 2018). Therefore, it is essential to conduct further investigations on the impact of visual imagery during reading.

This study represents a systematic attempt to address these gaps in the literature by examining the nature of individuals' thoughts during reading. We aimed to first understand how different reports of thought characteristics varied across time and task. Additionally, we were interested in examining relations amongst these thought characteristics. To this end, we conducted a two-session study wherein participants were asked to complete focused attention and narrative reading tasks. During these tasks, individuals were prompted to provide self-reports of their thoughts across a number of dimensions.

Method

Undergraduate college students (n = 85) recruited from a university in the northeast United States participated for partial course credit. In order to examine the consistency of participants' ratings across time, data was collected across 2 sessions (with an intervening interval of 3-7 days). To understand the effects of task on visual imagery, participants engaged in a focused attention (meditation) and narrative reading task in each session. During both tasks, participants were randomly probed to report multiple dimensions of their thought. During the focused attention task (10 minutes), participants engaged in meditation and were instructed to focus on the sensation of their breath. Thought probes were administered at 100 second intervals six times throughout this task and focused on four dimensions*: Mind Wandering:* Were you thinking about something other than what you were doing? [1: Completely on task – 7: Completely off task*]; Visual Imagery:* My thoughts were in the form of images. [1: Not at all – 7: Completely]; *Verbal Thinking:* My thoughts were in the form of words [1: Not at all – 7: Completely*]; Valence:* The content of my thoughts was: [1: Negative – 7: Positive].

Participants were then asked to read a narrative text. Two texts were adapted from J.D. Salinger's Nine Stories (1953): *Just Before the War with Eskimos* and *Uncle Wiggily in*

Connecticut. The texts were counterbalanced across the sessions. The same thought probes were again presented throughout the reading task such that participants responded 10 times at randomly selected intervals, which remained the same for all participants. Additionally, participants received three comprehension questions during reading to ensure they remained on task. After reading, participants were asked to recall all the information they could about the text. Finally, participants completed a demographic questionnaire, along with a battery of individual differences measures that are not analyzed in this paper.

Results

Linear mixed effects models (lme4 package in *R*; Bates, Mächler, Bolker, & Walker, 2015) were used to examine potential *session* and *task* effects of participants' thought probes. There was no reliable difference in participants' average self-reports of visual and verbal thoughts between the first and second session, indicating individual thought patterns were stable across time. There was also no reliable difference in rates of mind wandering or valence across sessions.

Participants exhibited different thought patterns across the meditation and reading tasks (see Table 1). Participants' rates of valence and mind wandering were higher during meditation than reading, demonstrating a tendency for more positive, but off-task thought during meditation. Additionally, rates of verbal thought were higher during meditation than reading. However, rates of visual imagery were higher during than meditation, such that participants were more likely to visualize while reading narrative texts.

Table 1

Mean and Standard Deviation of Thought Probes and the Task Effects on Thought Probes

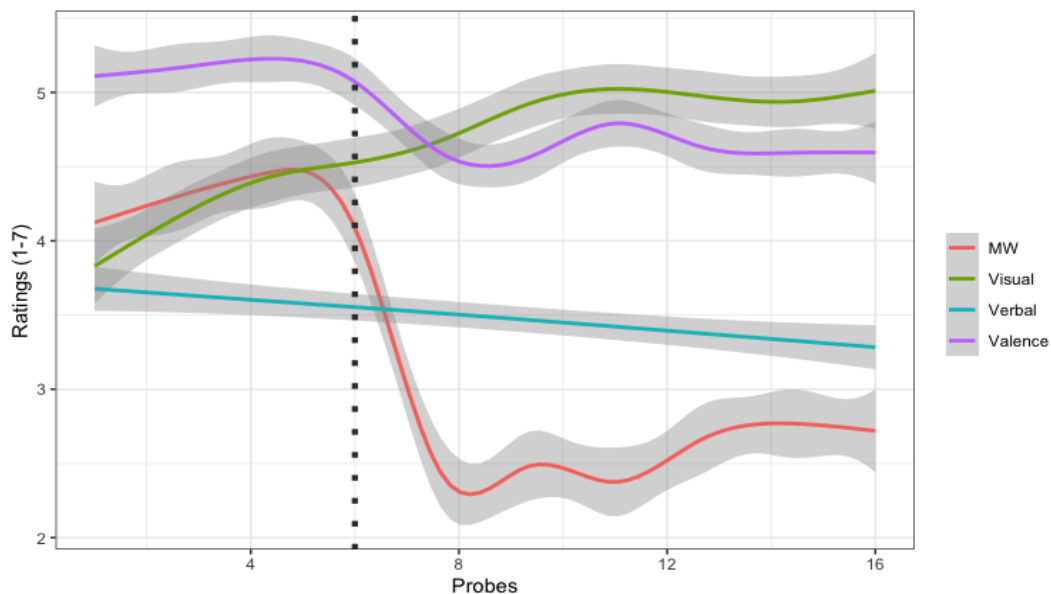| Variable	Meditation M(SD)	Reading M(SD)	Task Effect χ^2
1. Mind Wandering	4.32 (1.38)	2.58 (1.39)	814.41***
2. Visual	4.28 (1.50)	4.89 (1.43)	97.07***
3. Verbal	3.59 (1.50)	3.42 (1.46)	7.78**
4. Valence	5.16 (1.06)	4.64 (1.08)	137.06***

*p < .05. **p < .01. ***p < .001.

Figure 1

Mean of Participant's Answers to Each Thought Probe

Figure 1 illustrates the participants' ratings across the meditation and reading tasks. The dotted line represents the break between these two tasks. Figure 1 reveals that participants' visual and mind wandering scores were similar during meditation; however, during reading, they began to diverge. In particular, mind wandering drastically decreased, whereas reports of visual

imagery increased. Further, verbal scores decreased gradually during the reading task and seemed to exhibit a negative relation with reports of visual imagery. Analyses indicated that there was a large negative correlation between ratings of visual and verbal thoughts, suggesting that individuals tend to experience thoughts that are either predominantly visual or verbal (See Table 2). Further, there was a negative correlation between mind wandering and valence consistent with previous work demonstrating that participants felt more positive when they were on task.

Table 2

Correlation of Thought Components by Task

Variables	1	2	3	4
Meditation				
1. Mind Wandering	1.00			
2. Visual	0.15	1.00		
3. Verbal	-0.04	-0.70**	1.00	
4. Valence	-0.21	0.01	-0.12	1.00
Reading				
1. Mind Wandering	1.00			
2. Visual	-0.12	1.00		
3. Verbal	0.12	-0.68**	1.00	
4. Valence	-0.30*	-0.10	0.10	1.00

$*p < .05.$ $**p < .01.$ $***p < .001.$

Summary

The current study examined individuals' phenomenological experiences of reading narrative text. Overall, responses to thought probes were stable over time – in particular, there were no session effects on participants' ratings of mind wandering, visual imagery, verbal thinking, or valence. Further, results indicated that participants' reports of visual imagery and verbal scores were strongly influenced by task; specifically, participants reported experiencing

significantly higher rates of visual imagery and lower rates of verbal thinking during reading than meditation.

Overall, this study presents some of the first work to systematically examine the role of visual and verbal thought during reading. Additional analyses will examine how individuals' reports of visual imagery relate to their recall of text information, as well as the impact of individual differences known to be important to comprehension. Future studies will examine how participants' reports of visual imagery relate to comprehension processes, such as the generation of inferences or the access to prior knowledge. These studies have the potential to provide more clarity on the comprehension process as it relates to individuals' own conscious experiences.

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