Discourse Processes

Mind Wandering, Noncontingent Processing, and Recall in Reading

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In the present research, we attempted to manipulate noncontingent processing in reading, that is, mental activities not dependent on processing the words of the text. An important class of noncontingent processing is mind wandering, but noncontingent processing may include other task-related activities as well. In our study, participants read stories sentence by sentence, and we manipulated the interval between sentences. In the immediate condition, there was no delay; in the constant-delay condition, there was a 2-s delay before the next sentence; and in the random-delay condition, the delay was randomly either 0 or 2 s. Participants read a story in each of these conditions. Periodically while reading each story, participants were interrupted and asked to rate whether they were on task. Although delay had little overall effect, it moderated the relationship between on-task rating and recall: In the two delay conditions, recall increased with on-task rating, but there was no such effect in the immediate condition. This pattern of results suggests that introducing the delay increased noncontingent processing but the nature of that processing varied. For example, in some cases the delay may have increased mind

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wandering, leading to poorer recall; in other cases, the delay may have increased elaboration and reflection concerning the story world, leading to increased recall.

INTRODUCTION

Mind wandering, in which one's mental processes are diverted from the task at hand, is a common everyday occurrence and can be quite common in reading. For example, Schooler, Reichle, and Halpern (2004) estimated that in some contexts, as often as 23% of the time spent reading involves mind wandering. We argue that it is useful to think of mind wandering as a form of what we refer to as "noncontingent processing" in reading. Mind wandering is noncontingent because the processing proceeds independently of the stimulus input—it is not contingent on the words of the text. This conception is similar to the view that mind wandering involves "uncoupling" mental processing from perceptual input. In the present research, we provide evidence that although mind wandering may be noncontingent, not all noncontingent processing is mind wandering. Further, under some circumstances, noncontingent processing may foster comprehension and memory. This evidence undermines a simple identification between mind wandering and uncoupled processing.

One account of mind wandering is that it involves "decoupling" mental processing from perceptual input. Evidence in favor of this conceptualization includes the finding of a reduced P300 evoked potential component when participants report mind wandering (Smallwood, Beach, Schooler, & Handy, 2008) and the observation that external events can lead participants to reengage with the task (Smallwood, McSpadden, & Schooler, 2007; Smallwood, Riby, Heim, & Davies, 2006). In the context of discourse comprehension, Smallwood, Fishman, and Schooler (2007) argued that limited processing of the perceptual input while mind wandering cascades through levels of processing to impair the construction of a situation model. Although Smallwood (2013) suggested that decoupling does not cause episodes of mind wandering, he nevertheless described decoupling as a symptom of mind wandering and suggested that immersive reading, for example, occurs only when "imaginative processing" is linked to the text. The link between a decoupled state in reading and mind wandering was also assumed by Franklin, Smallwood, and Schooler (2011), who argued that when lexical variables fail to predict reading time, processing is decoupled from the textual input. They subsequently used this lack of a correlation to predict mind wandering episodes. Although most would likely agree that decoupled, noncontingent processing does not necessarily imply that readers must be mind wandering, it is nevertheless commonly assumed that a close relationship exists between the two.

In contrast to the decoupled state that is associated with mind wandering, reading comprehension is typically driven by the perceptual input. Clearly,

reading involves processing that goes beyond individual word identification, such as inferences and making remote connections. However, theories of reading generally assume that such processing is in the service of generating representations of the current word and sentence and integrating that with a representation of the discourse as a whole. For example, Just and Carpenter (1980) argued for an "eye–mind" assumption, in which the eye is generally fixated at the location in the text currently being processed, and an "immediacy" assumption, in which as much processing as possible occurs as each word is read. Consistent with these tenets, when comprehension difficulties are encountered at any level of processing, eye fixations are longer, suggesting further processing at that point in the text. Similarly, in the "E-Z Reader" model of reading, it is assumed that eye movements through the text are tied to processing times for individual words (Reichle, Pollatsek, Fisher, & Rayner, 1998). Thus, there is generally a link between where the eye is fixated during reading and the content of mental processing. Noncontingent processing in reading would refer to circumstances in which this link breaks down.

When noncontingent processing is devoted to mind wandering, a range of evidence suggests a detrimental effect on the construction of a situation model. For example, Smallwood et al. (2008) found that participants were less able to draw situation-model inferences needed to solve a Sherlock Holmes mystery. Using rather different materials, Farley and Dixon (2013) found that participants were less able to solve story mysteries when mind wandering. Dixon and Bortolussi (2013) argued that recall suffered during mind wandering because there are few resources to devote to integrative processes needed to build a situation model. There is also evidence that lexical processes may suffer. For example, Reichle, Reineberg, and Schooler (2010) found that during reading fixation, durations were less related to lexical variables while mind wandering, suggesting that word processing may have been less complete. Similarly, Schad, Nuthmann, and Engbert (2012) found that mind wandering was associated with proof-reading errors at the lexical level. However, it is possible that deficits at the lexical level are related to inadequate development of the situation model. For example, semantic processing of individual words may be incomplete because the information is not needed or used in developing the situation model. Our general conclusion is thus that the situation model is likely to suffer during mind wandering, although lexical information may also not be processed as deeply under some circumstances.

Despite this identification of mind wandering with noncontingent processing, we argue that in principle it might be possible to have noncontingent processing that benefits comprehension. In other words, not all noncontingent processing may be mind wandering even if all mind wandering is noncontingent processing. In particular, under some circumstances readers may reflect about the story or nature of the task even if they are not processing the words of the text per se.

Related to this suggestion, in an attentional vigilance task, Stawarczyk, Majerus, Maj, Van der Linden, and D'Argembeau (2011) found that 30% of the time participants indicated they were disengaged from the stimulus input but still thinking about the task. Smallwood et al. (2004) reported similar data. Baird et al. (2012) found that the rate of mind wandering was related to creative solutions to a prior unrelated task, suggesting that processing unrelated to the current stimulus might nonetheless be relevant to tasks encountered just previously. Smallwood (2013) argued that decoupling processing from perceptual input is used to foster coherence of self-generated thought rather than initiating episodes of mind wandering per se. These observations raise the possibility that in reading an extended text, mental resources might be devoted to aspects of the story that had been encountered previously rather than to mind wandering. Such processing would be noncontingent in that it would not be directly related to the word and sentence being fixated but rather pertain to previous material or broader processing of the story world. Thus, in principle, noncontingent processing has the potential to improve some aspects of comprehension. Although this possibility is not ruled out by most conceptions of mind wandering in reading, there are, to our knowledge, no clear demonstrations of such a phenomenon. A central goal of the present article is to demonstrate at least one manipulation that can lead to noncontingent processing with the potential for such beneficial effects.

To investigate the effects of mind wandering, one must be able to measure when it occurs. Perhaps the most obvious technique is to simply ask participants to report when they find themselves mind wandering. Schooler et al. (2004) referred to these as "self-caught" mind wandering episodes. They compared the occurrence of such episodes to a related technique in which participants were periodically interrupted and asked to report if they were mind wandering. These "probe-caught" episodes were more numerous and more closely related to comprehension accuracy than the self-caught episodes. Thus, the probe technique would seem to provide a more accurate assessment of mind wandering during reading, perhaps because self-caught episodes depend on meta-awareness of the mind-wandering state (cf. Smallwood & Schooler, 2006). Other more objective indices of mind wandering have been proposed, including the decorrelation of reading time and lexical variables (Franklin et al., 2011), proof-reading errors (Schad et al., 2012), and changes in evoked potential components (Smallwood et al., 2008). Although these measures correlate with mind wandering, they have not been demonstrated to be as accurate as self-reports. For example, Franklin et al. (2011) estimated that their decorrelation algorithm could predict on-task versus off-task episodes 72% of the time. Although this is clearly better than chance, it leaves many episodes incorrectly classified. Thus, in the present research we used a variation of the probe technique developed by Dixon and Li (2013) in which participants rate their on-task focus on a continuous scale.

We argue that this approach is valuable because readers may devote resources to the task of reading to a greater or lesser extent and a continuous scale may be able to capture relatively subtle variations in such resource allocation (cf. Dixon & Bortolussi, 2013). These variations may be obscured by, for example, requiring a binary distinction between being on-task or off. Although one must be cautious in interpreting such introspective data, the validity of such measures is supported by the correlation between on-task rating and indices of comprehension (e.g., Dixon & Bortolussi, 2013; Schooler et al., 2004).

Noncontingent processing could affect different aspects of comprehension, and consequently the measurement of comprehension needs to be carefully considered. Typically, research on mind wandering in reading has assessed comprehension using recognition measures such as multiple-choice tests. However, Dixon and Bortolussi (2013) argued that the effects of mind wandering on reading comprehension are most likely to be seen in recall indices. This is because the recall is often guided by using the situation model as a recall structure (e.g., Ericsson & Kintsch, 1995). Thus, if mind wandering has its effect on the situation model, adverse effects would be more likely to be seen in recall. In many cases, multiple-choice or true–false questions can be answered based on familiarity with the material, and such familiarity might be garnered automatically even while mind wandering.

In the present research, we investigated a manipulation that might affect the degree of mind wandering and other noncontingent processing. Although much of the research on mind wandering has examined its effects, it is also critical to a complete understanding of the phenomena to establish what the controlling variables are that determine when and the extent to which mind wandering will occur (cf. Smallwood, 2013). Although evidence on this problem is not extensive, several variables have been identified that affect the rate of mind wandering: the interest value of the material (Dixon & Bortolussi, 2013; Giambra & Grodsky, 1989; Unsworth & McMillan, 2013), time on task (Risko, Anderson, Sarwal, Engelhardt, & Kingstone, 2011), alcohol (Sayette, Reichle, & Schooler, 2009), and the importance of other task-unrelated concerns (McVay & Kane, 2013). The present research contributes to this literature by developing the straightforward insight that because contingent processing requires a stimulus to be present, noncontingent processing could be induced by simply not presenting the stimuli. Thus, in the context of reading, we attempted to promote noncontingent processing by introducing a delay between sentences while they were being read. If this manipulation is successful, it would provide another in a short list of variables known to affect the extent to which noncontingent processing occurs. Our evidence further bears on whether an increase in noncontingent processing would be related to the frequency of mind wandering and the extent of subsequent recall.

There were three conditions in the experiment. In the immediate condition, each sentence was presented on the computer screen shortly after participants

pressed the space bar. Thus, there was no impediment to a natural reading of the text. In the constant-delay condition, there was a 2-s pause after the space bar was pressed and before the sentence appeared on the screen. We reasoned that this additional delay would provide an opportunity for noncontingent processing without making the reading task inordinately difficult. Finally, in the random-delay condition, the 2-s pause occurred randomly on half the sentences. If the effects of the constant delay are related simply to the additional time provided during reading, then the random-delay condition should be much less effective because only half as much additional time is provided. On the other hand, if the mere fact of having at least some of the sentences delayed is important, then the random-delay and the constant-delay conditions may be comparable.

METHODS

Stimuli

Participants read three short stories by Ray Bradbury, "Marionettes, Inc.," "The Murderer," and "The Million Year Picnic." The stories consisted of 2,534, 2,892, and 3,433 words and 307, 288, and 321 sentences, respectively (Bradbury, 2010). The stories were read sentence by sentence in 18-point Times font on a 50.8-cm iMac computer screen (Apple Inc., Cupertino, California) at viewing distance of approximately 50 cm.

Participants

Participants were 36 undergraduate students who volunteered for the study as part of an introductory psychology course requirement. Each participant read all three stories, with the order of stories and the assignment of story to delay condition counterbalanced across all 36. However, the data from one participant were incomplete and were omitted.

Procedure

The stories were presented sentence by sentence under participants' control. After reading each sentence, the participant pressed the space bar to advance to the next sentence. A plus sign remained on the screen near the left edge of the screen as a fixation point. Sentences began just to the right of the fixation or, in the case of sentences that began a new paragraph, indented by 0.7 cm.

In the immediate condition, each succeeding sentence was presented 0.2 s after participants pressed the space bar; in the constant-delay condition, the sentence was presented 2.2 s after the key press; and in the random-delay

condition, the sentence delay was random: 0.2 s with probability .5 and 2.2 s with probability .5. When the sentence presentation was delayed, an ellipsis appeared on the screen during the delay.

At nine points during the story presentation, when participants pressed the space bar an on-task probe was shown. The probe consisted of the question, "Were you fully focused on the story or were you thinking of something else?" Participants responded by using the mouse to click on a 14.6-cm bar shown on the screen. The bar was colored with a gray scale gradient from white to black, with the words, "Definitely thinking of something else," "Thinking of something else to some extent," "Focused on the story to some extent," and "Definitely focused on the story," arrayed underneath. The bar was a total of 578 pixels in length, and on-task responses were measured in terms of pixels to the left or right of the bar midpoint, where negative values indicated a "thinking of something else" response and positive values indicated a "focused on the story" response. Thus, responses could range from -289 to $+289$. Although there were no points on the bar corresponding to the four labels, each occupied about one-fourth of the length of the bar. Probe points were selected in the stories at roughly equal but unpredictable intervals. The interval between probes averaged 31.7 sentences with a standard deviation of 3.9. After reading each story, participants were asked to recall as much of the story as they could and typed their recall protocol using the TextEdit program (Apple Inc., Cupertino, California).

Analysis

We eschewed null hypothesis significance testing because of the well-established problems in its application and interpretation (e.g., Cohen, 1994; Dixon & O'Reilly, 1999; Wagenmakers, 2007). Instead, we compared nested models of the results to describe the evidence provided by our results. The nested models generally differed in a single effect or contrast, and a model with that effect was compared with a model without that effect using likelihood ratios. The likelihood ratio describes the likelihood of the data given one model relative to that given a second model. Thus, very large values of the likelihood ratio indicate that one model fits the data substantially better than the other. Following the suggestion of Glover and Dixon (2004), the likelihood ratios were adjusted for the different number of parameters in the models based on the Akaike information criterion (Akaike, 1973), yielding a statistic we label as λ_{adj}. Thus, the model comparison was tantamount to selecting one of two models based on the Akaike information criterion value, a common approach to model selection.

By way of comparison, an adjusted likelihood ratio of about 3 corresponds approximately to an attained significance level of .05 in some prototypical hypothesis testing scenarios. For example, the adjustment based on Akaike information criterion is e^{k}, where k is the difference in the number of parameters.

Thus, if there is one additional parameter, an adjusted likelihood ratio of 3 implies an unadjusted likelihood ratio of 8.15. If there are three conditions in a repeated measures design with 36 participants (comparable with the present experiment), there would be 72 independent observations within subjects and 70 degrees of freedom for the error term. The F ratio corresponding to a likelihood ratio of 8.15 can then be calculated from Equation 10 of Glover and Dixon (2004): $F(1, \ df_{error}) = df_{error} \ (\lambda^{2/n} - 1) = 70 \ (8.15^{2/72} - 1) = 4.20$. This corresponds to an attained significance level of .04.

Four measures were calculated for each story: the total number of words in the recall protocol, an overall assessment of the quality of the recall, the median of the nine on-task responses for that story, and the median reading time per word. The quality of the recall was rated independently by two judges, blind to condition. The judgment was based on the completeness of the story structure and the level of detail. A scale from 1 to 5 was used where 1 was minimal recall and 5 was a good summary of the plot plus additional details. The interjudge reliability was .83. Because the delay manipulation and the recall measures were limited to each story and subject, we constructed aggregate measures of on-task response and reading time to relate to those measures. For on-task responses, we used the median response for each story and subject. For reading times, we first calculated time per word for each sentence, excluding the title. Among these times, 5.3% of the sentences were excluded as outliers with reading time per word greater than 0.750 s or less than 0.050 s. The median of these times was used for each story and subject.

Models were fit to the results using the program lmer (Bates, Maechler, Bolder, & Walker, 2014) in the R statistics environment (R Core Team, 2014). Model comparisons began with a base model that included the story being read and the linear trend in serial position. The dependent variables were assumed to vary randomly with participant. We then compared the base model with successively more complex models in which further variables or contrasts were added. The adjusted likelihood ratio provides an indication of how much better the more complex model matches the data, while compensating for the flexibility accruing from its additional degrees of freedom.

RESULTS

We first assessed the effect of delay condition on on-task response. The estimated mean response is shown in Table 1. As can be seen, on-task responses were somewhat higher in the immediate condition and similar and lower in the two conditions with delay. We constructed a contrast that compared the immediate condition with the two delay conditions; adding this contrast to the base model led to a clear improvement, $\lambda_{adj} = 6.63$.

TABLE 1
On-Task Response, Recall Words, and Recall Rating (and Standard Error) as a
Function of Delay Condition

	Condition		
	Immediate	*Random Delay*	*Constant Delay*
On-task response (pixels)	110.2 (11.6)	71.0 (11.6)	63.9 (11.6)
Recall (words)	494.1 (22.3)	488.9 (18.8)	508.3 (18.2)
Recall rating (points: 1–5)	2.57 (0.13)	2.68 (0.11)	2.72 (0.11)
Recall rating on-task effectiveness (points/pixel)	0.0011 (0.0014)	0.0034 (0.0011)	0.0031 (0.0011)
Reading time (s/word)	0.253 (0.004)	0.262 (0.004)	0.262 (0.004)

We next assessed the effect of delay condition on the number of words recalled (shown in Table 1). In this case, there was little indication that recall varied with condition, and adding the delay contrast to the model led to no improvement, $\lambda_{adj} = 1.00$. However, as might be expected from previous research, recall was related to on-task response: For example, across participants and conditions, the correlation between the two variables was .35. To explore the possibility that the effect of delay condition on recall was moderated by whether participants were on task, we added on-task response as a covariate separately for each condition and then assessed whether the covariate improved the model. Such covariates are effectively linear regression lines that predict variance that is left unexplained by the factors in the model. To reduce the error variance in these model comparisons, we also included two other variables that had some effect on recall but were orthogonal to the question of interest: Words recalled tended to decrease over story serial position, and the overall relationship between recall and probe response tended to decrease as well. These variables were included in all models considered. When response was added for the immediate condition, there was no improvement, $\lambda_{adj} = 0.46$. However, when on-task response was added for either the constant-delay or the random-delay condition, there was a some improvement in the model, $\lambda_{adj} = 3.32$ and $\lambda_{adj} = 4.18$, respectively. Overall, a model in which the covariate was limited to the delay conditions (and 0 was used for the immediate condition) was better than a model that simply included on-task response as a covariate for all conditions, $\lambda_{adj} = 6.82$. As well, a model that included on-task response as a covariate that interacted with delay condition was substantially better than a model without those effects, $\lambda_{adj} = 26.66$.

The model with different covariates in each condition is illustrated in Figure 1. The positions of each of the three plotted points depict the overall effect of delay condition on on-task response (indicated by the horizontal positions and error bars) and on words recalled (indicated by the vertical positions and error bars). The plotted lines depict the relationship between recall and on-task response
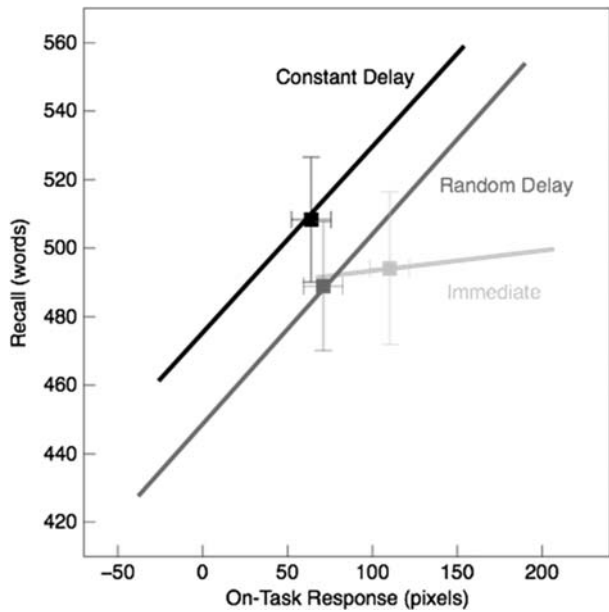
FIGURE 1   The effect of delay condition on the relationship between on-task response and recall. Each plotted point and associated error bars indicate the overall effect of condition on on-task response (in the horizontal dimension) and on words recalled (in the vertical dimension). The lines plotted through those points indicate the regression line for on-task response entered as a covariate separately for each condition in an analysis of recall. The lines are plotted over the interquartile range of on-task response in each condition. On-task responses could range from -289 to $+289$ pixels.

within each of the three conditions, that is, the effect of on-task response when included as a covariate. (The lines are plotted over the interquartile range of the on-task response in each condition.) Figure 1 makes it clear that although the delay condition does not affect overall recall, it moderates the effect of on-task response. In particular, increasing on-task response leads to greater recall when there is a delay before the onset of sentences but has little effect when there is no delay.

Figure 2 provides a different depiction of this effect. In this case, the magnitude of the covariate regression coefficient (i.e., the slope of the lines plotted in Figure 1) are shown for each condition. These coefficients can be interpreted as the increase in recall for a given increase in on-task response. Thus, in the two delay conditions, there is greater recall when participants are on task and relatively less when they indicate that they are thinking about something else. This relationship can be thought of as a form of effectiveness: How effective is an increase in task focus at improving subsequent recall? In this light,
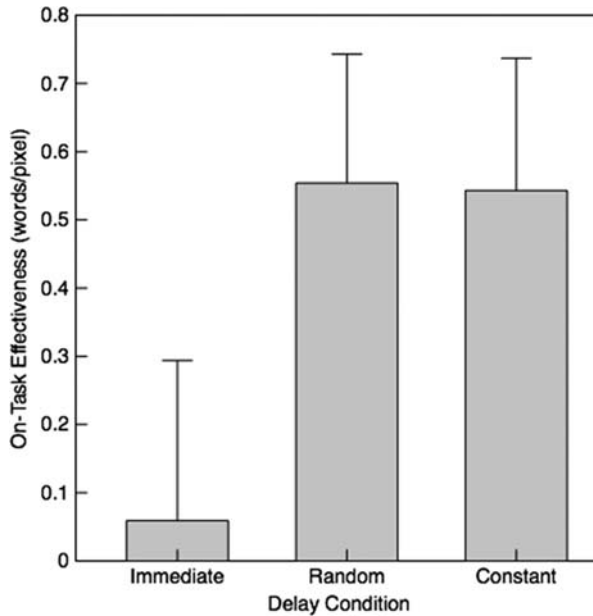
FIGURE 2   On-task effectiveness as a function of delay condition. On-task effectiveness indicates the extent to which recall increases as function of increasing on-task response and is calculated as the slope of the regression line for on-task response entered as a covariate separately for each condition in an analysis of recall.

the delay conditions produce effective focus, whereas the immediate condition does not.

Results for recall rating are shown in Table 1. Rating was highly correlated with recall words, $r = .89$. The same model comparisons were used as for recall words, and these showed comparable effects. In particular, there was no overall evidence for an effect of condition, $\lambda_{adj} = 0.48$, and a model with on-task response as a covariate that interacted with condition was substantially better than a model without those covariates, $\lambda_{adj} = 22.25$. Table 1 ("Recall rating on-task effectiveness" row) also shows the slope of the regression line for probe response when entered as a covariate, comparable with the results shown in Figure 2 for recall words. The results for recall rating were consistent with those for recall words in that a model in which the response covariate was limited to the delay conditions was better than a model in which response simply had an overall effect, $\lambda_{adj} = 2.51$. However, this pattern was not as robust as that for recall words. For both recall words (Figure 2) and recall rating (Table 1), there is good evidence that probe has an effect in the delay conditions and little

evidence for such an effect in the immediate condition. Although quality of recall is an important measure to consider, our index in this study was a relatively informal subjective assessment and may have been affected by a variety of extraneous variables (e.g., the participant's general language facility). Consequently, our principal dependent variable was the objective measurement of recall words.

Reading times across conditions are shown in Table 1. There was no evidence that reading time varied with condition, $\lambda_{adj} = 0.67$, and no evidence that reading time varied with on-task response, $\lambda_{adj} = 0.38$.

DISCUSSION

The results indicate that although adding a delay before sentences has no overall effect on recall, it does moderate the effect of being on task: When there is no delay, on-task response has little relation to recall; however, with a delay, recall varies systematically as a function of on-task response. Our claim is that adding the delay instigates noncontingent processing. Further, the variation in on-task rating in these conditions suggests there is variation in the nature of that noncontingent processing. We suggest as a plausible possibility that when participants are focused on the story, the noncontingent processing includes further processing of the story that, in turn, this leads to better recall. On the other hand, when participants are less focused on the task, noncontingent processing is more likely to include mind wandering; this leads to poorer recall. Thus, on our analysis the relationship between on-task response and recall found in the delay conditions is a function of noncontingent processing, either of the story or of other off-task concerns.

The pattern of results can be also be described in terms of the effectiveness of on-task focus. On-task effectiveness can be conceived of as the increase in recall for a given increase in on-task focus. In the immediate conditions, effectiveness is relatively low, so those who report being focused on reading only recall a small amount more than those who do not. In the delay conditions effectiveness is higher, with those who are more on task recalling substantially more. The improvement in recall is presumably mediated by the nature of the processing that readers engage in during the delay. We conjecture, for example, that the additional time may provide an opportunity for rehearsing events of the story, elaborating the situation model for the story, and so on. Intuitively, the benefit of the delay in these instances can be characterized as an opportunity to pause and "let things soak in." One possibility is that the delay allows participants to identify temporal structure in the narrative (e.g., Radvansky & Copeland, 2010) and that such a structured representation supports better recall. A pause might also allow participants to replenish depleted cognitive resources. An interesting

aspect of the results, however, is that there was little apparent difference in effectiveness between the constant-delay condition and the random-delay condition, despite the fact that the constant-delay condition had, on average, twice as much additional time inserted between sentence presentations. This pattern of results suggests that merely some opportunity to engage in noncontingent processing can have a beneficial effect on recall.

Given our interpretation, the pattern of results in the immediate condition is somewhat of a puzzle. Figure 1, for example, suggests that when participants were fully focused on the task of processing and comprehending the story, performance was better in the delay conditions than in the immediate conditions. In other words, with equivalent, high on-task response, enforcing a delay improves recall. However, in principle, there is no reason why participants could not have paused of their own accord during the reading of the story to engage in the noncontingent processing that would produce higher recall. One possibility is that participants were not strongly motivated to study the story for later memory or deeper appreciation. For example, in the immediate condition, a typical approach might be to read the story without any pauses to find out how the story ends. In other words, participants may be motivated to pursue the events of the story with little of the elaborative processing that would support later recall. Indeed, story recall in the immediate condition was rated as weak-to-adequate according to our recall scoring, corresponding to some portion of the story-world events with little detail, and there was little improvement in quality with increasing on-task rating (as indicated by the regression coefficient in Table 1). In contrast, the delay condition forces participants to pause and provides the opportunity to consider the story more deeply. This could lead to the pattern in which recall with high on-task rating (i.e., Figure 1, right) appears to be superior in the delay conditions.

Although the present results are preliminary, this analysis suggests the delay manipulation introduced here could have pedagogical implications. If participants read educational material on an electronic device, it would be straightforward to have that device delay presentation of the material to enforce noncontingent processing just as in the current experiment. When readers are focused on the task, this additional time could lead to elaboration and better recall as demonstrated here. There could be additional benefits as well, such as deeper inferencing and better connections to prior knowledge, that were not assessed in the present experiment. However, the present results also indicate the additional delay could simply lead to further mind wandering for some participants. Consequently, any manipulation of delay in such a context would have to be combined with a strong incentive to attend to the task. The present results suggest it may be important to explore the interactions of such incentives with the delay manipulation.

In conclusion, our results demonstrate that noncontingent processing is heterogeneous, and our suggestion is that such processing is sometimes devoted to mind wandering and is sometimes devoted to further processing of the text.

We conjecture that such noncontingent processing of the text may involve processing the material at a deeper level. This implies that identifying perceptual decoupling with mind wandering may be simplistic.

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