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Perceptual decoupling in the sustained attention to response task is likely: Comment on Bedi, Russell, & Helton (2024)

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Abstract

Recent work by Bedi, Russell, & Helton (2024) posits that perceptual decoupling in the sustained attention to response task (SART) is unlikely. In this commentary, we challenge their broad titular claim by revisiting two important studies: Smallwood et al. (2008) and deBettencourt et al. (2019). These studies demonstrate that lapses in attention during the SART are associated with degraded neural responses and impaired memory encoding. Diminished P300 amplitudes during commission errors and periods of mind-wandering suggest that external perceptual processing is compromised when attention shifts inward. Moreover, recent methodological innovations that integrate real-time monitoring of attentional state have provided evidence of perceptual decoupling in the SART using an interleaved working memory task. Our review is meant to reaffirm the task's value in studying sustained attention, mind-wandering, and perceptual decoupling. We argue that existing evidence supports a conjecture that perceptual decoupling in the SART is likely, and that valuable new methods allow us to pivot away from commission errors as a behavioral proxy for lapsing attention.

Keywords: perceptual decoupling, sustained attention, mind-wandering, response bias

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Perceptual decoupling in the sustained attention to response task is likely: Comment on Bedi, Russell, & Helton (2024)

Imagine tapping the same button over and over again to a stream of digits with the intent of withholding responses to rare 3s. You begin to think: “why would a scientist invite me into their lab and instruct me to do something so dull and monotonous?” As these thoughts percolate, your eyes begin to glaze over. You suddenly realize — too late — that you just pressed the button to the number 3.

The sustained attention to response task (SART) is one such monotonous task that has been used for nearly three decades to study fluctuations in sustained attention in the lab (Robertson et al., 1997). It has provided insights into neural, physiological, and phenomenological correlates of lapsing attention and the accompanying experience of perceptual decoupling (e.g., Christoff et al., 2009; Keene et al., 2022; Smallwood et al., 2004). During decoupling, attention disengages from external perception (Schooler et al., 2011). A common assumption is that the SART is especially conducive to perceptual decoupling due to its repetitive and mindless nature.

In contrast with this assumption, Bedi, Russell, & Helton (2024) recently published a study titled “Perceptual decoupling in the sustained attention to response task is unlikely” in *Experimental Brain Research*. In one behavioral experiment, they examined whether perceptual decoupling is a significant determinant of commission errors on the SART. They found that errors were better explained by response leniency than a failure to consciously perceive stimuli. While informative, we believe that their evidence does not support the statement made in the article’s title. The purpose of our commentary is to correct the titular claim of Bedi, Russell, & Helton (2024) by describing two particularly influential studies — Smallwood et al. (2008) and deBettencourt et al. (2019) — which provide strong evidence of perceptual decoupling during the SART. We contend that the SART remains a useful tool for studying mind-wandering, perceptual decoupling, and other dimensions of sustained attention in newer ways that turn the spotlight away from commission errors.

If perceptual decoupling happens during the SART and reduces the processing of external events, one would expect 1) a reduction in neural responses to external stimuli and 2) a degradation of encoding into memory. On the first point, Smallwood et al. (2008) assessed electrophysiological activity during the commission errors and mind-wandering self-reports in the SART. Specifically, they looked at the P300 event-related potential (ERP), which is a positive deflection in the stimulus-evoked response that occurs about 300 ms after the processing of a task-relevant stimulus. In our view, a reduced ERP response serves as a powerful neural indicator of perceptual decoupling. This particular response is thought to generally reflect the amount of resources allocated to stimuli from the environment so that it can be encoded into working memory (Polich, 2007); as a result, a dampened P300 response to an external stimulus indicates these processes were degraded because the observer was presumably attending to something else, such as an internal stream of task-unrelated thought (mind-wandering; Smallwood & Schooler, 2015). Smallwood & colleagues indeed showed that ERPs were reduced during both commission errors (vs. correct withholding) and task-unrelated thoughts (vs. on-task reports). Furthermore, the P300 amplitude prior to these proposed indices of lapsing attention correlated with one another, suggesting that both commission errors and mind-wandering reflect a common attentional state characterized by reduced processing of external events. On a related note, we can infer that the phenomenological experience of mind-wandering is extremely frequent during the SART based on much work in subsequent years (e.g., Stawarczyk et al., 2011; Christoff et al., 2009, Kane et al., 2021), and other findings show that

signatures of perceptual decoupling during mind-wandering are persistent across paradigms and modalities (e.g., Baird et al., 2014; Kam et al., 2011). Therefore, since mind-wandering occurs during the SART and perceptual decoupling occurs during mind-wandering, it is reasonable to conjecture that perceptual decoupling during the SART is *likely* at the very least.

Second, deBettencourt et al. (2019)'s series of experiments showed that interactions between attentional state and other phenomena in cognitive psychology, such as memory encoding, can be studied using a modified version of the SART. They interleaved a SART with working memory probes that prompted the participant to report the colors of stimuli on the previous trial. A perceptual decoupling account suggests that this working memory report should be less accurate during conventional behavioral SART indices of lapsing attention, such as errors. This would be because a lapse should reduce the encoding of colors due to insufficient external attentional selection. That is exactly what they found — working memory performance was lower after rare trial errors than after correct responses. In following experiments, they ruled out the possible confound of error-related processing explaining the working memory reduction by leveraging a real-time triggering procedure (Shelat et al., 2024) to predict participants' attentional state via intrasubject response time fluctuations and then inserting probes after only frequent trials. This work demonstrates the flexibility of new versions of the SART in assessing other consequences of attentional lapses and perceptual decoupling beyond just errors of commission (e.g., deBettencourt et al., 2018; Wakeland-Hart et al., 2022; Corriveau et al., 2024).

While we agree that commission errors can be explained by reasons beyond perceptual decoupling, the evidence presented by Bedi, Russell, & Helton (2024) does not adequately support their broad titular claim that perceptual decoupling in the SART is unlikely, especially given findings from Smallwood et al. (2008) and deBettencourt et al. (2019). We argue that perceptual decoupling is actually *likely* during the SART, though we recognize the methodological and operational constraints of the SART in sustained attention studies (see Dang et al., 2018; Seli, 2016; Seli et al., 2013). Bedi et al.'s (2024) consideration of response bias as a possible explanation for dimensions of vigilance that we hold near and dear today can only strengthen the field as a whole (Skinner & Giesbrecht, 2025).

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