

## Attention States in the Sustained Attention to Response Task: Effects of Trial Duration, Mind-Wandering and Focus

**Authors :** Aisling Davies, Ciara Greene

**Abstract :** Over the past decade the phenomenon of mind-wandering in cognitive tasks has attracted widespread scientific attention. Research indicates that mind-wandering occurrences can be detected through behavioural responses in the Sustained Attention to Response Task (SART) and several studies have attributed a specific pattern of responding around an error in this task to an observable effect of a mind-wandering state. SART behavioural responses are also widely accepted as indices of sustained attention and of general attention lapses. However, evidence suggests that these same patterns of responding may be attributable to other factors associated with more focused states and that it may also be possible to distinguish the two states within the same task. To use behavioural responses in the SART to study mind-wandering, it is essential to establish both the SART parameters that would increase the likelihood of errors due to mind-wandering, and exactly what type of responses are indicative of mind-wandering, neither of which have yet been determined. The aims of this study were to compare different versions of the SART to establish which task would induce the most mind-wandering episodes and to determine whether mind-wandering related errors can be distinguished from errors during periods of focus, by behavioural responses in the SART. To achieve these objectives, 25 Participants completed four modified versions of the SART that differed from the classic paradigm in several ways so to capture more instances of mind-wandering. The duration that trials were presented for was increased proportionately across each of the four versions of the task; Standard, Medium Slow, Slow, and Very Slow and participants intermittently responded to thought probes assessing their level of focus and degree of mind-wandering throughout. Error rates, reaction times and variability in reaction times decreased in proportion to the decrease in trial duration rate and the proportion of mind-wandering related errors increased, until the Very Slow condition where the extra decrease in duration no longer had an effect. Distinct reaction time patterns around an error, dependent on level of focus (high/low) and level of mind-wandering (high/low) were also observed indicating four separate attention states occurring within the SART. This study establishes the optimal duration of trial presentation for inducing mind-wandering in the SART, provides evidence supporting the idea that different attention states can be observed within the SART and highlights the importance of addressing other factors contributing to behavioural responses when studying mind-wandering during this task. A notable finding in relation to the standard SART, was that while more errors were observed in this version of the task, most of these errors were during periods of focus, raising significant questions about our current understanding of mind-wandering and associated failures of attention.

**Keywords :** attention, mind-wandering, trial duration rate, Sustained Attention to Response Task (SART)

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