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Inside the commuting driver's wandering mind

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ABSTRACT

The aim of this study was to explore how frequently drivers report mind wandering during their daily commute, and to learn more about how conscious and unconscious processes combine during everyday driving. We recorded 587 thought samples across 110 drives by eleven female participants aged between 28 and 48 years who regularly drive between home and work. Using a probe-catch descriptive experience sampling procedure, thought samples were captured and categorised according to whether they were driving-related or not, and according to their trigger (sensory vs internal). We found that drivers on the daily commute reported mind wandering on 63% of reports, and were actively focused on the driving task for between 15% and 20% of samples. For the remaining one fifth of thought samples, drivers were not actively thinking about anything in particular. Over half of drivers' mind wandering reports were related to things they saw or heard, suggesting that although they are not directly focused on driving all of the time, they frequently and habitually scan the road and roadside environment. When momentary driving task demands do not command attention, drivers' minds wander towards personal current concerns. Mind wandering is often triggered by what drivers see or hear. These findings suggest that in familiar, undemanding situations, drivers are more likely to be found mind wandering than focusing on driving, however mind wandering is swiftly interrupted when driving task demands command effortful attention. The results have implications for research into mind wandering, implying that a baseline of sustained task focus is not the norm when driving the daily commute. Researchers and policy-makers ought to consider how to design road and traffic systems that align with drivers' unconscious expectations.

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1. Introduction

Mind wandering is a common experience during everyday life, particularly during routine, familiar activities. Allowing our minds to wander to task-unrelated thoughts is relatively harmless during most of these everyday activities, such as while reading a book (Smallwood, McSpadden, & Schooler, 2008). Somewhat more surprisingly, mind wandering (MW) is also relatively common during everyday driving, according to drivers themselves (Burdett, Charlton, & Starkey, 2016). The suggestion that it is normal for drivers to experience MW during an everyday drive seems counter-intuitive, because driving, unlike reading a book, is inherently risky. Nevertheless, although drivers may routinely engage in MW while driving to and from home and work, they do not routinely crash. It may be that because crashes are rare events, drivers allow their minds to wander. Alternatively, it may be that everyday driving by its nature does not always require sustained attention.

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In contrast to MW, engaging in some types of task-unrelated thought while driving appears to be unambiguously hazardous. For example, drivers' use of mobile phones for conversations or texting significantly increases the risk of a crash (Beanland, Fitzharris, Young, & Lenné, 2013; Caird, Willness, Steel, & Scialfa, 2008). If we are to make sense of this apparent paradox and understand how and when drivers' minds can safely wander, we need to learn more about what drivers think about during everyday driving, and how their focus shifts between driving and other, unrelated thoughts during a routine, familiar drive. As a starting point, it would appear to be important to simply determine the extent of MW in driving: that is, how often drivers report mind wandering, and what captures their attention during an everyday drive.

The fact that there are few published studies of MW frequency in everyday driving reflects both the difficulties in observing and measuring MW, as well as a longstanding problem in driver behaviour psychology, namely that the interaction of conscious and unconscious processes during everyday driving is poorly understood (Charlton & Starkey, 2011; Martens & Brouwer, 2013). To date, what little we know about when and how often drivers' minds wander has come from retrospective questionnaires (Berthié et al., 2015; Burdett et al., 2016; Galéra et al., 2012). Although questionnaires give some indication of drivers' reported tendency to experience MW, they may not be reliable indicators of MW frequency during everyday driving because of limitations associated with retrospective accounts generally, and our lack of insight into the experience of MW specifically.

Although they have not established the frequency of MW, driving simulation studies have explored the effect of MW on aspects of behaviour such as eye fixation duration, driving speed and headway to a lead vehicle (He, Becic, Lee, & McCarley, 2011; Yanko & Spalek, 2013). He et al. (2011) asked drivers to report when they noticed that their minds were wandering during a simulated car-following task. They found a positive correlation between MW and narrowed gaze patterns during the 12 s preceding a self-caught MW episode (He et al., 2011). Yanko and Spalek (2013) periodically asked participants completing a simulated driving task whether or not they were thinking about the task (a probe-catch procedure). They found that participants drove faster, with shorter headways and slower response times when they reported MW than when they reported driving task focus (Yanko & Spalek, 2013).

One potential problem with these laboratory studies is that attention and driving performance are known to change with repeated practice in driving simulation. This was revealed by Charlton and Starkey (2013) who studied the effects of practice on conscious and unconscious processes during simulated driving. They found that driving performance including lane position and mean speed differed between a group that drove the simulated route repeatedly across twenty sessions, and a group who drove the same simulated route just once. The one-off group reported higher task difficulty, while difficulty ratings among the repeated-sessions group reduced over time, with several participants volunteering that they drove on "autopilot" or were "thinking about food" after the first three to five sessions. Thus, although laboratory simulation can be used to investigate aspects of driving as a proceduralised activity if repeated often enough, baseline results from a single simulation session are not likely to reflect baseline performance during normal, everyday driving in the real world (Charlton & Starkey, 2013).

The laboratory environment is particularly limited in its ability to give any insight into the frequency or nature of MW in normal, everyday driving. Driving a simulated journey as a research participant is likely to foster a different kind of conscious experience than driving in the real world, not least because theories suggest that MW may be triggered by an individual's underlying momentary goals, or current concerns (Klinger, 1975). Driving between home and work on an everyday journey is conceivably likely to trigger different concerns than may manifest in a university driving simulator or during an experimental drive with no explicit purpose from the participant driver's perspective. Participants in the He et al. (2011) study, for example, were instructed to "keep their attention on the driving task as much as possible" (p. 15). There is no evidence to suggest that drivers in the real world actually operate with this level of diligence.

To find out how often drivers' minds wander, it may be useful to study them on a familiar trip such as the daily commute between home and work. Berthié et al. (2015) found that drivers were more likely to report MW during their most recent trip if it was their daily commute, and in general drivers report more MW driving their own cars on familiar roads (Burdett et al., 2016). Research involving qualitative analysis of interviews has also suggested that drivers readily report driving on "autopilot" during familiar drives such as the daily commute (Handy, Weston, & Mokhtarian, 2005; Papp et al., 2004; Steinberger, Moeller, & Schroeter, 2016).

MW during the daily commute can perhaps best be studied using experience sampling, which has long been used to investigate natural conscious experience during everyday life. Klinger (1975) pioneered experience sampling by equipping participants with a pager, notebook and pencil so that they could record their thoughts when paged at random as they went about their lives. The procedure was found to be a useful and unobtrusive method to capture insights into the content of everyday thought outside of the laboratory (Klinger, 1975). More recently, experience sampling research has revealed that attention fluctuates between MW and task focus during all manner of everyday activities (Killingsworth & Gilbert, 2010).

In experience sampling studies, thoughts are often categorised in some way by the participant, according to mood, for example (Killingsworth & Gilbert, 2010) or the temporal focus of the thought as past, present or future (Baird, Smallwood, & Schooler, 2011). Descriptive experience sampling is a specific version of the method where participants describe what they are thinking about when probed, without being confined to specific categories (Hurlburt & Akhter, 2006). Although not widely used in traffic psychology to date, it has potential to provide insight into complexities associated with the content and flow of conscious experience that cannot be captured by analysis of categorised thought samples in isolation from their context (Engelbert & Carruthers, 2011). Descriptive experience sampling is a form of ambulatory assess-

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