

Research Statement  
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My research focuses on attention and performance from both theoretical and applied perspectives. On the theoretical front, my research seeks to better understanding basic mechanisms of selective and divided attention. On the applied side, my research is directed towards understanding how these basic mechanisms play out in real-world situations. However, I view the distinction between basic and applied research as being somewhat artificial: Good applied research can often provide important insights into the basic mechanisms of human cognition and basic research can lead to new directions in applied research. In the following paragraphs, I briefly summarize two lines of my research that illustrate these theoretical and applied themes and then I discuss some future directions of my work.

One line of my research examines how well our theoretical understanding of attention and multitasking scale to real-world situations such as driving and automobile. The task of operating a motor vehicle provides an excellent venue for studying divided attention in natural environments. Driver distraction is increasingly recognized as a significant source of injuries and fatalities on the roadway. In fact, naturalistic studies have found that up to 90% of the crashes involved driver distraction in one form or another. Driver distraction can arise from visual/manual interference, for example when a driver takes his or her eyes off the road to interact with a device. Impairments also come from cognitive sources of distraction when attention is diverted from safely operating the vehicle. In the latter case, the driver's eyes may be on the roadway and their hands on the steering wheel, but they may not be attending to the information critical to safe driving. Concern over distracted driving is growing as more and more wireless devices are being integrated into the vehicle. Working with AAA Foundation for Traffic Safety, my lab and I developed and validated a metric of distraction associated with the diversion of attention from driving. Our studies show that the distraction potential can be reliably measured, that visual and cognitive workload systematically varies as a function of the secondary task performed by the driver, and that many activities, particularly newer multi-modal interactions in the vehicle, are associated with surprisingly high levels of mental workload. In fact, using the new technology in the vehicle may have unintended consequences that adversely affect traffic safety. It is noteworthy that the methods we developed are now being applied in Australia to assess human-machine interactions in the vehicle (with the goal of integration of this information into their new car assessment program).

Another line of my research examines the role that interaction in natural environments plays on mental and physical health. This program of research grew out of the Cognition in the Wild seminar I developed to explore this topic. My lab uses objective behavioral and psychophysiological measurements to test predictions derived from attention restoration theory and stress recovery theory. In particular, my research examines both time-domain and frequency-domain changes in the electroencephalographic (EEG) brain activity after participants spend short periods of time (e.g., walking in Red Butte

Garden) or longer-term periods of time (e.g., hiking and exploring in southern Utah) in nature. My lab is the first to provide EEG-based biomarkers associated with these interactions. Specifically, our time-domain event-related brain potential (ERP) studies show modulation in brain activity originating in the anterior cingulate cortex and our frequency-domain analyses show changes spectral power in mid-frontal theta and parietal alpha associated with different nature/technology interactions. It is also important to note that it is very challenging to bring an electrophysiology lab into the field and collect high quality data. I recently gave a TED-X talk on the role that nature plays in our mental experience (see [https://www.youtube.com/watch?v=\\_vRMRBxtZA](https://www.youtube.com/watch?v=_vRMRBxtZA)).

My research program will continue to focus on theoretical and applied issues in attention and performance. On the one-hand, I plan to focus on the role that multitasking and vehicle automation play in driver performance. Driving provides an excellent opportunity to extend our understanding of human behavior from the laboratory to complex real-world situations. I believe that this domain provides a rich test bed for exploring both theoretical and applied issues related to attention and performance and has the potential to contribute significantly to more holistic theory development. This work also has the potential to save lives. On the other hand, I plan to continue my investigations into the role that interactions in nature play on mental and physical health. In particular, my research will continue to explore changes in behavior, EEG brain activity, and other psychophysiological measures associated with both shorter-term and longer-term exposure to nature.