Chapter 2
On Attentional Control and the Aging Driver

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ABSTRACT

Theories of cognitive aging suggest diminished frontal lobe function and reduced attentional control could contribute to age-related changes in driving a motor vehicle. To address this possibility, the authors investigated the interrelationship among age, attentional control, and driving performance. Using a high-fidelity simulator, they measured individual differences in participants' abilities to maintain a prescribed following distance behind a lead vehicle, as well as their reaction time to press a brake pedal when this lead vehicle braked. Consistent with the literature on age-related changes in driving, following distance elongated with increased age, and brake reaction time slowed. Furthermore, regression analyses revealed the increase in following distance and the slowing in brake reaction time both co-varied with age deficits in attentional control. These results provide a novel demonstration of the inherent value of cognitive theory when applied to naturalistic settings, sharpening our understanding of the relevance of age-related deficits in attentional control for complex, real-world tasks like driving.

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INTRODUCTION

The term *attentional control* has been used to refer to cognitive processes that support one's ability to actively maintain task goals in the face of distraction (Kane & Engle, 2002) and are thought to be primarily mediated by Prefrontal Cortex (PFC). Further, evidence from neuropsychological studies implies the PFC is particularly susceptible to age-related decline (Chan & McDermott, 2007; West, 1996). As shown in Figure 1, the cognitive neuroscience literature reveals a striking symmetry between the biological development of frontal cortex across the life span and the corresponding rise and fall of goal-directed behavior (see Watson, Lambert, Miller, & Strayer, 2011, for a recent review). Hence, with advanced age, activities that require PFC-mediated attentional control and managing task goals to resist interference in information processing may become increasingly difficult to complete. Consistent with this argument, decades of laboratory research have reported age-related impairments on cognitive tasks thought to require attentional control such as Stroop color naming, where individuals are instructed to respond to the color of a stimulus like the word "RED" printed in green ink and to ignore conflicting words (Spieler, Balota, & Faust, 1996). While these findings contribute to a vast empirical literature on age-related deficits in controlled

Figure 1. The curvilinear development of frontal cortex across the life span. Developmental changes have been observed in a variety of dependent measures including myelination, dendritic branching, synaptogenesis, glucose metabolism, blood flow, dopamine neurotransmitter function, and brain volume. Adapted from Watson, Lambert, Miller, and Strayer (2011).