

The Correlation between Eye Movements, Attentional Shifting, and Driving Simulator Performance among Adolescents with Attention Deficit Hyperactivity Disorder

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Abstract : Car accidents are a problem worldwide. Adolescents' involvement in car accidents is higher in comparison to the overall driving population. Researchers estimate the risk of accidents among adolescents with symptoms of attention-deficit/hyperactivity disorder (ADHD) to be 1.2 to 4 times higher than that of their peers. Individuals with ADHD exhibit unique patterns of eye movements and attentional shifts that play an important role in driving. In addition, deficiencies in cognitive and executive functions among adolescents with ADHD is likely to put them at greater risk for car accidents. Fifteen adolescents with ADHD and 17 matched controls participated in the study. Individuals from both groups attended local public schools and did not have a driver's license. Participants' mean age was 16.1 (SD=.23). As part of the experiment, they all completed a driving simulation session, while their eye movements were monitored. Data were recorded by an eye tracker: The entire driving session was recorded, registering the tester's exact gaze position directly on the screen. Eye movements and simulator data were analyzed using Matlab (Mathworks, USA). Participants' cognitive and metacognitive abilities were evaluated as well. No correlation was found between saccade properties, regions of interest, and simulator performance in either group, although participants with ADHD allocated more visual scan time (25%, SD = .13%) to a smaller segment of dashboard area, whereas controls scanned the monitor more evenly (15%, SD = .05%). The visual scan pattern found among participants with ADHD indicates a distinct pattern of engagement-disengagement of spatial attention compared to that of non-ADHD participants as well as lower attention flexibility, which likely affects driving. Additionally the lower the results on the cognitive tests, the worse driving performance was. None of the participants had prior driving experience, yet participants with ADHD distinctly demonstrated difficulties in scanning their surroundings, which may impair driving. This stresses the need to consider intervention programs, before driving lessons begin, to help adolescents with ADHD acquire proper driving habits, avoid typical driving errors, and achieve safer driving.

Keywords : ADHD, attentional shifting, driving simulator, eye movements

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