



The relationship between ADHD symptoms and driving behavior in college students: The mediating effects of negative emotions and emotion control

Michele L. Oliver¹, Kyunghye Han, Alexander J. Bos, Richard W. Backs*

Department of Psychology, Central Michigan University, United States

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ABSTRACT

Previous research has shown a relationship between attention deficit-hyperactivity disorder (ADHD) symptoms and driving anger and adverse driving outcomes. Moreover, adults with ADHD symptoms express their emotions in more aggressive ways, indicating a lack of emotion control. The present study surveyed 246 college students to examine the relationship among ADHD symptoms, negative emotions, emotion control, and driving anger and safe driving behavior. Mediating effects of negative emotions and emotional control on the relationship between ADHD symptoms and self-reported driving anger and safe driving behavior were also examined. Both negative emotions and emotion control were significant mediators of the relationship between ADHD symptoms and driving anger, but not safe driving behavior. Mediation was stronger for ADHD-Hyperactive/Impulsive symptoms than for ADHD-Inattention symptoms. These results may provide some insight on how to design training programs for individuals with ADHD symptoms to increase driving safety.

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1. Introduction

Aggressive drivers are a significant community problem, particularly when they are young and inexperienced. Aggressive driving is “the operation of a motor vehicle in a manner that endangers or is likely to endanger persons or property,” (National Highway Traffic Safety Administration: [National Highway Traffic Safety Administration, 2004](#)). More importantly it is punitive in nature with the goal of injuring or harming other drivers ([Galovski, Malta, & Blanchard, 2006](#)). Left unchecked, aggressive drivers often lose their temper in reaction to various traffic situations (such as slow drivers in a fast lane, someone tailgating, or being cut off by other drivers), and they may use their vehicles to make sudden threatening maneuvers on the road, thereby posing a serious traffic safety risk.

What makes some drivers more likely to demonstrate aggressive behaviors on the road than others? Some believe that maladaptive driving behaviors are triggered by external stimuli, in this case the actions of surrounding drivers; whereas, others think that stressors such as the use of cell phones, increased traffic and an overall rushed society may be the root causes ([AAA Foundation for Traffic Safety, 2009](#); [Goodman, Tijerina, Bents, & Wierville, 1999](#); [Strayer & Johnston, 2001](#)). However,

* Corresponding author at: Department of Psychology, Central Michigan University, Mount Pleasant, MI 48859, United States. Tel.: +1 989 289 0679; fax: +1 989 774 2553.

E-mail address: backs1rw@cmich.edu (R.W. Backs).

¹ Present address: Department of Psychology, Texas State University, San Marcos, United States.

many agree that the mood and emotional state of the driver prior to getting behind the wheel may be a more important source (Stutts, Reinfurt, Staplin, & Rodgman, 2001; Trick, Enns, Mills, & Vavrik, 2004). Negative emotions such as anger are defined as explosive or short-lived outbursts leading to loss of control, feelings of provocation, or constant irritation and impatience (Wender, 1995). Additionally, anger has been linked to aggressive and risky driving behaviors (Porter & Berry, 2001) and individuals who have difficulty controlling emotional arousal may be at higher risk for adverse driving outcomes (Barkley, Murphy, DuPaul, & Bush, 2002).

1.1. Driver inattention and vehicular crashes

Research has shown that younger drivers demonstrate more frequent outbursts of anger on the road, engage in more beligerent and risky driving behaviors, and experience more moving violations and accidents than older drivers (Richards, Deffenbacher, & Rosen, 2002). Statistics show that drivers between the ages of 15 and 20 years-old accounted for 6.4% of the over 208 million licensed drivers estimated in the United States in 2007 (National Highway Traffic Safety Administration, 2009). A disproportionate 11% of younger drivers were involved in fatal crashes in 2009; making motor vehicle crashes the leading cause of death for this age group. In addition, adolescents and young adults receive more traffic citations, experience more motor vehicle accidents, perform more poorly in driving simulators, engage in more risky driving behavior, and have their licenses suspended and/or revoked more often than older drivers (Curry, Hafetz, Kallan, Winston, & Durbin, 2011; Williams, 1998)

Safety experts agree that a large percentage of automobile accidents are caused by attention difficulties; specifically problems with selective attention (Fisher & Pollatsek, 2007; Stutts et al., 2003; Trick et al., 2004). Trick et al. (2004) concluded that younger, inexperienced drivers had greater incidence of attention difficulties resulting in more frequent adverse driving outcomes; and younger drivers with disorders such as Attention Deficit-Hyperactivity Disorder (ADHD) may be at an even higher risk.

1.2. Drivers with ADHD

ADHD is a common psychiatric disorder characterized by inattentiveness, excessive motor activity and impulsivity (Diagnostic and Statistical Manual of Mental Disorders [DSM-IV-TR], American Psychiatric Association, 2000; Barkley, 1997; Barkley & Murphy, 1998). A common theme from recent literature is the role of emotional dysregulation in ADHD (Barkley, 2010) and although ADHD is primarily diagnosed in school-aged children, approximately 4% of adults have ADHD (Kessler et al., 2006) with symptoms decreasing in severity with age. Moreover, the impairments associated with ADHD symptoms include poor emotional development (Waschbusch et al., 2002) mood problems, and increased numbers of automobile accidents (Barkley, 2004; Nigg, 2006). Research has shown that drivers with ADHD experience greater numbers of traffic citations, vehicular crashes, and suspended or revoked licenses than drivers without ADHD (Barkley, 2004; Fischer, Barkley, Smallish, & Fletcher, 2007). In light of this research, the question arises whether ADHD symptom dimensions such as inattention and hyperactivity have a direct effect on adverse outcomes in driving. Alternatively, can the relationship between ADHD symptom dimensions and poor driving performance be explained by other factors associated with ADHD?

The expression of emotion is a common and highly frequent experience and is part of the normal process of development (Connor, 2002). However, for individuals with ADHD, the expression of emotion produces the following characteristics: increased levels of reactive aggression, and higher levels of anger associated with aggressive behaviors (King & Waschbusch, 2010). Therefore, a principal problem in individuals with ADHD is the inability to control their impulse to respond to provoking or stressful situations (Ramirez et al., 1997), and in highly intense situations anger may cause maladaptive behavior. In a study of college students, Richards et al. (2002) concluded that students with high ADHD symptoms reported higher state and trait anger and more mood and emotional outbursts than their low ADHD symptom counterparts and demonstrated more driving anger and displayed anger in more hostile ways while driving. Moreover, individuals with ADHD symptoms have difficulty controlling the expression of negative emotions and express their emotions in more aggressive ways than controls (Richards, Deffenbacher, Rosen, Barkley, & Rodricks, 2006). Therefore, although ADHD symptoms are clearly associated with both driving anger and unsafe driving, we propose that a co-existing readiness to express negative emotion and poor emotional control may better explain this association than simply deficits in attention and hyperactivity/impulsivity symptom domains.

1.3. Hypotheses

The present study examined the relationship among ADHD symptoms, negative emotions, emotional control, and driving anger and safe driving behavior in young adults. First, we predicted that ADHD symptoms would be positively associated with driving anger (hypothesis 1), but negatively associated with safe driving behavior (hypothesis 2). We also expected ADHD symptoms would be positively related with the expression of negative emotions (hypothesis 3), and positively associated with an inability to control (dysregulation) their emotions (hypothesis 4). Furthermore, the expression of negative emotions was predicted to be positively associated with driving anger (hypothesis 5) and negatively associated with safe driving behaviors (hypothesis 6), whereas emotion control would be positively associated with driving anger (hypothesis 7) and negatively associated with safe driving behaviors (hypothesis 8). Lastly, we expected that negative emotions and

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