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Expert Recommendations for Improving Driving Safety for Teens and Adult Drivers with ADHD

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For many teenagers and young adults, driving emerges as an essential activity of daily living that promotes independence and facilitates mobility. While several aspects of driving become automatic over time, driving continues to be a complex task involving coordination of cognitive and motor demands that continuously shift based on changes in the environment (Fuermaier et al., 2015). As such, adolescents and adults that present with underdeveloped attention, inhibitory control, and executive functions are at heightened risk for compromised driving safety (Barkley et al., 1996). Drivers with ADHD experience more frequent crashes and a higher number of traffic violations (Aduen et al., 2015, 2018; Fischer et al., 2007; Vaa, 2014), with evidence suggesting that these rates do not decline in adulthood like they do for drivers without ADHD (Kay et al., 2009). On average, drivers with ADHD are involved in a motor vehicle crash every two years, and this frequency doubles for drivers with the most severe ADHD symptoms (Aduen et al., 2018). Drivers with ADHD are more likely to have their driver's license suspended or revoked, and are more likely to be legally 'at fault' for traffic accidents (Aduen et al., 2015; Jerome et al., 2006; Vaa, 2014). Particularly scary for parents are studies showing that drivers with ADHD experience more severe crashes and are more likely to be killed in a car crash than drivers without ADHD (Aduen et al., 2016; Chang et al., 2014).

Understanding how and why ADHD's behavioral and cognitive symptoms relate to risky driving has the potential to improve driving safety for these drivers. Data from high-tech driving simulators indicates that adolescent and adult drivers with ADHD show less stable vehicle control, less defensive driving, more abrupt acceleration and deceleration, more frequent lane departures, and more speeding (Groom et al., 2015; Merkel et al., 2016;

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Reimer et al., 2006). Several studies have shown that inattention is a primary contributor to these driving difficulties for drivers with ADHD (Dingus et al., 2016; Fuermaier et al., 2015). Potentially as an outcome of underdeveloped executive functions (Aduen et al., 2017), drivers with ADHD are more likely to get distracted by objects and people in their car (Pope et al., 2017; Reimer et al., 2010). Drivers with ADHD are also less likely to maintain their focus during longer periods of driving, resulting in greater distraction, less monitoring of changing road and traffic conditions, and longer glances away from the road (Biederman et al., 2007; Fuermaier et al., 2015; Kingery et al., 2015). Interestingly, performance on a brief test of executive attention can predict crash risk for drivers with ADHD up to two years later (Aduen et al., 2017). Even short lapses of attention can have serious consequences while driving: attentional lapses as short as two seconds have been shown to result in severe or fatal driving outcomes (Horrey & Wickens, 2006).

Because driving safety is an area of growing concern for adolescents and adults with ADHD and their families, there is a need for specific, actionable recommendations aimed at reducing risk and improving driving skills. As such, the purpose of the current article it to provide concrete, evidence-informed, and actionable recommendations for parents of teens with ADHD and for adult drivers with ADHD. To achieve this goal, we brought together a panel of researchers and clinicians with expertise in ADHD and driving safety (the article's authors). Drawing from their research and clinical experiences, each expert provided evidence-informed recommendations and considerations for families about driving with ADHD, which we present here. We hope that increased awareness of the different aspects of driving will help parents think about which aspects are most relevant and concerning for their teen with ADHD. Combining these recommendations with your expertise regarding your own child (or yourself, for adult drivers with ADHD) should provide a roadmap to specific steps that you can take to reduce risk and make decisions regarding expectations for driving with ADHD.

Stimulant medication works but it matters *when* you take it!

There is clear and consistent evidence that stimulant medications improve driving safety (Cox et al., 2006; Jerome et al., 2006) and reduce vehicular crashes (Cox et al., 2012; Chang et al., 2017). Drivers with ADHD recognize that they drive safer when they have taken their stimulant medication (Cox et al., 2006). However, these medications are only effective when they are working in the body (referred to as 'metabolically active'). Forgetting to take the medication, taking too low of a dose before driving, and driving after the medication's effects have worn off all negate the benefits of stimulant medication. Further, some individuals actually drive *worse* after their medication wears off compared to when they don't take medication, a phenomenon called a 'rebound effect' (Cox et al., 2008). We recommend talking with your prescribing physician about *when* you (or your child) do most of your driving to make sure that the medication will be active when you need it most. For example, even the most long-acting medications are not likely to be effective late at night (if taken in the morning), so a short acting booster medication may be beneficial. In addition, if you have to drive shortly after waking up, it is important to take a rapid onset medication. Deciding upon the optimal medication and dose requires time, effort, and support from the prescribing physician. Maximizing the benefits of stimulant medications requires finding an

optimal dose that provides the greatest benefit while not triggering a rebound effect. Finally, our expert panel noted that there is a lack of evidence regarding non-stimulant medications and ADHD driving safety: At this time, we cannot make any recommendations regarding non-stimulant ADHD medications because we do not know whether they help, hurt, or have no effect.

Drive stick!

In an effort to improve attention while driving, one study investigated the benefits of manual vs. automatic transmission. The rationale for this study was that manual transmission requires more driver engagement, and if the driver is inattentive then the immediate feedback of a stalled car or grinding gears would discourage inattention. In fact, that's exactly what they found: Cox and colleagues (2006) reported that the benefits of using manual transmission during stop-and-go driving was equivalent to the benefits of stimulant medication. The downside to this approach is that it is not anticipated to be beneficial when frequent gear shifting is not required, like the open highway (where many crashes occur for drivers with ADHD), and that it requires training and a manual transmission vehicle.

Turn Off Cruise Control

ADHD drivers are more likely to get into a crash while driving on monotonous, open roads where attention is more likely to drift (Reimer et al., 2007). In 2010, researchers compared young adults with and without ADHD during a series of boring and challenging driving situations. They found that drivers with ADHD were particularly distracted during periods of boring (low-stimulation) driving. Based on these findings, we recommend avoiding the use of cruise control when driving on the highway. The idea is that cruise control results in less engagement while driving, and we know that drivers with ADHD are more likely to becomes distracted in such situations. One strategy for increasing driving engagement is to use an active, sequenced scanning procedure while driving: look ahead, check mirrors, look ahead, check side traffic, look ahead, check speedometer, look ahead….

Don't Drink and Drive

Drinking and driving don't mix. That's true for everyone (Fillmore & Van Selst, 2002), but it's especially true for drivers with ADHD (Barkley et al., 2006). Drivers with ADHD are more impaired while driving at lower levels of intoxication than drivers without ADHD (Barkley et al., 2006). Even at lower blood alcohol concentrations (BACs), drivers with ADHD have greater difficulty maintaining constant vehicle speeds (Weafer et al., 2008). This difficulty may occur because alcohol impairs the ability to divide attention among the many demands of driving. To make matters worse, there is a 'positive illusory bias' in teens and adults with ADHD with regard to alcohol and driving. That means that adolescents and adults with ADHD *underestimate* how intoxicated they are and *overestimate* their ability to drive safely (Weafer et al., 2008). In other words, drivers with ADHD are less likely to notice that they have had too much to drink and less likely to realize that they shouldn't drive. Given the greater vulnerability to the effects of alcohol and the tendency to underestimate its risk, parents of teenagers with ADHD should strongly discourage drinking

and driving and have open discussions about how they are at even greater risk than their friends. To discourage risky driving, parents may consider a ‘no questions asked’ policy of picking up their teen anytime/anywhere, setting up an account with a ride-sharing service, or otherwise ensuring that the teen driver has a safe way home should they find themselves in a risky situation.

Hang Up and Drive

Drivers between the ages of 16 to 25 have the highest rates of cellphone use while driving. Driving while talking or texting is problematic and can result in serious injury or death. Using hand-held devices has been linked with the highest rates of attention-related crashes and near-crashes. In fact, talking on a cell phone impairs your driving just as much as driving while intoxicated. Unfortunately, hands-free devices do not decrease this risk. When we talk on the phone we are visualizing the person we’re talking to and visualizing what they’re talking about – these mental visuals take our eyes off the road whether or not we’re physically holding the phone. Talking on the phone while driving is riskier than driving with passengers in the car. Similarly, do not text and drive (Kingery et al., 2015). Sending a short text or emoji while driving is the equivalent of driving the entire length of a football field with your eyes closed. Remember that even brief attentional lapses as short as two seconds can result in severe or fatal crashes for you and others on the road (Horrey & Wickens, 2006). Drivers with ADHD can easily reduce temptation by putting their cellphone in the trunk, turning on Do Not Disturb mode, or otherwise physically placing the phone out of sight and out of reach while driving.

Technological Tools

In-car access to technology can be a source of serious risk (e.g., distracted driving). It also has the potential to be a golden opportunity for intervention (e.g., real-time monitoring/intervention). Technological tools such as engine performance monitors that track maximum speeds, sudden braking, and sudden acceleration may be useful for monitoring teen driving and ensuring that the teen is not engaging in risky behaviors. On-board cameras that are triggered by sudden changes in car movement can also be useful for monitoring and reducing risky teen driving (Fabiano et al., 2011, 2016). These videos may also be useful in the future for behavioral treatment.

Automated Driving Systems

Like seat belts and airbags, driver assist technology will soon be standard equipment in all new cars. These technologies have the potential to save lives, but they may also introduce additional risk for drivers with ADHD. For example, adaptive cruise control may stop the car automatically to avoid rear ending someone, lane maintenance can prevent the car from drifting into the oncoming lane, and cruise control can help avoid unwanted speeding tickets (if set at/below the speed limit). However, these technologies may also further increase driver inattention, surrendering control and responsibility to technology. This is likely to be true for all drivers, and especially true for drivers with ADHD. We recommend talking to your teen about the pros and cons of these technologies.

Peers Matter, But So do Parents!

Studies of teen drivers without ADHD have consistently found that parents *and* peers play significant roles in their driving outcomes. The same is true for teen drivers with ADHD (Cardoos, Loya, & Hinshaw, 2013). For example, teenagers who report better relationships with their parents engage in less risky driving. Parents who report less parenting stress also tend to have teenagers who engage in safer driving practices. Thus, the quality of the parent-child relationship is important: the better your relationship with your teen driver, the more likely they are to take your advice and drive safely when you're not around. Your teenager is listening to you (even if they're acting like they're not!). Many of the tips for breaking down steps to obtaining a license and learning to drive involve considerable parent-teen interaction, communication, problem solving, and contracting. Parents and teens with ADHD might find it helpful to work with a therapist to learn these strategies. Discussions about driving can serve as a great focal point for parent-teen communication training. In addition, negotiating formal parent-teen driving contracts can give parents and teens the tools necessary to not only improve driving safety but set the stage for navigating other developmentally-relevant conversations like dating. Negotiating with your teen and creating a formal driving contract that specifies when they are allowed to borrow the car can be very helpful for maximizing academic performance and improving family life.

Peers also play an important role in the driving behaviors of teens. Whereas we talk about parents as assets and protective factors for their teen drivers with ADHD, peers are most often discussed in terms of increased risk. Many states have adopted 'graduated driver's licensing laws.' These laws limit the number of peers that are allowed in the car due to the increased risk for crashes associated with having other teenagers in the car (Allen & Brown, 2008). Make sure your teen is aware of those restrictions and set clear expectations and consequences for violations of these laws. If your state does not have graduated licensing laws, consider implementing them on your own. In addition, consider extending the period of time that your teen must drive without peers in the car. For example, your state might not allow a peer in the car for the first 6 months of independent driving. You might consider extending this rule to 9 months or one year to allow your teen more time to practice driving without the distraction and influence of peers.

Break it Down

Some parents report that their teenager with ADHD seems to lack motivation to obtain their driver's license. In our experience, teens with ADHD often appear to lack motivation for other developmentally-expected activities, like doing their chores or studying for exams. Yet, parents don't usually throw their hands up in the air with regard to those tasks (well not initially, anyway). Putting together all of the steps to earn a driver's license can be daunting for individuals with ADHD – in fact, avoidance of activities that require sustained mental effect is a core symptom of ADHD! Mentally challenging activities like homework, school projects, or completing a long-term project like earning a driver's license are *objectively more difficult* for individuals with ADHD. Individuals with ADHD usually don't have a problem with motivation – they are usually just as motivated as their peers, but they would actually need 'super motivation' because the task is objectively more difficult for them than

it is for their peers. To help your teenager with ADHD overcome these hurdles, help them break down the steps, write down the steps, and provide support and structure to help them achieve each step. For example:

Obtaining a permit or driver's license:

The first step toward independent driving is knowing whether it's time to start working toward a driver's license, and if so, what steps are needed to earn a driver's license. When it is appropriate to pursue this adult-responsible task, help your teen research your state's licensing requirements. We find it helpful to break down the task of obtaining one's permit and driver's license by conducting a task analysis. A task analysis involves breaking down a complicated task into its concrete, manageable parts. Then, help your teen make a plan for each step, including filling out paper work, studying for exams, and practicing driving with an adult. Each step should have SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound) goals tied to them. If your teen seems lacking in motivation, help them identify ways in which they can reward themselves for reaching each goal.

Importantly, have an explicit discussion with your teen to figure out what role they would like *you* to play in this process. Do they want you to provide reminders of their goals? If so, how? With notes or in person? Maybe they would prefer to outsource this to a third party like an ADHD Coach. Each teen will have their own preferences and it is helpful to honor their preferences. Remember that this is a big step in your teen's pathway to adulthood and independence. Consider the larger goal of wanting your teen to feel confident in their ability to reach their goals. Teens with ADHD require more support and accountability than their peers without ADHD.

Learning to drive by practicing:

Once your teen has obtained her learner's permit, the next step is practice, practice, practice. Expect your teenager with ADHD to require more practice than their peers who don't have ADHD. Learning occurs when we're paying attention, so we expect individuals with ADHD to learn a little less than others from every lesson. Plan to practice more than you think you will need to: Teens with ADHD tend to overestimate their driving abilities (Fabiano et al., 2018), and their parents may be less likely to implement optimal strategies for helping teens learn to drive. Evidence from videotapes of parents teaching their teen with ADHD to drive show an over-reliance on critical comments and an under-usage of positive comments for appropriate driving (Schatz et al., 2014). This is an area where parents can immediately modify their approach to increase appropriate driving behavior.

Teens with ADHD will benefit from a lot of support when it comes to learning to drive. For example, start each practice session by reviewing the steps for safety when you first get in the car. You may want to create a written "pre-flight checklist" to review each time your teen gets in the car (for example, check gas, check that you have a clear view through all windows, check mirrors, cell phone off, seat belt on, scan for obstacles). Do this each time you get into the car, even when you're driving. The goal is for your teen to perform these safety steps *automatically and without prompting*. Use specific praise to reinforce these behaviors ("great job doing all of your safety steps before starting the car!").

Come up with a ranking of driving challenges. Use this ranking to develop a plan to practice driving with your teen. Start by practicing in the environment with the least safety risk. For example, start in empty parking lots with the goal of getting a feel for the gas and brake pedals. Work your way up to residential areas and residential areas with turns. At the top of the rankings could be highways, busy city traffic, or whatever situations your teen finds most challenging. In addition, consider the conditions of the environment and how those could be integrated into the rankings. For example, driving in residential areas when it is raining is harder and should be higher on your rankings than driving on sunny days on the same road.

The Children's Hospital of Philadelphia's website has great resources for teaching teens with ADHD to drive.[1] The guide breaks down the ranking process described above for parents. It sets up specific goals for driving during each practice session. In addition, they provide parents with logging and rating tools so they can keep track of hours practiced. This tracking is an important requirement for obtaining a graduated drivers' license, and one that can be very challenging given the organizational skills difficulties associated with ADHD.

Finally, consider outsourcing this task. Look for driving schools in your community to see if your teen can learn to drive with a professional experienced in breaking down this complex task. Many driving schools will include the option of weekly on-road practice with a driving instructor, and this applied practice may be particularly important for a teen with ADHD. We find it helpful to have teens rate their own driving performance. Then, compare your teen's ratings with the driving instructor's ratings to help your teen develop more realistic beliefs about their driving skills. You and your teen may want to consider whether you are comfortable with disclosing their ADHD and related difficulties with the driving instructor. Again, here it is important to talk with your teen candidly about the potential positives and negatives of disclosing their diagnosis. The decision to disclose one's diagnosis is highly personal and your teen is at a stage in development where they want to participate in the decision-making process. Explicitly engaging your teen in this kind of thinking will be beneficial for them down the road as they consider whether or not to disclose their diagnosis in other settings such as work.

Driving Opportunity

By the time that a teenager with ADHD is ready to start driving, their family has likely been through multiple treatment efforts, experienced considerable conflict, and be quite literally exhausted from parenting (Dishion, Nelson, & Bullock, 2004). Thus, the idea of starting yet another clinical treatment for ADHD may be aversive to teens and their family. At least usually. However, there is new research suggesting that teens and parents may be highly motivated to engage in effective behavioral treatments for ADHD when those treatments are paired with driving training. Interestingly, both teens and their parents are often highly motivated to participate in driving training developed for teen drivers with ADHD – parents are often anxious about the transition to driving given the high risks involved, whereas teens are often interested in the increased independence associated with driving. It seems that

[1] https://www.teendriversource.org/learning-to-drive/driving-with-special-needs/adhd-and-driving

pairing family-focused ADHD treatment with driver's education training yields increased adherence and engagement from families. For instance, Fabiano et al. (2016) reported nearly perfect attendance at a parent-teen behavioral intervention that included both communication training and driver's education. This is a considerably greater attendance rate than reported in most other parent-teen ADHD treatment studies. The take home message? The transition to driving can be an opportunity to improve family life when your teenager with ADHD is at home as well as improve their safety when they're on the road. In addition, access to the family car can be a strong motivator for teenagers to continue to meet behavioral expectations, even after they earn their license!

It's Not Just ADHD

More than half of individuals with ADHD are also diagnosed with another clinical disorder, such as oppositional-defiant disorder (ODD), depression, anxiety, or autism spectrum disorder (ASD; Classen, Monahan, & Wang, 2013; Vaa, 2014). Some of these co-occurring conditions are also associated with increased risk for motor vehicle crashes and other negative driving outcomes. For example, depression alone can increase crash risk (Aduen et al., 2015), so it is possible that drivers with both ADHD and depression could be at greater risk than those with either condition alone.

For parents of teens with ADHD and additional co-occurring conditions, we recommend considering the types of driving challenges associated with each disorder. For example, it is reasonable to expect that a teen with ADHD and comorbid oppositional-defiant disorder (ODD) might be at even greater risk for engaging in risky driving behaviors. It will be particularly important to use a formal driving behavior contract that sets clear expectations about (1) acceptable driving behaviors and (2) the consequences if these expectations are violated. For ADHD and comorbid autism spectrum disorder (ASD), we recommend working with an occupational therapist familiar with ASD and driving to determine the best methods for addressing ASD-related driving impairments. The Children's Hospital of Philadelphia has great resources regarding driving and ASD[2].

Should Licensure Be Delayed?

Both age and experience matter when it comes to driving safety (Curry et al., 2015). In general, drivers with ADHD earn their driver's license later than drivers without ADHD. On average, individuals with ADHD first receive their driver's license at age 20–21, whereas drivers without ADHD are typically licensed by age 17–18 (Thompson et al., 2007). This delay may occur because of parent's concerns about their teen's maturity and readiness for independent driving. Our final recommendation ends with a question: Should you delay licensure so that your teen with ADHD doesn't start driving independently until they're older? While there is consensus regarding the increased risk associated with driving for adolescents and adults with ADHD, experts in the field disagree regarding recommendations for delayed licensure. Some of our experts say yes, and others say no. Here, we present the available evidence so that you can make an informed decision for your family.

[2]https://www.teendriversource.org/learning-to-drive/driving-with-special-needs/autism-spectrum-disorders-and-driving

Why you should delay licensure for your teen with ADHD:

Some of our experts recommend delaying licensure until age 18 for drivers with ADHD. Part of the rationale for this recommendation is that, on average, adolescents with ADHD are 3–4 years behind in the development of brain areas associated with executive functions that help us control impulses, plan, and guide our behavior (Shaw et al., 2007). The argument is that driving among teens should be delayed until their brains are developed enough that they can make less risky driving decisions. Delaying licensure may reduce crash risk by 20% and may also help with parents' concerns about the teen's maturity and appropriateness for independent driving (Curry et al., 2015). However, it may unintentionally result in the teen experiencing fewer restrictions under graduated driver's licensing laws once licensed. That is, graduated license laws typically end at age 18, resulting in the introduction of driving contexts that incur greater risk. As discussed above, graduated license laws provide a more developmental approach to learning to drive by requiring a minimum amount of supervised practice prior to taking a licensure test and placing early restrictions on more risky driving situations like nighttime driving and driving with passengers under age 21. To get the benefits of these graduated licensing laws (i.e., increased practice during less risky driving situations) *and* the theoretical benefits of delaying licensure, some of our experts recommend that parents of teenagers with ADHD help their teenager obtain a permit to drive with supervision early (e.g., age 15), but then delay licensure until age 18 or later to ensure longer supervised practice opportunities.

Why you shouldn't delay licensure for your teen with ADHD:

Our experts all agree that obtaining a learner's permit early and having more practice opportunities prior to independent driving is essential for drivers with ADHD. Our experts that argue against delayed licensure point to research showing that teens with ADHD were much more likely to drive without a license than drivers without ADHD (Barkley et al., 1993; Hoza et al., 2013; Thompson et al., 2007). In other words, delaying licensure may not actually deter teens with ADHD from driving, but instead result in them driving in riskier situations. In addition, delaying licensure may unintentionally result in the teen experiencing fewer restrictions under graduated license laws once licensed. By delaying licensure until adulthood, individuals with ADHD may miss out on the opportunity to gain experience driving under the less risky driving conditions set forth by graduated licensing laws. In other words, delaying licensure will not necessarily protect your teen with ADHD and it might keep them from gaining skills necessary for adulthood. The key point for parents is that teens with ADHD need additional practice, longer spans of driving limits/restrictions, and increased parental monitoring and support. These supports can be enhanced by state laws, but may also need to be more intensive that the restrictions and supports used for drivers without ADHD.

Summary and Conclusions

Taken together, there is broad agreement that ADHD is associated with increased risk for motor vehicle crashes and other negative driving outcomes. There is also agreement among our expert panel that ADHD is not a sentence to become a 'bad driver.' We believe it is important that parents understand that the risk is real but not fated. We hope that the

evidence-informed recommendations in this article help parents of teenagers with ADHD – and drivers with ADHD themselves – weigh the risks and rewards, and take actionable steps to improve their driving safety.

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