The Hot Topic of Autism and Driving

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In considering the research for autism and driving, first, let's go beyond the image of Rain Man and refresh our understanding of the intriguing diagnosis of autism spectrum disorder (ASD).

ASD is a neurological, developmental disorder that is characterized by challenges with verbal and nonverbal communication (American Psychiatric Association, 2013). Individuals with ASD have difficulty relating to others socially and are also not inclined to make eye contact (American Psychiatric Association, 2013). They often display repetitive behaviors which could occur in many forms, such as flapping their hands and repeatedly saying the same phrases (Centelles et al., 2013). They frequently become highly fixated on a particular interest area and develop significant depth of knowledge in this area.

Degree of impairment varies markedly from individual to individual. There is a famous quote by Dr. Stephen Shore often repeated: "If you've met one person with autism, you've met one person with autism" (Spectrum, 2017).

This is certainly the case when it comes to cognitive abilities. Intelligence varies widely. However, the Center for Disease Control reports that over 50% of individuals with ASD are considered intellectually competent (CDC, 2017). One noted cognitive characteristic is that individuals with ASD have greater difficulty with executive functions – particularly in the areas of mental flexibility, planning, and inhibition (American Psychiatric Association, 2013). These individuals thrive with routines and rules but display problems with adjusting to novel tasks.

Physically, many individuals with ASD exhibit impairments in visual motor coordination, motor planning, and bilateral integration (American Psychiatric Association, 2013; Dzuik et al., 2007; Rinehart et al., 2006).

Interestingly, 83% of individuals with ASD have an additional diagnosis (Center for Disease Control and Prevention, 2017). ADHD is a common comorbidity (Leitner, 2014), as well as epilepsy (Danielsson, 2005) among others.

There is greater male prevalence with ASD. The disorder occurs 4.5 times greater in males than females children (CDC, 2017).

The rate of ASD diagnosis has increased to 1 in 68 children (CDC, 2017). Just between the years 2012 and 2014, the rate of diagnosis increased by 30% (Wingate et al., 2014).

One final fact regarding the general diagnosis is that these children are growing up, and there is a lack of services to address the needs of older adolescents and adults with ASD (Tyler, 2013). This is the point at which we as driver rehabilitation specialists encounter these individuals. They and their families want them to lead healthy, independent lives as much as possible – including living on their own, working and, yes, driving in the community.

Ten years ago research in this area was nearly nonexistent (Classen & Monohan, 2013), but it has grown considerably. In surveying the research for this article, 20 studies specific to the topic of ASD and driving were reviewed. All studies were published or presented between 2009-2017. Of interest, four of the 20 studies are published in academic journals by our own members of ADED. All the studies vary greatly in number of subjects, methods, and geographical areas.

DRIVER LICENSING

As expected, fewer individuals with ASD have a driver license compared with their neurotypical (NT) peers. Whereas ~85% of individuals 16 and older in the general adult population in the United States have a driver license, 24% to 48% of individuals with ASD obtain a driver license (Cox et al., 2012; ; Curry et al., 2017;Farley et al., 2009; Feeley et al, 2010; Huang et al., 2012). The largest study by Curry et al. (2017), which was recently featured in News Brake, indicated that 1 in 3 in the general ASD population obtain a driver license.

Individuals with ASD require more time to obtain a driver license. Based on the same study by Curry et al. (2017), individuals with ASD obtain a driver license an average of nine months later than NT peers in New Jersey. According to Daly et al. (2014), individuals with ASD in Sweden obtain a driver license approximately two years later than NT peers. People with ASD require nearly three times as many driving lessons as healthy peers and must take more road tests to obtain a driver license (Almberg et al., 2015).

Positive indicators for obtaining an unrestricted driver license are that the individual has at least near average intelligence, that driving is included as a goal in a teen's individualized education plan (IEP), and that the parent has experience with teaching driving (Huang, 2012). Additionally, obtaining a driver permit is a strong indicator, as Curry et al. (2017) revealed that 90% of individuals with ASD who obtain a driver permit obtain a full unrestricted driver license.

DRIVING CHALLENGES

Adult drivers with ASD report more collisions and more traffic violations than their NT peers (Daly et al., 2014). The number of traffic violations was statistically significant, with 30% of individuals with ASD compared to 12% of their peers. The traffic violations were primarily related to running stop signs or stop lights, speeding, reckless driving, and making illegal turns.

It should be noted that this is the opposite for teen drivers. Teens with ASD have lower crash ratings than peers (21% vs. 33%) (Curry et al., 2016).

Reports of individuals with ASD, their parents, and driver instructors yield insights about weaknesses in driving. Individuals with ASD, parents and driver instructors all note problems with adjusting to unexpected or novel roadway situations (Chee et al., 2014; Cox et al., 2012; Tyler, 2013). Parents report challenges with concentrating and multi-tasking during driving (Cox et al., 2012). Driver instructors report that the individuals with ASD exhibit problems with the following: merging into traffic, interpreting facial expressions and gestures of other drivers, focusing for longer driving periods, becoming over-stimulated, displaying anxiety and anger, and wanting to focus only on their particular areas of interest, not driving (Tyler, 2013).

Research using driving simulators and driving-like tasks has produced further information about driving behaviors in the ASD population and possible underlying causes for errors. On a driving simulator, non-drivers with ASD exhibited more driving errors (Classen et al., 2013). These errors were related to issues with maintaining lane alignment, regulating speed, and responding to stimuli. Interestingly, compared to the NT adolescents, these same individuals with ASD or ASD/ADHD had decreased right-eye visual acuity, selective attention problems, decreased visual scanning, and challenges with visual-motor coordination and specific physical-motor tasks. Individuals with ASD responding to video footage of driving show reduced reactions to human hazards versus mechanical hazards in the driving environment (Bishop, 2017; Sheppard et al., 2010). Driving simulator research shows that individuals with ASD have a tendency to shift eye gaze away from increasing roadway stimuli and to the right (Reimer et al., 2013). This same study suggests heightened anxiety by an elevated heart rate on driving simulator tasks. Although difficulties with coordinating the motor aspects of driving may be a challenge, another driving simulator study presented that individuals with ASD can be successful with overcoming motor challenges to regulate steering, accelerating and braking (Brooks et al., 2016). The individuals with ASD required more time than NT teens to achieve success on the tasks but eventually performed at the same level of the control group. Finally, another driving simulator study revealed that these individuals have reduced working memory and slower reaction times with steering, but not braking (Cox, 2016).

DRIVER TRAINING TECHNIQUES

Reports from parents and driver instructors indicate that the following methods are most helpful in training individuals with ASD:

- Using video games and driving simulation experiences before driving a vehicle to lessen anxiety (Cox, 2012).
- Using the same vehicle for driving lessons (Cox, 2012).
- Providing repetitive, routine but short lessons (Cox, 2012; Ross, 2015, Tyler, 2013).
- At the beginning of driving sessions, providing a brief visual or verbal plan of the session (Cox, 2012).
- Using direct communication (Ross, 2015; Tyler, 2013).
- Avoiding excessive, verbal instruction (Cox, 2012).
- Breaking down the driving task into smaller steps (Cox, 2012; Tyler, 2013).
- Encouraging use of coping mechanisms (Tyler, 2013).
- Adapting the training techniques for each individual's needs (Ross, 2015; Tyler, 2013).
- Using a workbook to reinforce driving terminology and concepts (Tyler, 2013).
- Providing visual demonstrations of the targeted driving behaviors (Ross, 2015).
- Being patient and remaining calm (Cox, 2012).

ADDITIONAL THOUGHTS AND PERCEPTIONS

In regards to their self-perceptions, several studies inquired of drivers with ASD, primarily adolescents and young adults. Three different studies (Chee et al., 2014; Huang et al., 2012; Tyler, 2013) indicated that individuals with ASD were confident in their ability to follow the rules of the roadway. These individuals rated their driving skills significantly lower than their peers in a study by Daly et al. (2014). Chee et al. (2014) found that most prefer not to drive on the highway or at night, limit their driving to when necessary, choose to drive fewer days per week, and voiced anxiety about driving.

Parents expressed other concerns. They were hesitant to reveal the ASD diagnosis, as they feared their children's experiencing discrimination on the driving test (Tyler, 2013). Although 70% of parents acknowledged the impact of the ASD symptoms on driving, they felt that their children did not recognize how the ASD symptoms deterred driving safety (Cox et al., 2012).

Although yielding significant information, these current research studies have several limitations. One notable point is that none of the studies are directly related to in-vehicle observations of individuals' driving. Many are based on reports of individuals and parents. Few studies included the reports of driver rehabilitation specialists or driver instructors. Several are based on performance on driving simulators. A couple of the studies used individuals' responses to driving video footage.

With our direct behind-the-wheel work, it would be highly interesting for driver rehabilitation specialists to be more involved in studies with this unique population and to contribute to proven driving assessments and training methods.

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