DRIVER PREPAREDNESS: A HANDBOOK FOR OCCUPATIONAL THERAPISTS ADDRESSING PRE-DRIVING SKILLS IN TEENAGERS WITH DEVELOPMENTAL DISABILITIES

A Thesis submitted to the faculty at Stanbridge University in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

by

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Certification of Approval

I certify that I have read Driver Preparedness: a Handbook for Occupational Therapists Addressing Pre-Driving Skills in Teenagers with Developmental Disabilities by Allyse LeDuc, Austin Murrow, Alyanna Michelle Poniente, and Kelsey Thompson, and in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy at Stanbridge University.

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Abstract

Driving, an instrumental activity of daily living (IADL), requires a multitude of different components to be performed safely. Adolescents with developmental disabilities (DD) such as autism spectrum disorder (ASD), attention-deficit hyperactivity disorder (ADHD), and intellectual disability (ID) will have more difficulty with the various skills needed to drive than their neurotypical peers. Research has indicated that occupational therapists are well qualified to address driving skills in teenagers with DD; however, currently, there are limited evidence-based resources and tools that exist. This thesis project was designed to create and disseminate an evidence-based resource for clinicians to highlight areas of need when assessing pre-driving skills in teenagers and adolescents with DD, along with providing additional resources for interventions and safe-driving and related skill development strategies for caregivers and occupational therapists (OTs). We conducted in-depth research highlighting the areas of difficulty that adolescents frequently experience when learning to drive in addition to beneficial assessments, evaluations, and interventions that occupational therapists may use when addressing the skills needed for driving. A digital handbook was then created and developed that contained information helpful to occupational therapists when addressing these skills, such as comprehensive driving analysis, driving skill lists, assessment lists, evaluation and screening tool flowcharts, and suggested interventions. The handbook was disseminated preliminarily to a small group of clinicians for professional review through the use of reviewer surveys. The review forms included a 5-point Likert Scale and qualitative data which included questions relevant to the handbook. Once the data was completed, it was compiled and analyzed for themes. Results from the feedback forms

were consistent among each reviewer, which revealed that the handbook was well appreciated, comprehensive, and necessary for occupational therapists. Thus, it is anticipated that the handbook created has the potential to further the clinical application of occupational therapists for teens with DD and concerns relating to driving skills. Future research should consider the *Driver Preparedness* application in a pre and posttest research design, along with resources and information on funding processes that could enhance the handbook and lead to the creation of a more clinically appropriate second version in the future.

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Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-Driving Skills in Teenagers with Developmental Disabilities

Driving is an instrumental activity of daily living (IADL) that can be seen as a rite of passage for young teenagers; therefore, it is an emerging practice area for pediatric occupational therapy clinicians. Classen, Monahan, and Wang (2013) outlined the skills that are needed for teenagers learning to drive. These skills encompass visual attention, cognitive function, motor performance, and visual-motor integration (Classen et al., 2013). Visual attention skills are necessary for maintaining focus on the road and looking for unexpected events such as pedestrians crossing or cars suddenly stopping (Sheppard, Ropar, Underwood, & van Loon, 2009). Cognitive functioning skills encompass the processing speed of the visual stimuli, reaction time, and emotional regulation (Classen et al., 2013). Motor performance skills are the previously mentioned cognitive skills played out (Classen et al., 2013). Lastly, visual-motor integration skills include the combination of the visual system with the cognitive processes and the motor-output (Classen et al., 2013). This interplay of different systems is what makes driving such a complex task. Therefore, it can make driving difficult for someone diagnosed with developmental disabilities (DD) such as autism spectrum disorder (ASD), attention-deficit hyperactivity disorder (ADHD), or intellectual disability (ID).

Brooks et al. (2016) examined the behaviors and symptoms that can negatively affect driving performance and the motor aspects of pre-driving skills in young adults with ASD. It was reported that individuals with ASD had difficulty with four cognitive skills while driving, which include psychomotor speed, reaction time, cognitive flexibility, and executive function (Brooks et al., 2016). In addition, Ross et al. (2018)

found that new drivers with ASD reported issues with multitasking, assessing situations, reacting to unpredictable drivers, and the overall stress during the experience.

When evaluating the driving skills of adolescents, Kingery et al. (2015) focused on teenagers aged 16 to 17-years-old with ADHD. These participants were compared to their neurotypical counterparts on driving simulator evaluations (Kingery et al., 2015). The participants with ADHD displayed longer and more frequent visual inattention and lane deviation than their neurotypical counterparts (Kingery et al., 2015). A study by Ratzon, Lunievsky, Ashkenasi, Laks, and Cohen (2017) found similar results, and that teenagers with ADHD had increased center-lane crossings and road-edge excursions when compared with their neurotypical peers. Another study by Patomella and Bundy (2015) looked at young adults with ID and found that they too had trouble with lane and speed maintenance. These findings further illustrate the potential risk for teenagers with DD and safe driving.

These aforementioned studies have all been relatively small in sample sizes, consisting on average of fewer than 50 participants and thus are limited in validity of data on a larger scale (Brooks et al., 2016; Kingery et al., 2015; Patomella & Bundy, 2015; Ratzon et al., 2017; Ross et al., 2018). Therefore, current evidence and research with considerably more statistical strength is needed in order for occupational therapists to better evaluate and work with these young adult clients with developmental disabilities. **Task Analysis**

Driving is a complex task that includes client factors and performance skills such as gross motor, fine motor, range of motion, process skills, and social skills. For drivers to be safe and effective on the road, it is imperative that they encompass these skills and

can apply them while driving. It is also essential to take into consideration the context and environment when it comes to driving as these components are ever-changing between geographic locations. The pre-driving skills needed to be a safe and competent driver are vision, cognition, motor, and visual-motor integration.

Adolescents with DD who are interested in learning to drive may show signs of difficulty with a range of pre-driving skills (Bishop, Boe, Stavrinos, & Mirman, 2018). Pre-driving skills encompass aspects of mental functions, sensory functions, neuromusculoskeletal and movement-related functions, muscle functions, and movement functions (Classen et al., 2013). Within each area, there are client factors that clinicians can address to foster the development of these challenging pre-driving skills. While many current OT driving resources use terms stemming from the Uniform Terminology for Occupational Therapy 3rd edition, the driving resource the team created pulls from American Occupational Therapy Association's (AOTA) Occupational Therapy Practice Framework (OTPF): Domain and Process 3rd edition in order to direct clinical observations and decisions when assessing the skills related to driving. The OTPF was utilized in this resource in order to stay consistent with the most up-to-date terminology, as it replaced the Uniform Technology for Occupational Therapy in 2002 (Youngstrom, 2002). This section will explore the various skills required for safe and effective driving.

Mental functions. Mental functions include affective, cognitive, and perceptual skills (AOTA, 2014). There are several cognitive skills required to drive a car safely and effectively. Cognition includes the "information processing functions carried out by the brain, which included attention, executive functions (e.g., problem-solving, self-monitoring, self-awareness), comprehension and formation of speech, calculation ability,

visual perception, and praxis skills" (AOTA, 2013, S10). The clinician should address the client's mental functions to develop pre-driving skills effectively.

Clients with DD may have difficulties with specific mental functions such as higher-level cognitive skills, which are needed to make good decisions when maneuvering a vehicle to avoid hazards. Clients should be able to sustain attention and concentration while driving. It is imperative for the client to demonstrate appropriate attention for a prolonged period to ensure safe driving. It is also important for clients to have the ability to adjust to stimuli, traffic lights, and pedestrians. Memory is necessary when remembering directional information when driving, the rules and laws of the road, and how to successfully operate the vehicle.

Additionally, perception is needed to discriminate between senses such as auditory, tactile, visual, vestibular, and proprioceptive input. Thought processes are necessary to be able to make logical and safe decisions on the road. Sequencing complex motor movements is needed while driving in order to sequence the appropriate steps, such as starting and turning off the vehicle. These steps include actions such as putting in the key, turning on the ignition or pushing the start button while simultaneously pressing the brake, and changing the gear to either reverse or drive. Clients should also be able to sequence the steps when following driving rules and laws such as using the turn signal, looking in blind spots, and merging. Emotional skills are vital for driving as the client should be able to regulate their emotions if they feel overwhelmed when something unexpected, such as other drivers not following the rules, occurs. Having the ability to regulate one's emotions when distressing situations or unforeseen events occur will enable the client to make safe decisions while driving.

Moreover, clients who have developmental disabilities may present difficulties in global mental functions. When addressing global mental functions, it is essential to ensure good consciousness. Orientation is when the client is aware of the place, time, self, and others. Clients should present alertness and awareness of their surroundings to respond to their environment appropriately. Sensory functions are needed as clients should be able to interpret, select, and organize incoming information from the driving environment. Temperament and personality are important aspects of driving as it is essential to regulate behaviors while driving and not let emotions get in the way. Energy and drive refer to the client's ability to sustain their energy level, impulse control, and motivation while driving. Clients should be sleeping the recommended amount of time per night to be able to function appropriately while driving.

Sensory functions. Sensory functions include visual functions, hearing functions, vestibular functions, proprioceptive functions, and touch functions (AOTA, 2013). Clients should be able to process, interpret, filter, and organize incoming information from the driving environment, such as the feeling of different road conditions under the car. Visual functions are vital when driving, as these allow for the information we see in the environment to be transferred to the brain (Warren, 2018). Visual perception skills are needed for interpreting, understanding, and defining incoming visual information from other cars, pedestrians, and environments. Attention skills are needed in order for the client to visually stay on the task of driving, such as focusing on the road and other drivers, as well as ignoring stimuli unrelated to the task. Visual discrimination skills are necessary for the client to process the incoming visual information from the road. In

response to this, clients will be able to adjust their speed and reaction time to road-related factors.

Hearing functions are needed to be able to hear and respond to other vehicles, such as car horns or emergency vehicles. Vestibular skills are important for driving, as clients should be able to orient themselves for navigational purposes. Proprioception is needed for clients to process their body in space while turning the steering wheel and applying the brakes or the accelerator. Clients need to use touch functions when interacting with different components of the vehicle, such as the steering wheel.

Movement functions. Movement functions include motor reflexes, involuntary movement reactions, and the control of voluntary movement. Specific motor skills are needed for an individual to drive a car appropriately. Motor skills involve actions an individual uses to interact with the environment, objects, and tasks around them (Preston, 2018). Clients should present with appropriate motor reflexes to respond and contract their muscles automatically when driving. Involuntary movement reactions are vital when driving to correct and adjust body positions and postural reactions. Clients should demonstrate appropriate involuntary movement reactions such as righting reactions, which enable the client to adjust body posture when maneuvering the vehicle (Preston, 2018). Lastly, clients should have control of voluntary movement. Control of voluntary movement while driving demonstrates eye-hand and eye-foot coordination, bilateral integration, the ability to cross the midline, fine and gross motor control, and oculomotor functions. For example, clients should be able to coordinate their upper extremities and lower extremities to successfully operate the components of the vehicle when driving.

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Statement of the Problem

There is a need to create a resource for clinicians and caregivers that will address pre-driving skills in teenagers with DD. In the United States, it is estimated that teenagers make up approximately 6.5% of the population, yet have accounted for 8.4% of the total costs of motor vehicle injuries (Centers of Disease Control [CDC], 2018). Drivers between 16 and 20-years-old have the highest risk of fatalities and injuries compared to any other age group (Insurance Institute for Highway Safety, 2018). Teens with ADHD are almost four times as likely to be involved in a car accident while they are the driver of the vehicle when compared to their neurotypical peers (Behind the Wheel with ADHD, 2017). Adolescents diagnosed with a DD, such as ADHD, have a significantly higher chance of distracted driving, such as maintaining visual attention and lane management (Sheppard et al., 2009). Curry, Yerys, Metzger, Carey, and Power (2019) found that within the first six months of licensure, adolescents with ADHD had a 62% higher chance of being involved in a motor vehicle accident compared to their typically developing peers. Teenagers with ADHD are also reported to be two to four times more likely to have a driving citation (ADHD Editorial Board, 2019). Furthermore, individuals with ASD reported obtaining their license later than their peers (Cox, Reeve, Cox, & Cox, 2012).

According to the OTPF (AOTA, 2014), occupational therapists should address "driving and community mobility," as it is considered to be an IADL. Occupational therapists can conduct activity analyses and have the skills to evaluate and assess a client's ability when learning to drive Due to these critical skills that occupational therapists are equipped to perform, they most appropriate professionals to assess driving

and community mobility (Korner-Bitensky, Menon, Von Zweck, & Van Benthem, 2010). While there is a lot of research on this IADL, the research focuses more on how physical diagnoses affect the driving skills of aging adults (Patomella & Bundy, 2015). Little research has been conducted on how occupational therapists address pre-driving skills with teenagers with DD, such as ADHD, ASD, and ID.

While occupational therapists are the fittest profession to assess the pre-driving skills, there are a limited amount of resources to enable occupational therapists to fulfill this role (Larsson, Lundberg, Falkmer, & Johansson, 2007). Dickerson, Reistetter, Schold Davis, and Monohan (2011) mention that occupational therapists have the skills and abilities to assess these areas, but, possibly due to the lack of training, many do not. Since young adults with DD often have deficits in attention, occupations that require high levels of attentional demand are areas of concern for occupational therapy interventions. Driving is one of these areas of concern that has been increasingly prevalent, especially in teenagers with DD. The CDC (2018) reports that there are three types of distractions when it comes to driving: visual, manual, and cognitive. Individuals with DD are at an increased risk for visual and cognitive distractions that can result in manual distractions (e.g., removing hands from the wheel) and motor vehicle accidents (CDC, 2018). Because of the high rate of teenagers with DD who are driving and the high rate of motor vehicle crashes relating to new drivers, it is essential for occupational therapists and caregivers to have access to assessments and research regarding the pre-driving skills of these individuals. Therefore, the purpose of this thesis is to design and disseminate a resource for clinicians that will highlight areas of need when assessing pre-driving skills

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in teenagers and adolescents with DD, along with providing additional resources for interventions and safe-driving strategies.

The AOTA and the AOTF (2011) outlined research topics and goals for conducting occupational therapy research. This thesis most closely aligns with the research goal of "develop and evaluate strategies for identifying and/or measuring the influence of activity engagement in daily life on health" (AOTA & AOTF, 2011, p. 55). This research goal was chosen because the resource being created assists occupational therapists with evaluation and intervention strategies for pre-driving skills. Connections to the Stanbridge University Master's of Science in Occupational Therapy (MSOT) curricular threads can be found in the thread *Occupation based focus*, which states, "Addressed by OTPF as a guide to practice, intentional delivery of the occupation-based message by all faculty to students in all relevant lectures and labs" and also the thread *Transformative and Lifelong learning*, which states, "Engaged learning, experiential learning, practice learning, service learning, fieldwork learning, professional organizational involvement" (Stanbridge University, 2019, p. 25).

Literature Review

Driving is a complex task that requires competency in a variety of areas. Many of these driving skills have been assessed in relation to older adults, while few focus on the pre-driving skills that are required when learning how to drive safely and accurately. The skills are fostered during the years leading up to driving, which most often takes place in the teenage to young adult years, which ranges from approximately 14-22 years of age. Few studies have evaluated the impact that DD can play on the formation and growth of the pre-driving needs.

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Limited Research on Driving and Developmental Disabilities

According to Brooks, Mossey, Tyler, and Collins (2013), there was a substantial amount of research in the late 1970s and 1980s that focused on driving skills in individuals with ID. Studies during this time often compared the driving performances of those with ID to their typically developing peers (Brooks et al., 2013). These studies were consistent with one another and found that young adults who have ID require more instruction and practice because they were the group to be more likely to get into car accidents and obtain traffic violations (Brooks et al., 2013). However, since the 1970s and 1980s, studies on driving and individuals with ID have dramatically declined (Brooks et al., 2013).

Classen et al. (2013) conducted one of the first studies to research how having a DD can impact a teen's ability to drive. Using a battery of cognitive, visual, and motor performance assessments, along with a driving simulator, teenagers with ADHD and their neurotypical peers were evaluated and analyzed for their driving abilities (Classen et al., 2013). It was discovered that visual scanning, lane maintenance, speed regulation, adjustment to stimuli, and total driving errors were increased in teenagers with ADHD or ASD than those without (Classen et al., 2013). In addition, those with ADHD and ASD displayed deficits in the areas of executive function and thus made related driving errors (Classen et al., 2013).

Occupational Therapists and Driving

Of the many clinicians working in primary care, the need for evaluating and providing interventions on driving stills remains a topic that is not adequately assessed. A study by Ross et al. (2018) found that driving instructors feel like they lack the needed training when teaching drivers with ASD. Dickerson et al. (2011) stated that an "occupational therapy practitioner assessing a client completing a complex IADL observes whether the client can scan the environment, appropriately time and sequence two different tasks . . . and modify their actions in a complex environment" (p. 68). Thus, because driving is an IADL within the occupational therapy domain, practitioners should be able to accurately determine who is a safe driver and who is at risk for unsafe driving, with the proper training and resources (Dickerson et al., 2011). While occupational therapists are the most fit to assess driving skills, few feel they have the skills or knowledge to do so (Dickerson et al., 2011; Hawley, 2015).

Education. Korner-Bitensky et al. (2010) stated occupational therapists are the most appropriate professionals to assess driving and community mobility. Furthermore, Korner-Bitensky et al. (2010) found that occupational therapists were twice as likely to use screening tools rather than in-depth assessments and interventions. In addition, occupational therapists reported little perceived competence when it came to retaining license or refresher programs for older driving (Korner-Bitensky et al., 2010).

Larsson et al. (2007) conducted a survey across Sweden and discovered that many occupational therapists who can assist in driving do not do so. Larsson et al. (2007) found that occupational therapists did not assess many clients due to not feeling confident enough to do so. However, the occupational therapists recognized fitness-to-drive assessments were in demand (Larsson et al., 2007). Occupational therapists suggested that continuing education on the fitness-to-drive would be beneficial in helping them conduct assessments (Korner-Bitensky et al., 2010; Larsson et al., 2007). In addition, Yuen and Burik (2011) surveyed 90 entry-level occupational therapy schools and found

that only nine schools required a course that emphasized driving evaluation and rehabilitation in their curriculum.

Although there are resources for continuing education, including a Specialty Certification in Driving and Community Mobility, there is no emphasis on pre-driving skills in these resources relating to the development of driving skills (AOTA, n.d.). Furthermore, AOTA's continuing education and resources related to driving are geared towards older driver evaluation. The number of readily available lists of pre-driving assessments or interventions on AOTA's website is limited.

How occupational therapists assess driving. Two studies (Unsworth, Harries, & Davies, 2015; Vrkljan, Myers, Blanchard, Crizzle, & Marshall, 2015) looked into how experienced occupational therapists decided how to assess the fitness-to-drive in adults with physical disabilities. Both studies found occupational therapists took into consideration the individual's needs and cognitive skills (Unsworth et al., 2015; Vrkljan et al., 2015). Because every client is unique, the occupational therapists recognized that multiple assessments are needed to assess pre-driving skills and driving performances for each client (Unsworth et al., 2015; Vrkljan et al., 2015). Additionally, a study by Dickerson (2013) surveyed occupational therapists and certified driving rehabilitation specialists (CDRS) to gather information on current assessments and trends in the arena of driving rehabilitation. It was mentioned that while many CDRS find the behind-thewheel assessment to be a conventional assessment for deciding fitness-to-drive, there is little consistency in defining this assessment based on duration, routes, skills, etc. (Dickerson, 2013).

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Because there is no single universal assessment, occupational therapists find it difficult to decide which assessments to use for each client (Unsworth et al., 2015; Vrkljan et al., 2015). For example, using the Useful Field of View test, which assesses cognitive functioning, 49 occupational therapists and CDRS used this test for adults with neurological or dementia-related impairments, while only nine used this test for teenagers (Dickerson, 2013). Another example is that 74 occupational therapists and CDRS used the Ocular Range of Motion test to assess vision for adults with neurological and dementia-related impairments, but only ten reported using this when assessing new drivers (Dickerson, 2013). It is evident that while occupational therapists are assessing driving rehabilitation as an area of occupation, few are working with the adolescent and teenage populations, and even fewer are focused on teenagers and young adults with developmental disabilities (Dickerson, 2013; Unsworth et al., 2015; Vrkljan et al., 2015).

Caregivers and Driving Programs

Caregivers are an essential aspect of a teenager's success when learning how to drive. A study by Cox et al. (2012) found that parents of teenagers with ASD identified multitasking as the most frequent area of concern. Furthermore, Tyler (2013) established that teenagers diagnosed with ASD responded positively with interventions such as communication books, keywords, a set routine, "what if" scenarios, and positive reinforcements. Caregivers of young adults with ASD suggested helpful strategies such as not being overly emotional (i.e., raising a voice, getting upset, or "cringing") and not providing too much verbal instruction when teaching their child how to drive (Cox et al., 2012). Studies have shown that caregiver interventions are beneficial to a teenager's driving abilities (Fabiano et al., 2016; Mirman et al., 2014). Fabiano et al. (2016) found that a family-focused driving intervention for teenage drivers with ADHD was shown to be more effective than a driver education driver practice program. The Supporting the Effective Entry to the Roadway program was tailored to new drivers with ADHD and includes parent training on appropriate strategies to help their child with ADHD (Fabiano et al., 2016). An intervention known as Teen Driving Plan (TDP) assists parents and caregivers in effectively supervising their teens while driving, and Mirman et al. (2014) found that young drivers who used TDP were 65% less likely to fail an on-road driving assessment than those not given access to the intervention. This study illustrated the positive outcomes that TDP can have on teen driving skills (Mirman et al., 2014). The studies of Fabiano et al. (2016) and Mirman et al. (2014) show the importance of caregiver-child relationships when learning to drive, and that these relationships should be considered by the OT when planning an intervention.

Current Occupational Therapy Assessments, Evaluations, and Interventions

Although there are available assessments and evaluations for driving, most of them are targeted towards older adults. Furthermore, occupational therapists are not using the available assessments either due to lack of awareness or perceived competency (Larsson et al., 2007). Many assessments have been conducted to test a variety of abilities, including behavioral skills, cognition, perceptual-motor skills, physical skills, visual skills, and knowledge of driving (Dickerson, 2013; Vrkljan et al., 2015). Within these skills, assessments can vary from self-reported measures, off-road assessments, and on-road assessments (Dickerson, 2013; Unsworth et al. 2015; Vrkljan et al., 2015). The most commonly used assessments for older adults that are conducted by occupational therapists and CDRS include the trail making test, the brake reaction test, the Montreal Cognitive Assessment (MoCA), clock drawing, the Snellen test, driving simulators, and on-the-road driving assessment (Dickerson, 2013; Unsworth et al. 2015; Vrkljan et al., 2015). Other current interventions and assessments include DriveSafe, DriveAware (Hines & Bundy, 2014), and P-drive (Patomella & Bundy, 2015). Despite the available assessments being designed for older adults, they can still be used for novice teen drivers. However, very few studies have focused on the teenage population with DD (Dickerson, 2013).

On-road assessments. Interestingly, of the CDRS surveyed by Dickerson (2013), 75% reported doing an on-road assessment with clients, yet the time frames for these assessments ranged from five minutes to six hours. It is evident that driving skills seen in five minutes on a rural road can differ significantly than the breadth of skills seen in six hours on both rural roads or heavy traffic. The Performance Analysis of Driving Ability (P-Drive) is an on-road assessment that uses a manual and a scoring sheet of 27 items (Patomella & Bundy, 2015). The 27 items are then categorized into four subgroups that encompass different driving skills such as maneuvering, orienting, following regulations, and attending to different stimuli in traffic (Patomella & Bundy, 2015). Patomella and Bundy (2015) found that P-Drive was a successful tool in looking at the skills needed for driving for older adults. It was further successful in predicting which individuals would pass or fail their driver's test (Patomella & Bundy, 2015). Although this assessment was proven to be successful in older adults, the question remains on why this is not being used for novice drivers.

Motor based skills. The few studies that have been done on assessing the driving skills of teenagers with DD have demonstrated that driving simulators are appropriate tools to do so (Almber et al., 2017; Brooks et al., 2013; Brooks et al., 2016; Cox et al., 2012; Cox et al., 2017; Fabiano et al., 2016; Groom, van Loon, Daley, Chapman, Hollis, et al., 2015; Kingery et al., 2015; Mirman et al., 2014; Ratzon et al., 2017). Through the use of driving simulators, Almber et al. (2017) and Brooks et al. (2016) found that individuals with ADHD and ASD were just as capable as typically developing peer drivers but needed more practice time in off-road training and on-road training. Brooks et al. (2013) confirmed that driving simulators are appropriate in teaching pre-driving skills such as lane management and speed management. Furthermore, Cox et al. (2017) and Brooks et al. (2016) demonstrated that not only can a driving simulator evaluate driving skills within this population, but it can also teach driving skills to improve their driving performances. These findings illustrate that driving simulators should not only be used to assess but also used to train driving skills in young adults with DD. In addition, Repetitive Task Practice (RTP) also has been deemed appropriate for improving occupational performance (Nilsen et al., 2015). Nilsen et al. (2015) outlined that RTP consists of frequent repetition of task-specific movements and has been proven positive for increasing activity and participation.

Cognitive and visual processing. Hines and Bundy (2014) used DriveSafe and DriveAware to predict driving ability in people with cognitive impairments. These two assessments are designed to be used together prior to driving. Furthermore, two studies (Hines & Bundy, 2014; Kay, Bundy, & Clemson, 2009) both identified DriveSafe and DriveAware as being reliable and valid in predicting the driving ability for those with

cognitive impairments. Another test measuring cognitive skills that was identified to be reliable and valid was conducted by Brooks et al. (2016), which demonstrated the use of a computerized neurocognitive test battery known as the CNS vital signs in young adults with ASD. This assessment was used as a screening instrument to identify an individual's neurocognitive impairment, such as verbal and visual memory, attention shifting, and continuous performance (Brooks et al., 2016). Another assessment used in the study by Brooks et al. (2016) was the wide range assessment of visual-motor abilities (WRAVMA). Through this study, both the CNS vital signs and WRAVMA illustrate the utility of screening assessments for young adults with ASD for pre-driving skills.

Driving behavior. The Occupational Therapy Risk Propensity Test (OT-RiPT) was used to identify risk-taking behaviors in novice drivers (Bruce, Unsworth, Tay, & Dillion, 2015). The OT-RiPT used 19 short videos that had active and passive hazards that the participants were asked to identify. The OT-RiPT needs further testing with participants diagnosed with ADHD; however, it can aid in evaluating, measuring, and identifying risky-driving behavior in new drivers (Bruce et al., 2015). It is important for teenagers with DD to be aware of their driving behaviors to increase safe driving outcomes (Groom et al., 2015).

In addition, Molloy, Molesworth, and Williamson (2019) found that selfexplanation groups were more effective than feedback-oriented groups for novice driver speed management. The self-explanation groups gave participants the chance to explain and reflect on their driver behavior rather than auditory feedback, such as when the participant went over the speed limit (Molloy et al., 2019).

Conclusion of Literature Review

Occupational therapists and caregivers play a significant role in addressing the pre-driving skills of teenagers with DD. Dickerson et al. (2011) demonstrated that occupational therapists are the most equipped profession for treating and assessing predriving skills, as they have the ability to observe whether the client has abilities such as scanning the environment or appropriately sequencing the tasks of driving. However, there are limited resources, and clinicians may not feel competent enough in their abilities to manage this population (Korner-Bitensky et al., 2010; Larsson et al., 2007). There have been numerous assessments developed for the adult population, but few aimed at teenagers with DD. Of the driving research that has been conducted on teenagers with DD, it has been shown that they have difficulty with cognitive skills, visual skills, speed maintenance, lane maintenance, and more (Dickerson, 2013). Assessments, evaluations, and interventions that can be beneficial in addressing those skills include caregiver programs, on-road assessments, driving simulators, cognitive assessments, visual assessments, and behavior assessments. Because of the limited research and knowledge on pre-driving skills of teenagers with DD, occupational therapists and caregivers must be given a resource that includes information such as the beneficial assessments, evaluations, and interventions for teenagers with DD that encompass the necessary driving skills.

Statement of Purpose

The purpose of this thesis was to design and collect feedback on a resource for clinicians and caregivers that highlights areas of need when assessing pre-driving skills in teenagers and adolescents with developmental disorders (DD). In addition, we have

developed additional resources for intervention practices and safe-driving strategies. This resource was created to provide information on areas of pre-driving needs with clinical applications, currently existing assessments, subsequent assessment steps, and intervention strategies for clinicians. Likewise, the caregiver section provided information on a strategy and program that caregivers can use when attempting to foster the development of safe driving in their teenagers with DD. An evidence-based resource has been compiled, created, and preliminarily disseminated to pediatric occupational therapists, certified driving rehabilitation specialists (CDRS), and occupational therapists with driving rehabilitation experience, to increase their awareness in addressing the pre-driving needs of the pediatric population with developmental disabilities.

Theoretical Framework

The theoretical framework that informed the creation of this project is the Person Environment Occupation Performance (PEOP). The PEOP is an evidence-based frame of reference that is made of three central elements: the person, the environment, and the occupation (Cole & Tufano, 2008). The fourth aspect, the occupational performance, illustrates the outcome of the transactional relationship between the three central elements (Cole & Tufano, 2008). Moreover, the PEOP is a client-centered practice approach that can be used with individuals, organizations, and population groups (Cole & Tufano, 2008). The interactions between the person, environment, and occupation are ever-changing across the lifespan, which, in turn, impacts an individual's occupational performance during the learning of new skills such as driving (Cole & Tufano, 2008).

When designing driver rehabilitation and assessment resources, the PEOP is an appropriate framework as it emphasizes both an individual's occupational performance

and participation, using a top-down approach (Wong & Fisher, 2015). A top-down approach is holistic and focuses on the client's unique skills of what is required to participate in an activity (Wong & Fisher, 2015). Occupational therapists use the topdown strategy in multiple ways when addressing participation and functional activity (Cole & Tufano, 2008). According to Wong and Fisher (2015), the PEOP can help create occupational therapy interventions, as it focuses on identifying a client's resources and barriers to their occupational performance. The PEOP model also provides guidelines on how to select assessment measures (Wong & Fisher, 2015). This is useful when creating a resource for practitioners and caregivers, as the resource will provide information addressing some of the barriers that teenagers with DD face regarding pre-driving skills. The resource will further provide practitioners and caregivers with tools and guidelines when selecting assessments that address these barriers. It is essential to use the PEOP model to examine the teen with DD and driving and the clinician when creating the resource.

The OTPF was used to provide clinicians with recognizable terminology. The OT can reference the suggestions for assessments, interventions, and evaluations throughout the handbook; and as a result, determine a treatment plan from clinical reasoning and judgement.

Person

The PEOP model includes four major components: the first one being the "person" (Cole & Tufano, 2008). The person is composed of five dimensions: psychological, neurobehavioral, spiritual, physiological, and cognitive factors (Cole & Tufano, 2008; Wong & Fisher, 2015). For this project the research team identified the "person" as both occupational therapy practitioners and teenagers with DD.

Cole and Tufano (2008) state that people have an innate desire to explore and interact with their environment. Driving and community mobility provides an opportunity for an individual to express and fulfill that desire; however, teenagers with DD often experience difficulty in doing so. The handbook's structure and terminology were geared towards OTs of different learning styles to access a resource that will assist in their clinical judgement when addressing teenagers with DD and driving. A task analysis section was designed in the handbook to identify the interaction between the person, environment, and driving performance. The creation of a task analysis section allows practitioners to address the person's range of motion, muscle strength, endurance, sequencing, cognitive abilities, and other related pre-driving skills (AOTA, 2014). An occupational therapist will be able to utilize their task analysis skills when identifying any strengths or barriers in an individual's pre-driving skills (Wong & Fisher, 2015).

When creating this resource, we focused on the OT as the primary person regarding the PEOP model. However, it is critical to also examine the teenagers with DD who are learning to drive. Teenagers with DD possess variables that are critical for the OT addressing driving in treatment, such as skills and abilities that may affect safety and effectiveness in learning to drive. The OT can use the handbook's suggestions to guide their clinical judgement while acknowledging the individuality of the teenager with DD. **Environment**

The environment while driving consists of the built environment, the natural environment, the cultural environment, societal factors, and social interaction (Cole &

Tufano, 2008). These extrinsic characteristics are crucial to evaluate when examining pre-driving skills because it will impact an individual's participation. The complexities of driving in different environmental scenarios can add challenges to the activity of driving. The built environment of the car proposes potential difficulties such as auditory and visual distractions. Auditory distractions can include the radio or other people conversing in the car while visual distractions can include indicator lights. The natural environment, which consists of the time of day and location of driving, may overwhelm individuals with DD due to their reactions to excessive stimuli (Sheppard et al., 2009). The societal environment also affects an individual's driving skills. Sheppard et al. (2009) states how individuals with DD who are novice drivers have difficulties with distinguishing social hazards such as pedestrians crossing the road, and physical hazards such as, potholes, car accidents, and road construction.

Occupational therapists must take into consideration the various environments that a driver may encounter when addressing pre-driving skills. The occupational therapist should also consider how the environment may affect the client's performance during assessment and evaluation. For example, treating in the clinic as opposed to onroad, can influence how the teenager may perform—considering the therapist and the driver's environments, the performance of an individual with DD while driving can be adequately assessed. Therefore, a driving resource must consider the multiple environmental factors that may impact the driving performance of individuals with DD. **Occupation**

The third area within the PEOP model is occupation. According to Cole and Tufano (2008), an occupation is defined as an individual's wants and needs to participate

in their daily lives. Therefore, driving is an essential occupation for teenagers, which is seen as a rite of passage that increases their independence and promotes community mobility (Brooks et al., 2013). Along with the increased independence that driving enables, benefits also include access to social participation and feelings of self-efficacy (Morisset, Terrade, & Somat, 2010). Due to the complexity of driving, as previously outlined in the task analysis section, a driving resource should deconstruct the occupation of driving to simplify the tasks and skills for the teenagers with DD. By simplifying the occupation, the OT can identify the areas of improvement that can allow the teenagers with DD to participate in daily activities and interact with their environment through driving.

Furthermore, throughout the handbook, the components and significance of the occupation of driving are addressed within the various sections. These include the task analysis of driving, screening tools and assessments related to driving skills, and suggested interventions. Overall, the creation of the driving handbook will allow practitioners to analyze and examine the importance and skills of the occupation of driving in teenagers with DD.

Performance

The final component of the PEOP model is the "performance," which is defined as the act of participating in the occupation (Cole & Tufano, 2018). This component emphasizes the transactional relationship between the person, the environment, and the occupation that one chooses (Cole & Tufano, 2018). According to Wong and Fisher (2015), occupational therapists strive to improve performance by creating interventions for their clients to reach their full potential in participating within the home and community. The creation of this resource aimed to indirectly improve the performance of drivers with DD by directly enhancing the ability of both clinicians and caretakers to address pre-driving skills in these clients.

The PEOP model guided the creation of this resource for clinicians and caregivers by addressing the person, environment, occupation, and performance for teenagers with DD. The PEOP model is the best theoretical framework for this thesis, as it can guide clinicians and caregivers to address pre-driving skills successfully.

Methodology

This thesis used an extensive literature review as the foundation for the resource created. Articles that were researched included driving skills, cognitive functioning, screening tools, performance skills, adolescents, pre-driving, occupational therapists, CDRS, and driving assessments. The aim of this extensive review was to research what is currently available regarding the pre-driving skills of teenagers who have DD, what pre-driving skills were needed, what resources are available for occupational therapists and caregivers, and the currently available assessment tools. Articles were obtained through a search of PubMed, AOTA, Google Scholar, and ResearchGate. In order to find the articles that most closely relate to the intended area of interest, specific key terms were used when searching (e.g., "driving rehabilitation," "driving assessment," "occupational therapy," "ADHD," "developmental disability," etc.). Studies were also critically appraised for their reliability and validity based upon the clinical application of the evidence and the strength of the results.

The information from the evidence-based resources was compiled and organized based upon thematic elements, such as limited research, OTs role in addressing driving

skills, the caregiver's role in supporting teens learning to drive, current relevant OT assessment tools and evaluation practices, along with interventions. Studies were included if they were completed within the last 15 years. Typically, a literature review covers studies conducted within the last 10 years; however, due to the lack of current research on the topic, the range was broadened in order to include as much of the associated evidence as possible. Studies were also critically appraised based upon the clinical application of the evidence and the strength of the results.

Through the evaluation of current research with adolescent drivers with DD, a need for a resource was identified that would assist clinicians and caregivers in evaluating pre-driving skills and identifying related interventions. Individuals with DD, such as ADHD, have a higher incidence of motor vehicle accidents (ADHD Editorial Board, 2019). Therefore, there is a need to address safety concerns with this population. There is limited evidence on the motor coordination and sensory perception assessments that determine the fitness to drive of individuals with a DD.

IRB

Before beginning the research project, we completed the web-based training course, "Protecting Human Research Participants," to receive the online certification needed when conducting a research project involving human participants (National Institutes of Health [NIH], n.d.). Once certified, we identified a need for a clinician and caregiver resource for teenagers and driving skills. Because of the project involving a review of the resource by clinicians, we submitted their application to the Institutional Review Board (IRB) for Protection of Human Participants. To follow guidelines of the NIH, the team created a secure email address for communication with participants. We

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then prepared consent forms and additional documents related to the review portion of the project in order to submit the proposal form to IRB. After submission, the IRB suggested revisions were received, and the team proceeded with making adjustments as suggested. After resubmitting the proposal, the revisions were approved, and the team began recruiting reviewers.

Recruitment Process

The primary goal of this thesis was to create a resource to inform the evaluation processes that address driving skills; however, we were also able to preliminarily disseminate the handbook to a small group of clinicians for feedback. Participants were recruited through the research team's personal and professional connections, based on purposive sampling methods, with hopes to utilize snowball sampling from these connections. During the creation of the handbook, the research team sent an invitation email (see appendix A) to fifteen potential participants, with the intent to have at least three reviewers for the preliminary version of *Driver Preparedness: A Handbook For Occupational Therapists Addressing Pre-driving Skills In Teenagers With Developmental Disabilities (Driver Preparedness).*

Initially, the research team's first inclusion criteria was pediatric-based OTs and CDRS with at least two years of experience, respectively, to review the resource. However, due to the increased potential for obtaining feedback in the time allotted for thesis projects and the limited number of OTs who are certified driving specialists, we extended the inclusion criteria to also include OTs with at least two years of driving rehabilitation experience. Therefore, the inclusion criteria was expanded to include licensed pediatric OTs, OTs with driving rehabilitation experience, and/or a CDRS with

at least two years of experience in their respective fields. Because this is the first version of the handbook and it was only created in English, it was imperative that it was reviewed by those who are literate in the English language. The research team ensured that the reviewers were English literate by including the question, "Is English your primary language?" in the consent form. At this time, there will be no translated portable document format (PDF) for non-English literate participants. Exclusion criteria included OTs who do not have experience working with the pediatric population for at least two years, OTs that do not have driving rehabilitation experience for at least two years, or CDRS who do not have at least two years' experience in their field.

The participants that met the inclusion criteria were sent a confirmation email (see appendix B) which also included the consent form (see appendix C). Reviewers were required to sign the consent forms prior to participating in the review process of this study.

Handbook Creation

The research team compiled resources from the literature review and collected additional materials as needed to create and develop *Driver Preparedness* with the assistance of an online editing program called Canva for formatting. The digital handbook for OTs includes information regarding awareness of specific pre-driving skills related to teens experiencing developmental delay, techniques for addressing these skills, a flow chart for clinicians on suggested subsequent assessment steps when evaluating driving skills, a comprehensive list of resources for clinicians for evaluation, potential intervention strategies, and resources for caregivers for safe-driving strategies and homepractice techniques. Throughout the handbook the OTPF was used to provide clinicians
with recognizable terminology. The OT can reference the suggestions for assessments, interventions, and evaluations throughout the handbook; and as a result, determine a treatment plan from clinical reasoning and judgement. While developing this resource, the thesis team found a lack of current evidence on specific interventions that can be used in driving rehabilitation for teenagers, so more research was completed in an attempt to fill this gap. Further research was done using keywords such as "visual," "cognitive," "motor," and "visual-motor integration" interventions for driving rehabilitation. The articles produced were critically appraised based upon the clinical application of the evidence and the application to the formation of a reliable digital handbook.

The handbook, *Driver Preparedness* (see appendix D), was disseminated to five participants who were either the target population of pediatric-based OTs, OTs with driving rehabilitation experience, or certified driving rehabilitation specialists (CDRS) who met the inclusion criteria for the review.

Feedback Forms

The five accepted participants were provided with a PDF copy of the handbook and a feedback form (see appendix E), which they were asked to complete and return within 3 weeks of receiving it. There were two parts to the feedback form. The first part consisted of a 5-point Likert-scale which requested the reviewers to select one of the five answers, which included "Strongly Agree," "Agree," "Neither Agree nor Disagree," "Disagree," and "Strongly Disagree" to answer the seven questions/statements. The second part consisted of open-ended questions (see appendix E). By collecting this data, the validity of the resource was expanded. The feedback was intended to be utilized for

one small group review process in order to better inform the future cohorts for its application in a pre and post-test research design.

Although five reviewers were sent the digital handbook, only four completed and returned the feedback form. Once the feedback forms were completed and received by the team, a thank-you confirmation email (see appendix F) was sent to reviewers for their contribution which provided information regarding a thank you gift card. The research team read and coded the feedback responses for common themes utilizing inter-rater reliability. The team ensured forms were completed, and the comments and suggestions were organized to be taken into consideration for revision of the handbook as needed.

The goal for this information is to provide clinicians with today's resources and strategies and to help practitioners make evidence-based recommendations when evaluating driving skills in the pediatric DD population. To share this information as much as possible, the aim of the digital handbook is to be shared via poster boards, social media, and websites relating to the occupational therapy practice. Providing the digital handbook through this media allows it to reach a large number of clinicians across the United States. In addition, a pre-finalized handbook was disseminated at the OTAC Spring Symposium 2020.

Results

The results from the feedback forms submitted by participants illustrated consistency among the reviewers and served to improve the final draft of the *Driver Preparedness*. *Driver Preparedness* was provided to five reviewers for feedback. Four participants completed the review and returned the form, while one individual was unable to participate. The reviewers ranged in years of practice experience from 2 to 22 years,

one reviewer being a pediatric occupational therapist and three reviewers being occupational therapists with driving rehabilitation experience. The four reviewers submitted their feedback regarding *Driver Preparedness* using Likert scales to evaluate the following: content, accessibility, layout and structure, comprehensiveness, whether they think pre-driving skills should be addressed in adolescents, if this digital handbook would be a helpful resource for addressing pre-driving skills in teenagers with developmental disabilities and in their daily practice, and whether they would recommend components of *Driver Preparedness* to caregivers. Narrative style feedback was also collected on what reviewers liked about the handbook, including any recommendations for change, the need for additional resources, and any other comments and suggestions.

The first part of the feedback form, the 5-point Likert-scale, illustrated the validity of and need for *Driver Preparedness* as the responses were either "Strongly Agree" or "Agree." The first question examined the need to address pre-driving skills in adolescents. Three reviewers chose "Strongly Agree" while one reviewer selected that they "Agree" that pre-driving skills should be addressed in adolescents. On questions, (2) "Do you think this would be a helpful resource for addressing pre-driving skills for teenagers with developmental disabilities?", (4) "The content is appropriate to occupational therapists and certified driving rehabilitation specialists.", (5b) "The digital format of the handbook is user friendly. B. Text layout and structure", and (6) "The information provided in the handbook is easy to understand," all four reviewers chose "Strongly Agree." The third question inquired if the resource would be beneficial in their daily practice. The pediatric occupational therapist selected "Strongly Agree" while the

other three reviewers "Agreed" to this question. Question five A was divided 50% between "Strongly Agree" and "Agree" when asked about the digital accessibility. The last question, which asked if the OT would recommend the caregiver component of *Driver Preparedness* to caregivers had a response of three reviewers who selected "Strongly Agree" while one reviewer chose "Agree." None of the participants responded with any of the neutral or negative Likert options.

In the narrative portion of the feedback form, reviewers were given the opportunity to respond to questions regarding what they liked about *Driver Preparedness*, what recommendations for change they may have, any additional resources the creators should include in the handbook, and any other comments or suggestions not addressed above. Five themes were identified after reviewing the narrative style feedback portion: (1) the handbook was organized and comprehensive; (2) pre-driving skills in teenagers with DD is an essential topic; (3) different sections of the handbook both appealed and stood out to each reviewer, (4) this resource is essential to caregivers; and (5) suggested revisions. Additional details are described below.

Handbook was Organized and Comprehensive

The reviewers identified that *Driver Preparedness* was organized and comprehensive. In fact, for the first question regarding what was liked about this handbook, one reviewer answered, "this is a very organized and well-done handbook about a very important topic. It made clear and concise points and was easy to read." Another reviewer reiterated that same idea when they wrote, "overall, you did a great job, very organized and detailed." Regarding narrative question two, which allowed for the opportunity to make recommendations for change, two reviewers did not have any suggestions. In fact, one reviewer responded, "I am impressed by how comprehensive this handbook is. I do not have any recommendations for change."

Pre-Driving Skills in Teenagers with DD is an Essential Topic

The reviewers noted that driving is an essential topic for this population and went on to highlight their opinions. One reviewer emphasized that "this handbook is incredibly valuable to OTs as many OTs are appropriate to address driving and don't know where to start." A second reviewer explained that this is "a well-done handbook about a very important topic." While another reviewer added, "I believe that the resources are very thorough and cover the array of information that would be needed."

Different Sections of the Handbook Both Appealed and Stood Out to Each Reviewer

When asked what the reviewers enjoyed about *Driver Preparedness*, three reviewers responded with sections that stood out to them, while the other reviewer praised the organization and structure of the handbook. These sections included the task analysis of driving, implications for occupational therapy, and suggested interventions. One reviewer pointed out two specific parts: the task analysis and the implications for OT. This individual stated, "I greatly enjoyed reading through the task analysis section. It sheds light on the many different aspects of driving that many of us take for granted. It has reminded me of the multitude of different components needed to complete the IADL of driving" and "the other section I enjoyed was the implications for OT, I thought it was very thoughtful and overall beneficial for your thesis and readers' acknowledgments to see the performance skills needed for driving and the clinical observations." While the second reviewer stated that they "appreciated the information regarding standardized testing, treatment options and caregiver resources."

This Resource is Essential for OTs, OTAs, and Caregivers

The reviewers commended the creators on the creation of *Driver Preparedness* and its value for occupational therapists addressing these skills. One reviewer highlighted that they "feel this handbook is incredibly valuable to OTs as many OTs are appropriate to address driving and don't know where to start." While another reviewer emphasized they enjoyed the intervention section, and highlighted that it provided functional interventions to use when working with this population and others with DD. A third reviewer requested the ability to use this resource in their practice, stating, "Great job overall! With your permission, I would love to share this with some of the parents of our clients that may be interested in learning to drive."

Suggested Revisions

One reviewer suggested incorporating more of the emotional components involved in driving and how that affects an individual's responses while completing the task. For instance, the reviewer wrote, "some recommendations from my personal experience would be to elaborate more on the emotional toll that driving takes on an individual. I am specifically referencing when myself has been in the same room as an individual on the driving simulator and something happens. That something being a simulation of a child walking into the middle of the road or an animal crossing. Overall, it diminished their interest in learning to drive even though it was a simulation. In saying this, I think the screening tools would have been very effective for identifying this level of emotional maturity before starting driving on a simulation." They also brought up that every individual with developmental disabilities is going to vary on a case by case basis when learning to drive. Hence, it is essential that as an instructor, one should be aware and highly knowledgeable in all aspects of driving and these related resources. Another reviewer commented that "more information on billing and reimbursement would be beneficial." It was also suggested by a reviewer to refer to the National Highway Traffic Safety Administration for more driving-related data." The same reviewer also highlighted some grammatical errors and suggested improvements such as correcting citations, clarifying quotation marks, abbreviations, and increasing the user-friendly aspect of the handbook. Lastly, one reviewer suggested adding pictures to a revised version of *Driver Preparedness* for adolescents to understand scenarios better visually. These proposed revisions have been taken into account to finalize the final version of this current draft of the handbook.

Discussion

We created one of the first resources to provide occupational therapists with information and suggestions of assessments and interventions to address the pre-driving skills with individuals experiencing DD. *Driver Preparedness* was disseminated to five registered OTs for professional review. Upon receiving feedback from four reviewers, the research team noted common themes, as well as recommended revisions. Although there were only four participants who reviewed the digital handbook, their feedback was consistent and provided helpful details, which was essential in creating a more clinically appropriate handbook for the future.

We identified several positive conclusions during the review of the research data from the study's four registered OT participants. The first conclusion established was that the reviewers agreed that the digital handbook was organized and comprehensive. These results illustrate that there was ample information presented in an easy-to-follow format.

When creating *Driver Preparedness*, there was limited research on what works and what does not regarding the pre-driving skills in teenagers with DD. The feedback provided by reviewers indicated that the information, assessments, and interventions regarding predriving skills were presented in an easy-to-use format that had comprehensive material compiled into the first version of *Driver Preparedness*. However, it should be noted that despite the ample information provided, it is vital for future researchers to conduct additional research to ensure any future versions of the handbook includes current evidence-based research.

The second conclusion that arose was that reviewers acknowledged that teens with DD and driving is an essential topic. Presently, there is limited information regarding teens with DD and pre-driving skills (Brooks et al., 2013). Research should continue in order to provide evidence-based practice for OTs regarding helping this population with this occupation.

While each reviewer stated that they enjoyed the handbook as a whole, the reviewers pointed out different sections that appealed to them. These results show that each section within the resource has strong points. It is important to note that due to the various learning styles and backgrounds (e.g., number of years in practice, what setting they practice in, etc.), this could be an explanation for the differences in what stood out to each reviewer.

All of the reviewers agreed that the resource was important to clinicians and caregivers. One reviewer even stated that he would like to send it to a client's caregiver. This further implicates how critical it is for a caregiver to be informed about the activity analyses, assessments, and interventions related to pre-driving skills in this population.

Future research should be conducted on how various caregiver styles and involvement can impact an individual with DD on their ability to drive.

Along with the strong feedback given, participants also provided the researchers with a myriad of suggestions to improve the digital handbook. The reviewers identified that the "emotional" component with teens with DD and driving should be further addressed in the resource. While the resource identified multiple client performance skills, there is limited research regarding the emotional component in this specific population when it comes to pre-driving skills. Therefore, a future version of the handbook should include more assessments and interventions regarding the emotional toll one with DD can face when it comes to driving. In addition to helping identify the emotional aspect of these teens, it can help caregivers in developing any strategies when addressing their teens' emotional needs.

After reviewing the reviewers' feedback, we revised the resource for future dissemination. It is essential that future OTs and OT students continue research regarding teens with DD and driving as an occupation. Current evidence-based practice is fundamental to the occupational therapy profession and should be considered when determining interventions and assessments.

Driver Preparedness can be a vital resource for clinicians and caregivers in the scope of occupational therapy. The thesis follows the AOTA and AOTF research goal to "develop and evaluate strategies for identifying and/or measuring the influence of activity engagement in daily life on health" (AOTA & AOTF, 2011, p. 55). The thesis aligns with this research goal as *Driver Preparedness* is a handbook that was designed to assist OTs in identifying the pre-driving skills that teenagers with DD may be having difficulties in.

The handbook contains evidence-based research that can provide clinicians resources when choosing assessments, evaluations, and interventions. Using the feedback provided and by conducting more up-to-date research, future researchers can further contribute to reaching the AOTA and AOTF goal by developing a newer version of the handbook to further expand the knowledge of clinicians and caregivers on the pre-driving skills of teenagers with DD.

Limitations

Being a first of its kind, we faced a number of limitations in developing *Driver Preparedness*. These limitations were: the lack of evidence in assessing pre-driving skills in teenagers with DD, the limited number of therapists addressing pre-driving skills in teenagers with DD, the time constraints of the thesis project, the lack of generalizability of our results, and the limited constructive feedback we acquired. It is important to note that the reason for these limitations can be because this resource is among the first driving related resources created specifically for addressing the pre-driving skills in teenagers with DD. Therefore, it is a new area, and some clinicians may not currently address pre-driving skills in their clinics, despite the need to do so. The resource was created to spread awareness of this topic and be an introductory guide for clinicians, but it has a lack of specificity in treatments due to every individual with DD presenting with different symptoms and difficulties.

Since there is a short supply of therapists addressing pre-driving skills in teenagers with DD along with a lack of awareness surrounding this problem, there may be limited potential usage of *Driver Preparedness*. Furthermore, there is no exact funding towards assessing pre-driving skills, and it can be unclear for some therapists how it fits

into their current pediatric practice. In future development of *Driver Preparedness*, we anticipate resources and information on funding processes being added to the next edition.

We also faced time constraints as a limitation to this thesis project. Time for developing *Driver Preparedness* was limited as it needed to be completed by a specific deadline for class. There were also specific timelines to follow when promoting the study, collecting data, and reviewing the data. If more time was allotted, the research team could have taken full advantage of the intended snowball recruitment method from our original purposive sampling; and as a result, more participants would have been included in the study.

Constructive feedback given for the pre-driving resource was another limitation. There were not many suggestions on changing the content presented in the handbook. The lack of constructive feedback could be due to the topic of pre-driving skills in teenagers with DD being unexplored and relatively new to most clinicians. Furthermore, the small sample size of reviewers may also account for the lack of constructive feedback. The small sample size and the fact that participants were originally recruited through the research team's personal and professional connections, it is possible the feedback could have been biased. This could account for the lack of constructive feedback. Future versions should be disseminated to a larger sample size for more constructive feedback on how to improve *Driver Preparedness*.

Some of the evidence provided on the resources have originated from different countries such as Sweden and the United Kingdom; therefore, there is a lack of information from the United States. There are also studies which have more reliability and validity; however, these studies do not address our intended population. To account for these limitations, the research team carried out and designed an extensive critical appraisal of each evidence-based article that was included in the project. The clinician should use clinical reasoning while considering the client's culture and values when referencing the information from *Driver Preparedness*. While utilizing *Driver Preparedness*, the clinician should also take into account the local driving laws and regulations.

Ethical and Legal Considerations

Due to this project only involving four volunteer participants to review the digital handbook, there is a minimized amount of risk. This thesis project was approved by the IRB as an expedited study due to minimal participant interaction and it being project based. Interaction from participants only encompassed email communication for gathering of demographic information and feedback on *Driver Preparedness*. This considerably limited the project's ethical and legal considerations. The research team did consider the personal demographic information that was collected when interacting with participants, and thus a password protected email was created and used for the sole purpose of this project.

The only risk to the volunteer reviewers was the possible loss of time. To further minimize the risk, the research team provided the most up-to-date, accurate, and evidence-based information for this thesis project. The resource provided critically-appraised research to assist clinicians in designing pre-driving evaluations and interventions. *Driver Preparedness* was not designed to be used as a deciding factor as to a teenager's eligibility for a driving permit or license. Clinicians should also continue to

follow the protocols outlined by their place of work or medical practice facility. At any point, the reviewers had the option to stop participating within the study and opt-out. Furthermore, there is no monetary cost to the participants other than the time for the review. As a thank you, reviewers were compensated for their time with a \$5 Amazon gift card which was self-funded by the research team. In addition, reviewers were able to access this new resource before its publication and allowed to keep it after the review process.

Conclusion

Driver Preparedness was created to address the gap in available resources for clinicians and caregivers who work with this population. The resource highlighted predriving skills such as visual attention, cognitive function, motor performance, and visualmotor integration (Classen et al., 2013; Kingery et al., 2015). Occupational therapists encountering the teenage population and driving can use this resource as a reference for evaluation, assessment, and intervention.

After an extensive literature review, a first draft of the handbook was created and disseminated to five occupational therapists with relevant experience. Four of the reviewers provided their professional input for edits of the handbook draft. The research team revised the handbook while acknowledging the suggestions from the four reviewers. By having the handbook reviewed and further revised, the research team was able to further develop the clinical-application of the resource. However, it is essential that subsequent studies are conducted to add evidence-based research for teenagers with DD and driving.

There are many components to the occupation of driving and a clinician should utilize clinical-reasoning when making decisions for a client's treatment. *Driver Preparedness* was created to help equip clinicians with resources for clinical-decision making. It is essential the clinician understands the individual culture and values of their clients while referencing the handbook. With such positive reviews, we expect to further develop *Driver Preparedness* into a second version encompassing feedback suggestions from the preliminary reviewers. The team hopes to disseminate *Driver Preparedness* to more clinicians for use in their practices.

References

American Occupational Therapy Association. (2014). Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy*, 68(Suppl. 1), S1-S48. https://doi.org/10.5014/ajot.2014.682006

American Occupational Therapy Association. (n.d.). Specialty certification in driving and community mobility. *Education and Careers*. Retrieved from https://www.aota.org/Education-Careers/Advance-Career/Board-Specialty-Certifications/Driving-Community-Mobility.aspx

- American Occupational Therapy Association & American Occupational Therapy
 Foundation. (2011). Occupational therapy research agenda. *American Journal of Occupational Therapy*, 65(Suppl.), S4–S7. https://doi.org/10.5014/ajot.2011.65S4
- ADHD Editorial Board. (2019). ADHD statistics. *Additude: Inside the ADHD mind.* Retrieved from https://www.additudemag.com/statistics-of-adhd/
- Almber, M., Selander, H., Falkmer, M., Vaz, S., Ciccarelli, M., & Torbjörn, F. (2017). Experiences of facilitators or barriers in driving education from learner and novice drivers with ADHD or ASD and their driving instructors. *Developmental Neurorehabilitation*, 20(2), 59-67.

https://doi.org/10.3109/17518423.2015.1058299

- Behind the Wheel with ADHD. (2017). *ADHD Increases Driving Risk*. Retrieved from https://behindthewheelwithadhd.com/the-statistics/
- Bishop, H., Boe, L., Stavrinos, D., & Mirman, J. (2018). Driving among adolescents with autism spectrum disorder and attention-deficit hyperactivity disorder. *Safety*, 4(3), 40. https://doi.org/10.3390/safety4030040

- Brooks, J. O., Mossey, M. E., Tyler, P., & Collins, J. C. (2013). An exploratory investigation: Are driving simulators appropriate to teach pre-driving skills to young adults with intellectual disabilities? *British Journal of Learning Disabilities*, 42, 204-213. https://doi.org/10.1111/bid.12029
- Brooks, J., Kellett, J., Seeanner, J., Jenkins, C., Buchanan, C., Kinsman, A., ... Pierce, S. (2016). Training the motor aspects of pre-driving skills of young adults with and without autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 46(7), 2408–2426. https://doi.org/10.1007/s10803-016-2775-8
- Bruce, C., Unsworth, C. A., Tay, R., & Dillon, M. P. (2015). Development and validation of the Occupational Therapy Risk Propensity Test (OT-RiPT) for drivers with disability. *Scandinavian Journal of Occupational Therapy*, 22(2), 147–152. https://doi.org/10.3109/11038128.2014.992952
- Centers for Disease Control and Prevention. (2018). *Teen drivers: Get the facts*. Retrieved from

https://www.cdc.gov/motorvehiclesafety/teen_drivers/teendrivers_factsheet.html

- Classen, S., Monahan, M., & Wang, Y. (2013). Driving characteristics of teenagers with attention deficit hyperactivity and autism spectrum disorder. *American Journal of Occupational Therapy*, 67, 664–673. http://doi.org/10.5014/ajot.2013.008821
- Cole, M. B., & Tufano, R. (2008). *Applied theories in occupational therapy: A practical approach*. Thorofare, NJ: SLACK, Inc.
- Cox, N. B., Reeve, R. E., Cox, S. M., & Cox, D. J. (2012). Brief report: Driving and young adults with ASD: Parents' experiences. *Journal of Autism and*

Developmental Disorders, 42(10), 2257–2262.

https://doi.org/http://dx.doi.org/10.1007/s10803-012-1470-7

- Cox, D. J., Brown, T., Ross, V., Moncrief, M., Schmitt, R., Gaffney, G., & Reeve, R. (2017). Can youth with autism spectrum disorder use virtual reality driving simulation training to evaluate and improve driving performance? An exploratory study. *Journal of Autism and Developmental Disorders*, 47(8), 2544-2555. https://doi.org/10.1007/s10803-017-3164-7
- Curry, A.E., Yerys, B.E., Metzger, K.B., Carey, M.E., & Power, T.J. (2019). Traffic crashes, violations and suspensions among young drivers with ADHD. *Pediatrics*, 143(6). https://doi.org/10.1542/peds.2018-2305
- Dickerson, A. E. (2013). Driving assessment tools used by driver rehabilitation specialists: Survey of use and implications for practice. *American Journal of Occupational Therapy*, 67, 564–573. http://doi.org/10.5014/ajot.2013.007823
- Dickerson, A. E., Reistetter, T., Schold Davis, E., & Monahan, M. (2011). Evaluating driving as a valued instrumental activity of daily living. *American Journal of Occupational Therapy*, 65, 64–75. https://doi.org/10.5014/ajot.2011.09052
- Ellsworth, M.A.S.K. (2017). Autism spectrum disorder. In B.J. Atchison & D.P. Dirette (Eds.), *Conditions in occupational therapy* (pp. 26-53). Philadelphia, PA: Lippincott Williams & Wilkins.
- Fabiano, G. A., Schatz, N. K., Morris, K. L., Willoughby, M. T., Vujnovic, R. K., Hulme, K. F., ... Pelham, W. E. (2016). Efficacy of a family-focused intervention for young drivers with attention-deficit hyperactivity disorder. *Journal of Consulting and Clinical Psychology*, 84(12), 1078–1093. https://doi.org/10.1037/ccp0000137

- Groom, M. J., van Loon, E., Daley, D., Chapman, P., & Hollis, C. (2015). Driving behavior in adults with attention deficit/hyperactivity disorder. *BioMed Central Psychiatry*, 15(175), 1-11. https://doi.org/10.1186/s12888-015-0566-y
- Hawley, C. (2015). Knowledge and attitudes of occupational therapists to giving advice on fitness to drive. *British Journal of Occupational Therapy*, 78. https://doi.org/10.1177/0308022614562402

Hines, A, & Bundy A. C., (2014). Predicting driving ability using DriveSafe and DriveAware in people with cognitive impairments: A replication study. *Australian Occupational Therapy Journal*, 61, 224–229.
https://doi.org/10.1111/1440-1630.12112

- Insurance Institute for Highway Safety. (2018). *Fatality facts 2017: Teenagers*. Retrieved from https://www.iihs.org/topics/fatality-statistics/detail/teenagers
- Kay, L. G., Bundy, A. C, & Clemson, L. M. (2008). Predicting fitness to drive using the visual recognition slide test (USyd). *American Journal of Occupational Therapy*, 62,187-197. https://doi.org/10.5014/ajot.62.2.187
- Kingery, K. M., Narad, M., Garner, A. A., Antonini, T. N., Tamm, L., & Epstein, J. N. (2015). Extended visual glances away from the roadway are associated with ADHD- and texting-related driving performance deficits in adolescents. *Journal of Abnormal Child Psychology*, 43(6), 1175–1186. https://doi.org/10.1007/s10802-014-9954-x
- Korner-Bitensky, N., Menon, A., von Zweck, C., & Van Benthem, K. (2010). Occupational therapists' capacity-building needs related to older driver screening,

assessment, and intervention: A Canadawide survey. *American Journal of Occupational Therapy*, 64, 316–324. https://doi.org/10.5014/ajot.64.2.316

- Larsson, H. J., Lundberg, C., Falkmer, T., & Johansson, K. (2007). A Swedish survey of occupational therapists' involvement and performance in driving assessments. *Scandinavian Journal of Occupational Therapy*, 14, 215–220. https://doi.org/1-1080/11038120601110983
- Mirman, J. H., Curry, A. E., Winston, F. K., Wang, W., Elliott, M. R., Schultheis, M. T., .
 . . Durbin, D. R. (2014). Effect of the teen driving plan on the driving performance of teenagers before licensure: A randomized clinical trial. *JAMA Pediatrics 168*(8). 764–771. https://doi.org/10.1001/jamapediatrics.2014.252
- Molloy, O., Molesworth, B. R. C., & Williamson, A. (2019). Which cognitive training intervention can improve young drivers' speed management on the road?
 Transportation Research Part F: Traffic Psychology and Behaviour, 60, 68–80. https://doi.org/10.1016/j.trf.2018.09.025
- Morisset, N., Terrade, F., & Somat, A. (2010). Perceived self-efficacy and risky driving behaviors: The mediating role of subjective risk judgment. *Swiss Journal of Psychology*, 69(4), 233–238. https://doi.org/10.1024/1421-0185/a000027
- National Institutes of Health. (n.d.). *Protecting human research participants: Online training and certification*. Retrieved from https://phrptraining.com/
- Nilsen, D. M., Gillen, G., Geller, D., Hreha, K., Osei, E., & Saleem, G. T. (2015).Effectiveness of interventions to improve occupational performance of people with motor impairments after stroke: An evidence-based review. *American*

Journal of Occupational Therapy, 69, 6901180030.

http://doi.org/10.5014/ajot.2015.011965

- Patomella, A. & Bundy, A. (2015). P-Drive: Implementing an assessment of on-road driving in clinical settings and investigating its internal and predictive validity.
 American Journal of Occupational Therapy, 69(4), 1–9.
 https://doi.org/10.5014/ajot.2015.015131
- Preston, L.A. (2018). Evaluation of motor control. In H. M. Pendleton & W. Schultz-Krohn, *Pedretti's occupational therapy: Practice skills for physical dysfunction* (8th ed., pp. 444–469), St. Louis, MO: Elsevier.
- Ratzon, N. Z., Lunievsky, E. K., Ashkenasi, A., Laks, J., & Cohen, H. A. (2017).
 Simulated driving skills evaluation of teenagers with attention deficit
 hyperactivity disorder before driving lessons. *American Journal of Occupational Therapy*, 71. 1–8. https://doi.org/10.5014/ajot.2017.020164
- Ross, V., Jongen, E., Van Vlierden, K., Brijs, K., Brijs, T., Hens, R., ... Vanvuchelen, M.
 (2018). Process of learning to drive by young persons with autism: Experiences of the young persons themselves, parents, and driving instructors. *Transactions on Transport Sciences*, 9. https://doi.org/10.5507/tots.2018.012
- Sheppard, E., Ropar, D., Underwood, G., & van Loon, E. (2009). Brief report: Driving hazard perception in autism. *Journal of Autism Development Disorders*, 40(4), 504–508. https://doi.org/10.1007/s10803-009-0890-5
- Stanbridge University (2019). MSOT curricular threads [PDF File]. *MSOT thesis manual* - v 1.2., p. 25.

Tyler, S. (2013). Asperger's syndrome: The implications for driver training methods and road safety. *Journal of the Australasian College of Road*, 24(1), 55–63. Retrieved from: https://acrs.org.au/wp-

content/uploads/ACRSjournalVol24No1Feb13WEBv2.pdf

- Unsworth, C., Harries, P., & Davies, M. (2015). Using social judgment theory method to examine how experienced occupational therapy driver assessors use information to make fitness-to-drive recommendations. *British Journal of Occupational Therapy*, 78(2), 109–120. https://doi.org/10.1177/0308022614562396
- Vrkljan, B. H., Myers, A. M., Blanchard, R. A., Crizzle, A. M., & Marshall, S. (2015).
 Practices used by occupational therapists and others in driving assessment centers for determining fitness-to-drive: A case-based approach. *Physical and Occupational Therapy in Geriatrics*, *33*(2), 163–174.
 https://doi.org/10.3109/02703181.2015.1016647
- Warren, M. (2018). Evaluation and treatment of visual deficits after brain injury. In H.M.
 Pendleton & W. Schultz-Krohn, *Pedretti's occupational therapy: Practice skills* for physical dysfunction (8th ed., pp. 594–630). St. Louis, MO: Elsevier.
- Wong, S., & Fisher, G. (2015). Comparing and using occupation-focused models. *Occupational Therapy in Health Care*, 29(3), 297–315.
 https://doi.org/10.3109/07380577.2015.1010130
- Youngstrom, M. J. (2002). The occupational therapy practice framework: The evolution of our professional language. *American Journal of Occupational Therapy*, 56(6), 607–608. https://doi.org/10.5014/ajot.56.6.607

Yuen, H. K., & Burik, J. K. (2011). Survey of driving evaluation and rehabilitation curricula in occupational therapy programs. *American Journal of Occupational Therapy*, 65(2), 217–220. https://doi.org/10.5014/ajot.2011.000810

Appendix A

Invitation to Review Email

Subject: Stanbridge University MSOT Student Thesis Project: Volunteer Reviewer Opportunity

Dear [enter name],

A Stanbridge University's Master of Science of Occupational Therapy (MSOT) student thesis group would like to extend an invitation for you to become a volunteer reviewer for our thesis project. The research team is in the process of developing an evidencebased digital handbook for pediatric occupational therapists that addresses the pre-driving skills regarding teenagers with developmental disabilities. To ensure this resource is thorough and straightforward, we ask that you volunteer your expertise to complete a review of our first draft of the digital handbook, *Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities*. We anticipate this feedback form being sent within the next three (3) months.

Reviewer Instructions:

- 1. To be included in this study, reviewers must have two (2) or more years of experience in their respective fields of pediatric occupational therapy, occupational therapy with driving rehabilitation, and/or certified driving rehabilitation.
- 2. Qualified reviewers will receive a copy of Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with

Developmental Disabilities in digital format and a PDF/Paper feedback form will be attached to the email.

3. Reviewers will be assigned to review the structure and content of the digital handbook: *Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities.*

4. You will be given two weeks from receipt of the email containing the PDF to review the handbook, provide feedback, and send the feedback form back to the researchers.

If you would like to volunteer, please complete the attached form and return to <u>driverprepthesis08@my.stanbridge.edu</u>

If you know individuals who meet the inclusion criteria, please extend this invitation so they can have the opportunity to participate in the study.

Thank you,

Stanbridge University MSOT Thesis Group & Faculty Advisor Akemi Davies-McNeil, MA, OTR/L (adavies@stanbridge.edu) Allyse LeDuc, OTS Austin Murrow, OTS Alyanna Michelle Poniente, OTS Kelsey Thompson, OTS

Appendix B

Confirmation Email to Accepted Reviewers

Subject: Congratulations! You have been accepted as a volunteer reviewer for the digital handbook thesis project!

Dear [enter name],

We want to thank you for your willingness to participate as a volunteer reviewer for our thesis project, *Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities.* Upon review of your credentials, you have been identified as an ideal volunteer reviewer for the digital handbook!

Attached you will find the digital handbook and a PDF feedback form to complete. Please review and submit the completed form back to

driverprepthesis08@my.stanbridge.edu by Monday, January 20, 2020.

Thank you for your time and participation. Your expertise is highly valued for the completion of this Master of Science in Occupational Therapy thesis project. If you have any questions regarding the expectations or review process, please do not hesitate to contact us.

All the best,

Stanbridge University MSOT Thesis Group & Faculty Advisor

Akemi Davies-McNeil, OTR/L

Allyse LeDuc, OTS

Austin Murrow, OTS

Alyanna Michelle Poniente, OTS

Kelsey Thompson, OTS

Appendix C

Consent Form for Reviewers

STANBRIDGE UNIVERSITY RESEARCH CONSENT FORM

Description: You are invited to volunteer to be a reviewer for the *Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities.* Reviewers will be required to be literate in English and have at least two years of licensed experience in pediatric occupational therapy, two years of experience as an occupational therapist with driving rehabilitation experience, or two years of experience as a certified driving rehabilitation specialist to participate in the study. You will receive a copy of the digital handbook and then asked to provide feedback by answering questions on a PDF form. You will be given two weeks to complete the feedback form. Please note that volunteers are under no obligation to complete this study and may leave the study at any time.

Your Time Involvement: Your participation will take approximately 30 to 60 minutes.

Risks and Benefits: The only foreseeable risk is a loss of the volunteer reviewer's time. The benefits to this study include development in the knowledge of occupational therapists' role in fostering pre-driving skills in teens, and the potential for early copy of the handbook.

Payment: There will be a \$5 gift card for completing the review feedback.

Participant Rights: If you have read and signed this form, you are consenting to participate in this study. Participation in this study is voluntary, and you have the right to withdraw at any point without penalty. Your alternative is to not participate in this study. You have the right to refuse to answer specific questions. Your identity will not be disclosed at any time. Your identity will be kept anonymous and your responses will be recorded under a number instead of your name. Your information will be kept under a secure password-protected email and in a locked box at the Stanbridge MSOT office. The results of this study may be disseminated at professional meetings or published in scientific journals.

STANBRIDGE UNIVERSITY RESEARCH PARTICIPANT/PARTICIPANT'S BILL OF RIGHTS

Every person who is asked to be in a research study has the following rights:

1. To be told what the study is about and what will be measured;

2. To be told what will happen in the study and whether any of the procedures,

drugs or devices are different from what would be used in standard practice;

3. To be told about important risks, side effects, or discomforts of the things that will happen to her/him;

4. To be told if she/he can expect any benefit from participating and, if so, what the benefits might be;

5. To be told what other choices she/he has and how they may be better or worse than being in the study;

6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the study;

7. To be told what sort of medical treatment is available if any complications arise;

8. To refuse to participate at all before or after the study is started without any adverse effects. If such a decision is made, it will not affect his/her rights to receive the care or privileges expected if s/he were not in the study.

9. To receive a copy of the signed and dated consent form;

10. To be free of pressure when considering whether s/he wishes to agree to be in

the study

Independent Contact: If you are in some way dissatisfied with this research and how it is conducted, you may contact the Stanbridge University Vice President of Instruction at VP.instruction@stanbridge.edu or 949-794-9090.

Contact Information: If you have any questions about this research you may contact the faculty advisor. Advisor: Akemi Davies-McNeil; (949)-794-9090 x5550; amcneil@stanbridge.edu

To move forward in the volunteer process, we ask you to complete the following information on the next page which will be used to identify your qualifications. We will also use this information to contact you regarding your feedback if questions arise. All information will be kept under password protection.

Qualification Information

Name:	
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□ Pediatric Occupational Therapist

□ Occupational Therapist with driving rehabilitation

experience

□ Certified Driving Specialist

Degree/Credentials: _____ Years in the field: _____

May we contact you for additional information or questions related to your review?

____Yes ____No

Is English your primary language? ____Yes ____No Do you feel comfortable

reviewing an informative handbook in English?____Yes _____No

Phone:_____Email:_____

If you agree to move forward with the review, please add your signature and date and complete the below information.

Signature_____

Date:_____

If approved to be a reviewer and you would like to be included in the

acknowledgement section in the final version of the handbook, please sign

below.

Signature

Appendix D

Driver Preparedness Handbook



We would like to thank our advisor, Akemi McNeil, for all the insight and guidance throughout the creation of this project. We couldn't have done it without you.

We would also like to thank a few of our preliminary reviewers: Sarah Appleman MS, OTR/L Philip Prickett OTR/L Adam Sanchez OTR/L

Thank you!



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WHY IS DRIVING IMPORTANT?

When addressing clients' needs, occupational therapists (OTs) must consider driving as an instrumental activity of daily living (IADL) and how teens with developmental disabilities (DD) may experience difficulties with the pre-driving skills that are essential in learning to drive. This resource will explore the task-analysis of driving and the required performance skills to be successful.

Driving is often an essential daily activity as it increases independence and community mobility for many adolescents and teens. In the United States, drivers between the ages of 16 and 20-years-old have the highest risk for fatalities and injuries compared to any other age group (Insurance Institute for Highway Safety, 2018). Teens with attention deficit hyperactivity disorder (ADHD) are almost four times as likely to be involved in a car accident while they are the driver of the vehicle when compared to their neurotypical peers (Behind the Wheel with ADHD, 2017). Therefore, it is essential to address pre-driving skills in teens who have been identified with conditions that may further impact driving safety. A handbook that addresses the underlying factors within these conditions can help clinicians adequately prepare teens for the responsibility of driving or help determine when other methods of transportation might be beneficial.

Driving as an Occupation:

According to the Occupational Therapy Practice Framework (OTPF): Domain and Process (3rd ed.; American Occupational Therapy Association [AOTA], 2014), driving is an occupation. Driving and community mobility is defined as planning and moving around in the community using public or private transportation (AOTA, 2014). When occupational therapists (OTs) are evaluating client IADLs, they should include driving and community mobility in their assessment. This is a vital area for OTs to address as it promotes independence and identity (Strzelecki, 2011). Dickerson, Reistetter, Schold Davis, and Monahan (2011) mention that occupational therapists have the skills and abilities to assess skills related to driving, but many do not, possibly due to the lack of training and resources, specifically regarding driving as an occupation.

Driving is a mode of independence for teens:

Driving is an IADL for many individuals and in some cultures, can be considered a mode of independence, specifically for teens. Therefore, it is an emerging area of practice for pediatric occupational therapists. In some cultures, driving is seen as a rite of passage as an individual turns 16 because they are legally able to take a test and operate a vehicle (Alvarez & Classen, 2017). Although this does not apply to all populations, such as those who live in urban cities where public transportation or walking are viable options, there are a plethora of settings in which driving is the desired or preferred option of transportation. Teens often seek the ability to drive because it is seen as a step towards independence. It also facilitates participation in everyday occupations and meaningful activities that include social engagement, work, and school (Alvarez & Classen, 2017).


INTRODUCTION

DRIVING AND TEENS WITH DEVELOPMENTAL DISABILITIES

Throughout this handbook, DD is utilized to refer to ADHD, Autism Spectrum Disorder (ASD), and Intellectual Disorder (ID). When addressing driving, it has been noted that teens with DD have increased difficulty with learning to drive (Classen & Monahan, 2017). Utilizing task analysis, OTs can examine pre-driving skills to determine appropriate evaluations, assessments, and interventions that can strengthen an individual's ability to learn how to operate a vehicle safely.

Pre driving skills:

Classen, Monahan, and Wang (2013) outlined the skills needed for teenagers learning to drive. This encompasses visual processing, cognitive function, motor performance, and visual-motor integration (Classen et al., 2013).

- Teens with ASD have been reported to have difficulties with psychomotor speed, reaction time, and executive functioning (Brooks et al., 2016).
- Teens with ADHD and ID were reported to have difficulties with lane management, visual attention, and speed management (Brooks, Mossey, Classen et al., 2013; Cox, Reeve, Cox, & Cox, 2012; Tyler, & Collins, 2013;).

Safety:

Since teenagers with DD can have cognitive deficits, safety is a top concern for clinicians and parents when helping teens learn to drive (Schmitz and Voss, 2016). These cognitive deficits in areas such as emotional regulation, executive function, impulse control, and visual perception can impact a teens ability to safely control a motorized vehicle. Their symptoms can impact the ability to detect hazards, avoid crashes, make decisions in an appropriate amount of time, and regulate emotions while behind the wheel (Huang, 2013). The following sections examine the client factors a teen should possess in order to safely and effectively drive in the community.

THE ROLE OF THE CAREGIVER IN DRIVING

Caregivers are an important aspect in a teenager's success when learning how to drive (Fabiano et al., 2016; Mirman et al., 2014). They have the opportunity to assist in the development of on-road and offroad skills. On-road skills refer to tasks that occur when the client is actively operating a moving vehicle, while off-road skills consists of tasks that can occur in both clinic-based settings and home practice of skills such as emotional regulation and attention (Unsworth, Pallant, Russell, & Odell, 2011). Caregivers have the ability to guide on-road driving time, lessons, and provide positive reinforcement as well.

Caregiver involvement in pre-driving skill interventions is beneficial for promoting the development of these skills of teens with DD. Mirman et al. (2014) state that when caregivers utilized a Teen Driving Plan to adequately supervise driving experiences, their teens were less likely to fail the on-road driving assessment. A program called STEER focuses on family-teen training sessions such as parental monitoring, contingency management, and communication skills (Fabiano et al., 2016). Each week, the teen and parent are expected to create a behavioral contract that focuses on objective driving behaviors paired with agreed upon consequences (Fabiano et al., 2016). Parents should be informed of communication techniques that reduce negative parenting behaviors (i.e., sarcasm, put-downs) which promotes improved driving behavior amongst the teens (Fabiano et al., 2016).



Driving is a complex task that includes client factors and performance skills such as gross motor, fine motor, range of motion, process skills, and social skills. In order for drivers to be safe and effective on the road, it is imperative that they encompass these skills and factors and can effectively apply them while driving. It is also important to take into consideration the context and environment while driving as these components are everchanging between geographic locations.

COMMON SKILL DEFICITS SEEN IN INDIVIDUALS WITH DD

Adolescents with DD who are interested in learning to drive may show signs of difficulty with some pre-driving skills (Bishop, Boe, Stavrinos, & Mirman, 2018). Pre-driving skills encompass aspects of visual functions, mental functions, sensory functions, movement-related functions, and visual-motor integration (Classen et al., 2013). Within each area, there are sub-skills that clinicians can address in order to foster the development of these challenging pre-driving skills. While many current OT driving resources use terms stemming from the OT's Uniform Terminology, this resource will pull from AOTA's OTPF in order to direct clinical observations and decisions when assessing skills related to driving.

Mental Functions

Mental functions include affective, cognitive, and perceptual skills (AOTA, 2013). Cognition refers to the functions that are carried out in the brain to process information (AOTA, 2013, S10). This includes attention, executive functions (i.e., problem solving, self-monitoring, self-awareness), comprehension and formation of speech, calculation ability, visual perception, and praxis skills" (AOTA, 2013, S10). Cognition encompasses skills such as learning, retaining and responding, which are all essential when learning to safely drive a vehicle (Gillen, 2017).

Specific Mental Functions

- Higher-level cognitive: Clients should be able to make integrate higher-level cognitive skills to
 effectively and safely operate a vehicle. For example, the client will need working memory to scan,
 monitor conditions, and maintain awareness about the environment and vehicle while managing
 driving-related subtasks and distractors (Walshe et al., 2019).
- Attention: Clients should be able to sustain attention, concentration, and stay focused while driving. It is imperative for the client to demonstrate appropriate attention for a prolonged period to ensure safe driving and have the ability to adjust to stimuli, traffic lights, and pedestrians.
- Memory: Clients should be able to remember directional instructions, the rules and laws of driving, and how to successfully operate the vehicle
- Perception: Clients should be able to discriminate between senses such as auditory, tactile, visual, vestibular, and proprioceptive input.



- · Thought: Client should be able to make logical and safe decisions quickly on the road.
- Mental functions of sequencing complex movements:
 - Clients should be able to sequence the appropriate steps to start and turn off the vehicle (e.g., putting key in, starting vehicle, and changing gear to reverse or drive)
 - Clients should be able to sequence the steps for driving rules and laws (e.g., turning signal on, looking over shoulder, slowly merging, etc).
 - Clients should be able to monitor the speed of traffic and adjust their vehicles speed accordingly in order to avoid collisions.
- Emotional: Clients should be able to regulate emotions such as anger or fear so that when distressing situations or unexpected events occur, clients are able to make safe decisions while driving.
- Experience of self and time: Clients should be aware of their identity, body, and position in
 the reality of their driving environment (e.g., dirt roads) and the context of time (e.g., dark
 outside at night). For example, the client should understand that it is dangerous to drive at
 night on a dirt road without hi-beams and cautious driving.

Global Mental Functions

- Consciousness: Client should be alert and aware of their surroundings in order to ensure safety while driving. Consciousness will ensure that the client may respond to their environment appropriately.
- Orientation: Client should be oriented to person, place, time, self and others. Clients should be aware of their control, actions, and place while driving.
- Temperament and personality: Clients should be able to control and regulate behaviors. Sucha, Seitl, and Lehnerova (2016) describe the "problem-free driver" as being wellbalanced and strong with their reactions being accurate and quick.
- Energy and Drive: Client should be able to sustain their energy level, impulse control, and motivation while driving.
- Sleep: Client should not operate a vehicle while being drowsy. Driving drowsy is dangerous
 and has resulted in an estimated 6,000 fatal crashes in the United States (Center for Disease
 Control, 2019).

Sensory Functions

Clients should be able to process, interpret, filter, and organize incoming information from the driving environment. For example, the clients should be aware of the feel of different road conditions under the car, the vibrations from the steering wheel, and hearing sirens from emergency services.

- Visual Functions: Vision is a key component as it allows for the information we see in the environment to be transferred to the brain. Vision is essential for driving as it allows us to anticipate situations on the road and make appropriate decisions needed for safe navigation. Clients need mature visual acuity, stability and discrimination skills while driving.
- Hearing functions: Clients should be able to hear and process road factors (e.g., other driver honking horn, emergency services).



- Vestibular functions: Clients should be able to process vestibular input while driving. Vestibular functions such as linear motions and being able to tolerate turns or rotation of the neck are critical to effectively operate a vehicle in various environments. In addition, clients should be able to sense and secure body position when the car is moving in any direction.
- Proprioceptive functions: Clients should be able to process their body in space while turning steering wheel, and when applying force to brakes and accelerator.
- Touch functions: Clients should have the ability to respond appropriately to various textures such as a steering wheel. Clients should also be able to locate and operate certain functions such as the turn signal or the windshield wiper levers without looking.

Neuromusculoskeletal and Movement-related Functions

Clients should be able to perform movements of joints and bones within functional limits in order to operate vehicles.

- Joint mobility: Clients will need to demonstrate functional movement in joints required for
 operating a vehicle. For example, the client should demonstrate appropriate BUE range of
 motion (ROM) such as shoulder internal and external rotation, shoulder flexion, etc. when
 handling the vehicle's steering wheel. The client will also need sufficient BLE ROM to
 perform movements like ankle dorsiflexion and plantarflexion when operating the brake and
 accelerator pedals.
- Joint stability: Clients should present with structural integrity of their joints throughout their body. For example, clients should be able to maintain a consistent body position when using the steering wheel as well as maintaining LE position to apply consistent pressure for speed regulation.

Muscle Functions

- Muscle power: Clients should demonstrate the appropriate strength to operate a vehicle. For example, strength is required to open the door of a vehicle, turn the steering wheel, and adjust necessary functions within the car.
 - Clients should be able to carefully grade body movements when adjusting speed or maneuvering the vehicle's direction (e.g., use of steering wheel, brake pedal, and accelerator pedal)
- Muscle tone: Clients should present with a degree of muscle tension that will facilitate safe driving which included the ability to apply the appropriate amount of pressure in order to manipulate objects in the vehicle.
- Muscle endurance: Clients should be able to sustain active muscle contraction as needed to
 operate a vehicle and ensure safe driving.



Movement Functions

- Motor reflexes: Clients should demonstrate involuntary muscle movements in response to stimuli in the driving environment. The client should demonstrate integration of primitive reflexes to safely and effectively operate a vehicle in a plethora of environments and contexts.
 - The client should demonstrate integration of the Tonic Labyrinthine Reflex to appropriately coordinate movements, perceive time and space, and cause and effect skills involved in driving.
 - The client should demonstrate integration of the Symmetrical Tonic Neck Reflex to develop bilateral patterns of body movement and information processing for the left and right hemispheres. For example, bilateral body movement is essential in turning the vehicle's steering wheel.
 - The client should demonstrate integration of the Head Right Reflex for reaction of head movement when body movement or a change of posture. For example, the client's head should adjust when taking a sharp turn on a freeway on-ramp.
 - The client should demonstrate integration of the Optokinetic Reflex which is essential for the eye position during slow head movements.
 - The client should demonstrate integration of stretch reflexes which is essential for adjusting postures. For example, the client should be able to adjust posture during a Uturn at an intersection.
- Involuntary movement reactions: Postural reactions, body adjustment reactions, supporting reactions. For example, clients should demonstrate a righting reaction when maneuvering a vehicle through a corner.
- Control of voluntary movement: Clients should be able to demonstrate upper extremity (UE) and lower extremity (LE) coordination, bilateral integration, crossing midline, fine and gross motor control, and oculomotor functions to perform safe driving. For example, clients should be able to coordinate their bilateral UE (BUE) and unilateral LE (ULE) when turning a steering wheel and accelerating when making a U-turn.



IMPLICATIONS FOR OCCUPATIONAL THERAPY

According to the OTPF: Domain and Process (3rd ed.; AOTA, 2014), OTs address "driving and community mobility". In order for the OT to assess pre-driving skills, we will first look at the act of driving. We have developed these sections to help you evaluate your client's various skill sets related to driving.

Driving Skills	Performance Skills needed for Driving	Clinical Observations
Transferring in and out of the vehicle	 Aligns Bends Coordinates Initiates Moves Positions Sequences Stabilizes 	 Is the client steady moving from one surface to the next? Will the client know how to adjust the seat settings to customize to their needs?
Preparation for driving	 Accommodates Aligns Calibrates Flows Grips Handles Initiates Manipulates Positions Reaches Searches/Locates Terminates 	 Will the client know how to put on their seatbelt? Will the client know to wait for passengers to put on their seatbelts before driving? Will the client know how to look up directions before driving? Will the client know appropriate vehicle settings for driving environment (e.g., headlights on at night) before driving?



Driving Skills	Performance Skills needed	Clinical Observations
Staring/Turning off vehicle	 Calibrates Chooses Flows Grips Handles Initiates Manipulates Moves Paces Reaches Sequences Stabilizes Uses 	 Will the client have a key or push-start? Will the client be able to locate the correct key? Will the client be able to use a functional grasp with a key (e.g., lateral prehension grip)? Will the client know the correct sequence of starting the car or putting it back in park (e.g., automatic, manual, push-button start, and key ignition)? Does the client have appropriate in-hand manipulation skills with small objects such as a key? Does the client have steady arm movements when reaching?
Speed Regulation	 Accommodates Attends Calibrates Coordinates Initiates Paces Positions Sequences 	 Will the client be able to regulate speed in accordance to the environment and speed limit? Can the client use visual scanning while moving in vehicle to read speed limit signs? Does the client understand the vehicle's speedometer and react with appropriate ankle movements?

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Driving Skills

TASK ANALYSIS

Clinical Observations

Performance Skills needed for Driving

Driving Etiquette

- Approaches/Starts
- Concludes/Disengages ٠
- Expresses Emotion ٠
- Gesticulate ٠
- Heeds ٠
- Looks ٠
- Notices/Responds
- Regulates .
- Takes Turns
- Thanks

- · Does the client have fluid movement when demonstrating ankle dorsiflexion and plantar flexion?
- Will the client be able to understand and obey the rules and laws of the road?
- · Will the client be able to appropriately gesticulate and communicate with other drivers?
- · Does the client understand the use of gesticulations (e.g., waving a hand to let other drivers pass) related to driving?
- · Does the client understand the use of the car's horn and when it is appropriate?
- · Will the client know to follow emergencyservice etiquette (e.g., pulling off to the side of the road when an emergency vehicle passes by)?
- · Will the client know when to use turn signals at appropriate times?



Driving Skills	Performance Skills needed for Driving	Clinical Observations
Interacting with the vehicle settings	 Chooses Continues Coordinates Flows Grips Handles Manipulates Moves Positions Reaches Searches/Locates Sequences Stabilizes Uses 	 Will the client be able to locate and interact with: turn signals, headlight settings, window settings, A/C settings, emergency hazards, and windshield wiper settings? Can the client use a functional grip with task objects (e.g., a turn dial for the A/C)? Can the client use stereognosis to locate appropriate task objects? Does the client know the function of the vehicle settings
Maintaining car and understanding symbols	AdjustsBenefitsInitiatesInquires	 Will the client be able to understand dashboard symbols and their implications on the vehicle (e.g., low oil, check engine, airbag,

etc.)?
Will the client be able to understand regular maintenance of a vehicle (e.g., changing tires, changing oil, refilling gas, etc.)?

NOTE: The OT should be familiar with updated technology in vehicles and how it can benefit or hinder a novice driver.



These screening tools and assessments can help determine skill deficits that an adolescent may be experiencing in skills related to driving. OTs should ensure they are choosing assessments that are based on the referring concerns when analyzing driving skills. The following assessments are suggestions for use but occupational therapists should use their best clinical judgement when selecting appropriate assessments.

PRE-DRIVING COGNITIVE SKILLS

Driving is a complex task that requires executive functioning skills and perception. For example, it is vital to address and assess attention, memory, learning, verbal knowledge, and emotional regulation to ensure individuals are ready to drive.

Brown's Rating Scale

Description: Evaluates executive function abilities and attention. To gather this information, it draws from the perspectives of the child, parent, and teacher.

Population: Ages 3-years-old+ who have ADD/ADHD Availability: Found at Pearson

CNS Vital Signs

Description: Identifies an individual's neurocognitive impairment such as verbal and visual memory, attention shifting, and continuous performance (Brooks et al., 2016). Population: Ages 8 to 89-years-old Availability: Found at CNS Vital Signs

Cognitive Assessment System 2nd Edition (CAS-2)

Description: Measures cognitive ability based on PASS (Planning, Attention, Simultaneous, and Successive). This assessment has five supplemental composite scores: executive function without working memory, executive function with working memory, working memory, verbal content, and nonverbal content.

Population: Ages 4 to 18 years and 11-months-old Availability: Found at WPS Publish

Developmental Assessment for Individuals With Severe Disabilities (DASH-3)

Description: DASH-3 measures specific skill levels in children and adults who have developmental disabilities such as physic, intellectual, or sensory disabilities. This assessment demonstrates relevant skills for an individual, such as the ability to receive and respond to environmental stimuli. Population: Ages 6 months through adulthood Availability: Found at MocaTest

DriveABLE Cognitive Assessment Tool (DCAT)

Description: This assessment uses a plug-and-play system with a touchscreen to measure the cognitive processes needed for safe driving, such as motor speed, span of attentional field, decision making, and more. It is used to predict on-road performance.

Population: Ages 18 to 99-years-old

Availability: Found at DriveAble



Quick Neurological Screening Test (QNST-3)

Description: Documents the presence of neurological soft signs (NNS) and assesses the development of motor coordination and sensory integration associated with learning and daily functioning. This assessment is criterion referenced and takes approximately 20-30 minutes to administer and score.

Population: Ages 5 to 90-years-old +

Availability: Found at TheraPro

PRE-DRIVING VISUAL SKILLS

Vision is a critical pre-driving skill, as it ensures safety while on the road. To drive, one needs to have the ability to see objects and other cars up close and in the distance. Having good vision is essential for safe driving and, therefore, should be assessed.

Motor-Free Visual Perception Test 4 (MVPT-4)

Description: Assesses overall visual perceptual ability including visual discrimination, spatial relationships, visual memory, figure-ground, and visual-closure skills.

Population: Ages 4 to 80-years-old +

Availability: Found at Academic Therapy Publication

Test of Information Processing Skills (TIPS)

Description: This assessment is norm-referenced and examines how well an individual processes visual and auditory information.

Population: Ages 5 to 90-years-old Availability: Found at WPS Publish

Test of Visual Perception

Description: This is a standard comprehensive assessment that looks at visual analysis and processing skills. It includes looking at the strengths and weaknesses in the areas of visual discrimination, visual memory, spatial relationships, form constancy, etc.

Population: Ages 5 to 21-years-old who have impairments in motor, speech, neurological, or cognitive functions.

Availability: Found at TheraPro

Useful Field of View (UFOV)

Description: A 5-10 minute online assessment used to determine an individual's field of view, which in turn, can be used to determine visual processing speed. The visual processing speed can be used to predict crash risk.

Population: All ages when testing cognitive function, but it is recommended for individuals who drive for a living or at risk for accidents due to aging.

Availability: Found at BrainHQ



PRE-DRIVING MOTOR SKILLS

In order to evaluate safe driving, motor skills need to be assessed. While on the road, driving requires both fine motor and gross motor skills to operate and maneuver one's car.

Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT-2)

Description: Measures gross and fine motor skills. Can be administered in a short form and sections. **Population:** Ages 4 to 21 years and 11-months-old **Availability:** Found at **Pearson**

Goal-Oriented Assessment of Lifeskills

Description: An evaluation of functional motor skills and abilities needed for daily living. Turns assessment results into goal-oriented, treatment plans.

Population: Ages 7 to 17-years-old *Availability:* Found at **WPS-GOAL**

School-Assessment of Motor and Process Skills (School-AMPS)

Description: A student's schoolwork tasks are assessed to determine if their performance is done efficiently and safely. It can help determine if any assistance in motor or cognitive tasks is needed. **Population:** Ages 3 to 15-years-old

Availability: Found at Center for Innovative OT Solutions

PRE-DRIVING VISUAL-MOTOR INTEGRATION SKILLS

Driving requires the ability to receive and process information in the environment. It is essential to assess the client's ability to observe, recognize, and utilize visual information in response to the demands of driving.

Beery-Buktenica Developmental Test of Visual Motor Integration (BEERY-VMI)

Description: Assesses the integration of visual and motor skills by instructing the client to copy geometric forms ordered by levels of difficulty. This assessment is available in a short and long form.

Population: Ages 20 to 99 years and 11-months-old *Availability:* Found at **Pearson**

Wide Range Assessment of Visual Motor Abilities (WRAVMA)

Description: Assesses and compares visual spatial, fine motor skills, and integrated visual motor skills. It takes 4 to 10 minutes to administer each subtest. *Population:* Ages 3 to 17-years-old

Availability: Found at Pearson



DRIVING SPECIFIC ASSESSMENTS

DRIVING BEHAVIOR ASSESSMENT

Occupational Therapy Risk Propensity Test (OT-RiPT)

Description: Evaluates an individual's driving behavior regarding lane management and speed regulation **Population:** Teenagers-Adults **Availability:** Currently in development

DRIVING SKILLS

DriveABLE (DCAT)*

* See "Pre-driving Cognitive Skills" on page 13 for description, population, and availability.

Occupational Therapy: Driver Off-Road Assessment (OT-DORA)

Description: Can be used as an off-road or on-road assessment. This assessment covers cognition, perception, sensory skills, behavior, and other driving skills. Population: Teenagers-Adults Availability: Found at AOTA Store

Simulated Driving Assessments (SDAs)

Description: A virtual reality driving simulation assessment in which the individual drives a course and the computer detects any errors produced such as lane deviations and speed maintenance.

Population: Ages 14-years-old +

Availability: Contact website for available options at Simulator Systems International



FLOWCHART OF SUGGESTED ASSESSMENTS AND SCREENING TOOLS FOR DRIVING SKILLS

This section will provide readers with an easy-to-follow flow chart. The flow chart will highlight performance skills and recommend various assessments to utilize when addressing pre-driving skills. It will also illustrate the potential driving error that may be corresponding with an area of deficit while driving on the road. It will suggest, not direct or instruct on what assessments should be used when an OT/caregiver notices the child may be experiencing deficits in these areas.

NOTE: the following flowchart is adapted from a thesis dissertation by Buza and Chin (2016).



















This section includes suggestions for interventions that will assist in developing performance skills and client factors such as visual motor integration and mental functions. It is to be noted that these are suggestions and not directions. Some of these interventions are not specific to driving but general OT interventions that address vision, cognition, motor skills, and visual-motor integration. Suggested interventions below are divided into different performance skill areas for more clarity.

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DRIVING SPECIFIC INTERVENTIONS
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Driving Simulators

Driving Simulators can be used for both interventions and assessments. OTs can utilize simulators to practice pre-driving skills and motor performance skills with their clients. See driving simulator section above in the assessments section.

On-road Interventions

On-road interventions usually take place in a vehicle equipped with safety equipment such as an instructor's brake. This form of intervention is used to identify strengths and weaknesses of the driver while behind the wheel. This intervention is the closest intervention to actual driving. Although this type of intervention and assessment is reported to be utilized with 75% of CDRS's clients, the time of the actual on-road intervention and assessments range from five to six hours (Dickerson, 2013).

- Novice drivers had improved speed management skills when they were able to use selfexplanation for their driving experience (Molloy, Molesworth, & Williamson, 2019)
- Skills: visual attention, visual perception, visual processing, cognition, emotional regulation, motor control, motor planning, muscle strength, spatial relationships, reaction time

MULTI-SKILL INTERVENTIONS

Basketball

Play basketball by having the client throw different objects in different buckets or baskets that are placed throughout the room. The OT can move the baskets to make it more challenging or have the client switch to shooting towards the basket on his right side then left side.

 Skills: visual attention, visual perception, visual discrimination, motor control, motor planning, spatial relationships, and reaction time

Card Exercise Game

The OT has a deck of cards with each suit representing a different exercise activity. For example, hearts mean jumping jacks, spades mean squats etc. OT and client take turns pulling a card from the deck. Depending on the card, the participant must complete that activity the given number of times (e.g., 5 of hearts translates to five jumping jacks). Exercises can be modified to whatever skills the client is focusing on (e.g., push-ups to increase upper body strength, squats to increase leg strength).

Skills: cognition, motor control, motor planning, and muscle strength



Corn Hole

Client and OT are on two opposite teams. Client and OT take turns throwing bean bags at the cornhole board, attempting to make it in the hole. OT can modify throwing underhand to overhand and closer or farther away.

 Skills: visual perception, visual discrimination, motor planning, motor control, muscle strength, and spatial relationships

Darts

The OT has the client throw soft darts at different targets across the room. The OT can grade up by moving targets throughout the game, which facilitates having the client scan to look for targets.

· Skills: visual attention, visual perception, motor control, and motor planning

Dodgeball

Start with three balls in the middle of the room. The OT and client will begin on the opposite sides of the room and race to the balls. Once the balls are achieved, the teen and OT try to hit each other or dodge the balls.

 Skills: visual attention, visual perception, visual discrimination, motor control, motor planning, muscle strength, and reaction time

Four Spot Finder

Place four pictures of objects (e.g., a house, dog, car, tree, etc.) on the wall in locations to act as areas the driver should look at while driving. One picture can be in place where the rear view mirror would be placed, one for the road, and two for the side mirrors. Have the teen begin on the opposite side of the room. Have them walk towards the wall and call out the objects they should stare at when walking forward. The client should sustain their attention on only the object being called and appropriately shift their attention when a new object is called.

Skills: cognition, visual attention, visual perception, visual discrimination, and reaction time

Jenga

Client and OT take turns to play a game of jenga, pulling one piece at a time and replacing it on the top of the tower without causing the tower to fall

 Skills: cognition, visual perception, visual discrimination, motor control, motor planning, and spatial relationships

"Laser" Maze

Place string in a zig-zag across the room creating a maze. Instruct clients to move from point A to B without touching the string "laser". Clients should move over, under and in between the maze to reach the other side.

Skills: visual attention, visual perception, motor control, and motor planning



Paint by Numbers

Clients can work to complete a picture (templates can be found online) by painting the correct color with the corresponding number.

Skills: cognition, visual attention, visual discrimination, motor control, and motor planning

Puzzles

Find puzzles at the local store and have the client complete them. Client can be timed, or puzzle pieces can be scattered across the room for the client to find them. The client can also be on a swing and must grab pieces from one side and place it on the other side while swinging.

· Skills: cognition, visual attention, visual discrimination, and motor control

Scooter Board Driving

Using the scooter board as the car, have the client move around the clinic responding to street signs and rules of the road. Place "stop", and "pedestrian" signs, traffic signals, or have family members move out from behind obstacles. This creates the illusion of driving and responding to stimuli while acknowledging the rules of the road.

 Skills: cognition, motor control, motor planning, visual perception, visual attention, visual discrimination, and reaction time

Search & Find Activities

Find printable online of iSpy books or Where's Waldo and have the client look for and point to intended objects

· Skills: cognition, visual attention, visual perception, motor control, and motor planning

Sequence Board Game

Sequence is a board game in which the client and OT will select cards from their hand and find the corresponding location on the board. The OT and client will alternate taking turns. Participants will place a chip on the corresponding location and work to match five in a row before their opponent.

 Skills: cognition, visual attention, visual perception, motor control, motor planning, spatial relationships, and reaction time

Soccer

Client can kick the ball towards different targets. Client can also juggle a soccer ball and kick it through an obstacle course.

 Skills: visual attention, visual perception, visual discrimination, motor control, motor planning, spatial relationships, and reaction time



Obstacle Course

OT and client work together to build an obstacle course around the gym. Obstacle course can be customized to develop each clients individual skills. For example, adding a cognitive puzzle component at the end, adding more leg strength activities, and adding balance components.

 Skills: cognition, visual attention, visual perception, motor control, motor planning, and muscle strength

Word Search

Find templates of word searches online and have the client visually scan and circle found words.

· Skills: cognition, visual attention, and visual discrimination

Zones of Regulation

An intervention program that uses a cognitive behavioral approach to help children learn selfregulation by dividing their feelings into four "zones." Zones of regulation assists individuals in explaining and identifying their emotions, which is necessary when driving, as well as providing coping strategies that can be used with each zone (Kuypers, 2019).

· Skills: cognition and emotional regulation



OTHER AVAILABLE RESOURCES

This section will provide OTs with additional resources to supplement knowledge. This section will be comprised of information regarding Certified Driving Rehabilitation Specialists (CDRS), the Department of Motor Vehicles (DMV), additional resources that can assist in driving specialist training, and a source for driving rehabilitation services. These other resources may be beneficial for healthcare professionals and caregivers.

PRACTITIONER TRAINING

Training to be a Certified Driving Rehabilitation Specialist (CDRS)

Clinicians who have received education to assess driving abilities over a wide range of ages and developmental stages.

For more information visit the Driver Rehabilitation specialist Association at ADED.net

Vocational Rehabilitation Grant

This is a program which provides grants to help States across the country in operating vocation programs, such as driving rehabilitation training.

For more information visit US Department of Education

PRACTITIONER AND CAREGIVER RESOURCES

Department of Motor Vehicles

The DMV offers alternative methods for completing the driver's license knowledge tests including audio and person to person facilitation.

For more information visit Department of Motor Vehicles

Finding a Driving Specialist

Practitioners can search AOTAs database for driving programs and specialists in their areas

For more information visit AOTA

AAA Teen Driving Information

AAA has great driving resources for both caregivers and teens. These include information on laws, driver education, distracted driving, a parent-teen agreement, and an interactive tool for teens.

For more information visit AAA Teen Driving



CAREGIVER INFORMATION

Clinicians can utilize this additional caregiver information to disclose at their discretion to the client or client's caregiver.

Setting and Adhering to Limits and Expectations

A parent-teen agreement can be created before the teen becomes licensed to set expectations for driving. Teens who have parents that monitor them and put driving restrictions on them are less likely to have violations and crashes (Beck, Hartos, & Simons-Morton, 2006). The parent and/or caregiver should not only set limits and expectations but should also enforce those expectations to promote and enhance safe driving of their teen.

 Suggestions may include: only driving during specific conditions, avoid driving at night, always wearing a seat belt, driving with no one else in the car or only with specific individuals, and not driving while under the influence.

Teen Driving Plan (TDP)

Teen Driving Plan (TDP) is a web-based program that caregivers and parents can utilize to adequately supervise their teens' driving practice (Mirman et al., 2014). This web-based program includes brief videos, guides, and logging tools. The TDP has four components that aid caregivers in assisting their teens. These four components include learning, planning, practicing, logging, and rating. Mirman et al. (2014) found that young drivers who used TDP were 65% less likely to fail an on-road driving assessment than those not given access to the intervention.

To explore the features specific to each component check out TDP Practice Guide.



Alvarez, L. & Classen, S. (2017). Simulated driving performance of healthy teens. In S. Classen, Driving simulation for assessment, intervention, and training (pp. 145-156). Bethesda, MD: American Occupational Therapy Association, Inc.

- American Occupational Therapy Association (AOTA). (2014). Occupational therapy practic e framework: Domain and process (3rd ed.). American Journal of Occupational Therapy, 68(Suppl. 1), S1-S48. https://doi.org/10.5014/ajot.2014.682006
- American Occupational Therapy Association (AOTA). (2013). Cognition, cognitive rehabilitation, and occupational performance. American Journal of Occupational Therapy, 67, S9-S31. https://doi.org/10.5014/ajot.2013.67S9
- Beck, K. H., Hartos, J. L., & Simons-Morton, B. G. (2006). Relation of parent-teen agreemen t on restrictions to teen risky driving over 9 months. American Journal of Health Behavior, 30(5), 533–543. https://doi.org/10.5993/AJHB.30.5.10
- Behind the Wheel with ADHD. (2017). ADHD Increases Driving Risk. Retrieved from https://behindthewheelwithadhd.com/the-statistics/
- Bishop, H., Boe, L., Stavrinos, D., & Mirman, J. (2018). Driving among adolescents with autism spectrum disorder and attention-deficit hyperactivity disorder. Safety, 4(3). https://doi.org/10.3390/safety4030040
- Brooks, J. O., Mossey, M. E., Tyler, P., & Collins, J. C. (2013). An exploratory investigation: Are driving simulators appropriate to teach pre-driving skills to young adults with intellectual disabilities? British Journal of Learning Disabilities, 42, 204-213. https://doi.org/10.1111/bid.12029
- Brooks, J., Kellett, J., Seeanner, J., Jenkins, C., Buchanan, C., Kinsman, A., ... Pierce, S. (2016). Training the motor aspects of pre-driving skills of young adults with and without autism spectrum disorder. Journal of Autism and Developmental Disorders, 46(7), 2408–2426. https://doi.org/10.1007/s10803-016-2775-8



Buza, R. & Chin, J. (2016). Dementia: Predicting driving fitness with St. Louis University mental status exam and trail-making tests. (Unpublished master's thesis). Stanbridge University, Irvine, California.

Center for Disease Control (2019, November). Drowsy driving: Asleep at the wheel. Retrieved from https://www.cdc.gov/features/dsdrowsydriving/index.html

- Classen, S., Monahan, M., & Wang, Y. (2013). Driving characteristics of teenagers with attention deficit hyperactivity and autism spectrum disorder. American Journal of Occupational Therapy, 67, 664–673. http://doi.org/10.5014/ajot.2013.008821
- Classen, S. & Monahan, M. (2017). Simulated driving performance of teens with ADHD, ASD, and ADHD-ASD. In S. Classen, Driving simulation for assessment, intervention, and training (pp. 157-170). Bethesda, MD: American Occupational Therapy Association, Inc.
- Cox, N. B., Reeve, R. E., Cox, S. M., & Cox, D. J. (2012). Brief report: Driving and young adult with ASD: Parents' experiences. Journal of Autism and Developmental Disorders, 42(10), 2257– 2262. https://doi.org/http://dx.doi.org/10.1007/s10803-012-1470-7
- Dickerson, A. E., Reistetter, T., Schold Davis, E., & Monahan, M. (2011). Evaluating driving as a valued instrumental activity of daily living. American Journal of Occupational Therapy, 65, 64– 75. https://doi.org/10.5014/ajot.2011.09052
- Fabiano, G. A., Schatz, N. K., Morris, K. L., Willoughby, M. T., Vujnovic, R. K., Hulme, K. F., ... Pelham, W. E. (2016). Efficacy of a family-focused intervention for young drivers with attentiondeficit hyperactivity disorder. Journal of Consulting and Clinical Psychology, 84(12), 1078–1093. https://doi.org/10.1037/ccp0000137
- Gillen, G. (2017). Cognition and occupational therapy In H.M. Pendleton & W. Schultz-Krohn (Eds.). Pedretti's occupational therapy: Practice skills for physical dysfunction, (8th ed.). St. Louis, MO: Mosby.
- Huang, P. (2013) Developmental disabilities and driving.[web log]. Retrieved from: https://injury.research.chop.edu/blog/posts/developmental-disabilities-and-driving#.Xc2ybZNKiu5



Insurance Institute for Highway Safety. (2018). Fatality facts 2017: Teenagers. Retrieved from https://www.iihs.org/topics/fatality-statistics/detail/teenagers

- Kuypers, L. (2019) The zones of regulation: A concept to foster self-regulation & Emotiona 1 control. Retrieved from: https://www.zonesofregulation.com/learn-more-about-the-zones.html
- Memisevic, H. & Djordjevic, M. (2018). Visual-motor integration in children with mild intellectual disability: a meta-analysis. Perceptual and motor skills. 125(4), 696-717. DOI: 10.1177/0031512518774137

Mirman, J. H., Curry, A. E., Winston, F. K., Wang, W., Elliott, M. R., Schultheis, M.T.,... Durbin, D. R., (2014) Effect of the teen driving plan on the driving performance of teenagers before licensure: A randomized clinical trial. JAMA Pediatrics 168(8):764-771. https://doi.org/10.1001/jamapediatrics.2014.252

- Pendleton, H.M., & Schultz-Krohn, W. (2018). The occupational therapy practice framework and the practice of occupational therapy for people with physical disabilities. In H. M. Pendleton & W. Schultz-Krohn (Eds.), Pedretti's occupational therapy practice skills for physical dysfunction (8th ed., pp.1-15). St. Louis, MS: Mosby Elsevier.
- Schmitz, M & Voss, M. (2016). The Occupation of Driving: A Guide for Occupational Therapists Working with Adolescents Who Have ADHD" (2016). Occupational Therapy Capstones. 326. Retrieved from: https://commons.und.edu/cgi/viewcontent.cgi? article=1325&context=ot-grad
- Strzelecki, M. (2011). Green light go: Helping teens with disabilities take the wheel. OT Practice, 16(2), 8–19
- Sucha, M. & Seitl, M., & Lehnerova, J. (2016). The role of personality qualities in driving. Transactions on Transport Sciences, 4. https://doi.org/10.2478/v10158-011-0019-3
- Unsworth, C., Pallant, J., Russell, K., & Odell, M. (2011). OT-DORA: Occupational therapy driver off-road assessment battery. Bethesda, MD: American Occupational Therapy Association.



Warren, M. (2018). Evaluation and treatment of visual deficits after brain injury. In H. M. Pendleton & W. Schultz-Krohn (Eds.), Pedretti's occupational therapy practice skills for physical dysfunction (8th ed., pp. 594-610). St. Louis, MS: Mosby Elsevier.

Walshe, E.A., Winston, F.K., Betancourt, L.M., Khurana, A., Arena, K., & Romer, D. (2019). Working memory development and motor vehicle crashes in young drivers. JAMA Network Open, 2(9). doi:10.1001/jamanetworkopen.2019.11421



Appendix E

Feedback Form for Reviewers

Feedback Form

Thank you for taking the time to review our digital handbook: Driver

Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities. Please answer the following questions after reading the Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities.

Years of practice:

Is English your primary language? _____ Yes _____ No

Qualifications (Check all that apply):

□ Pediatric Occupational Therapist

Occupational Therapist with driving rehabilitation experience

□ Certified Driving Specialist

Please select an answer for the following questions/statements about the digital handbook:

Do you feel that pre-driving skills should be addressed in adolescents?

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

Do you think this would be a helpful resource for addressing pre-driving skills for teenagers with developmental disabilities?

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

This resource would be helpful in my daily practice.

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

The content is appropriate to occupational therapists and certified driving rehabilitation specialists.

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

The digital format of the handbook is user friendly.

a. Digital accessibility

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

b. Text layout and structure

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

The information provided in the handbook is easy to understand.

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

I would recommend the caregiver component in the handbook to caregivers.

1: Strongly Agree 2. Agree 3. Neither Agree nor Disagree 4. Disagree 5. Strongly Disagree

Please fill in your responses for the following questions:

What do you like about this handbook?

What recommendations for change do you have about this handbook?

Do you recommend any additional resources that should be included in this handbook?

Other comments/suggestions?

Thank you for your time and

feedback,

Stanbridge University MSOT Thesis Group & Faculty

Advisor Akemi Davies-McNeil, MA, OTR/L

(adavies@stanbridge.edu) Allyse LeDuc, OTS Austin

Murrow, OTS Alyanna Michelle Poniente, OTS Kelsey

Thompson, OTS

Appendix F

Thank You Email to Reviewers for Completion

Subject: Thank you for your contribution!

Dear [enter name],

Thank you for your contribution,

The Driver Thesis Team would like to express our gratitude for your professional review of our resource. We will consider your feedback in the development of *Driver Preparedness: A Handbook for Occupational Therapists Addressing Pre-driving Skills in Teenagers with Developmental Disabilities.* We hope future Stanbridge students can continue to develop this resource for occupational therapists to use in their practice!

As a reviewer, you will receive a \$5.00 gift card, which will be sent electronically within 2 months.

All the best,

Stanbridge University MSOT Thesis Group & Faculty Advisor Akemi Davies-McNeil, OTR/L Allyse LeDuc, OTS Austin Murrow, OTS

DRIVER PREPAREDNESS

Alyanna Michelle Poniente, OTS

Kelsey Thompson, OTS