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Supporting Drivers with Disabilities

Introduction

Transportation as a whole is a vital way for individuals to access and explore their environment. Transit is a necessary prerequisite for most people to engage in leisure activities, socialize with others, fulfill work and volunteer roles, and maintain their health. While there are several methods of public transportation including buses and trains, driving a vehicle is personally meaningful to many individuals. This personal connection is due in part to the independence and convenience it affords a person and those around them. For this reason, driving is considered an occupation high on the list of priorities for many individuals with disabilities. Occupational therapists are one of several professionals who are well-poised to provide habilitative and rehabilitative services focused on driving. By helping individuals with disabilities to develop or improve their driving skills, therapists can enhance a person's quality of life, health management skills, community integration, independence, and much more.

Section 1: Background & OT's Role in Helping Drivers with Disabilities

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

The transportation industry is overall booming – in 2019, individuals living in the United States took 9.9 billion trips using public transit. This is a popular choice among many city-dwellers, as they have perhaps the highest level of access to a variety of transportation types. However, many individuals do not have access to those transportation services. In fact, the American Public Transportation Association states that around 45% of Americans cannot access public transportation. While there are other ways for people to get around their environment, financial resources serve as a barrier to many public transit

alternatives such as personal vehicles. This creates a dearth of access for several demographic groups, who are unable to access a range of other community resources due to a lack of transportation.

Among these groups include three vulnerable populations: those who live in rural areas, individuals with disabilities, and older adults. People who fall under one or more of these categories are likely to experience major difficulty accessing transportation. As of 2020, the U.S. Census Bureau reports there are 46 million Americans residing in rural areas. This number is quite significant, as it makes up roughly 14% of the U.S. population. In addition, about 25.5 million people consider themselves to have a travel-limiting disability. Individuals over the age of 5 who have disabilities that impact their travel comprise 8.5% of the population. The number of older adults in America (specifically, those ages 65 and older) is also steadily increasing – this group's numbers grew 34% between 2010 and 2019. In this same time frame, the amount of deadly traffic crashes involving older adults increased by 31%. In 2019, older adults accounted for 20% of all licensed vehicle operators and 15% of drivers who experienced fatal traffic accidents.

A recent study showed that 63% of older adults noted driving is their primary method of transportation. While this number indicates more than half of the geriatric population currently drives, this population still experiences barriers to community access. 26% of older adults (including those who drive and those who do not) cited transportation-related limitations that impact their community engagement. Just 9.2% of older adults disclosed their participation in driver rehabilitation programs or other rehabilitation focused on driving skills within the past year.

These study results – and other driving statistics as a whole – suggest there are discrepancies between the reported need for remediation of driving skills and enrollment in driver rehabilitation as well as many gaps in who is utilizing various

transportation methods. Firstly, many individuals cannot take advantage of any affordable, accessible transportation. In addition, several of the at-risk populations mentioned earlier could benefit from education surrounding license surrender, rehabilitation in the area of driving abilities, and preventive services such as driver screenings.

Definition & Importance of Safe Transportation

The aforementioned gaps in access to transportation have a ripple effect to many areas of a person's life. Transportation is a major determinant in someone's ability to get connected with healthcare services. Many people in rural settings cannot take advantage of public transportation and, therefore, cannot utilize resources outside of their immediate environment. Individuals with disabilities often require a variety of services to manage chronic conditions, which often necessitates being in close proximity to healthcare facilities.

While there are many ways for individuals to navigate their environments, people often view driving as the default and most desirable way to get around. Yet, this occupation may be difficult for individuals with disabilities and the aging population. Driving can be expensive and cumbersome. Furthermore, it may be dangerous for people who do not have the appropriate accommodations to engage in such a task. Driving can give people a sense of independence and joy, as some people find it to be relaxing. Driving also serves a direct purpose in helping people explore their environment and participate in other activities they find meaningful. For individuals with disabilities, being able to operate a vehicle can be a significant contributing factor toward their occupational participation, health management, IADL function, community engagement, social participation, and more.

Safe driving is defined as the operation of any motorized vehicle (with or without the use of adaptive equipment) for the purpose of getting from one place to another safely and in coordination with other drivers and non-drivers on public roads. Alternatively, safe driving is part of a larger category of skills called community mobility skills. Community mobility consists of planning and moving about the community via private or public transit methods including but not limited to walking, biking, driving, rideshares, taxis, buses, trains, and more. Three important aspects of community mobility are spontaneity (being able to go where you want, when you want – often without a plan), independence (not needing to rely on others in order to get yourself from point A to point B), and identity. Driving contributes to a person's identity because many view independent community navigation (including driving) not only as a means to engaging in important activities, but also as purposeful occupations themselves.

For the individuals who consider driving and navigating their surroundings as a strong part of their identity, this often starts from a very young age. Many people can recall being passengers in a vehicle or on a school bus when they were a child, and being excited to go on a field trip or to the arcade. This enmeshment in one's identity only deepens in adolescence, when most people learn the skill of driving for the first time. Driving, whether with or without friends, is an important aspect of many teenagers' identities and can even usher in feelings of belonging as they share more commonalities with their peers. Regardless of the methods someone seeks out or engages in themselves, the need for some type of transportation remains constant across the lifespan, as this allows people to participate in what is most important to them. This includes occupations that are essential to one's vitality, such as work or school, and occupations that enrich a person's quality of life, such as socialization and leisure. These reasons offer a strong justification for occupational therapists and related professionals to address transportation and driving in treatment.

Types of Driving Programs

There are several programs that provide services related to driving. Some of them are standard and most suitable for regular drivers without any health concerns or special learning needs. Other programs are considered medical in nature, as they help prospective and current drivers who need some support. Medical-based programs are where occupational therapists play a role in driving-related interventions.

Community-Based Education Programs for Driving

There is a hierarchy of driving programs to help individuals understand what services can benefit them based on their needs. At the bottom of the hierarchy is community-based education, which offers standard instruction for those who request it. Within community-based driving education, individuals can seek out driver safety programs. These programs along with the instructors who run them are typically credentialed by organizations such as the American Association of Retired Persons (AARP) and the American Automobile Association's (AAA) Driver Improvement Program. They offer specific knowledge about how to safely drive and may be classroom- or computer-based. The content in driver safety programs consists of defensive driving techniques, road rules, self-awareness, state driving laws, and other similar topics. Driving schools are another example of community-based driving education. A driving school instructor must be certified as a Licensed Driving Instructor (LDI) by their state's licensing agency, the Department of Education, or a similar accrediting body. The purpose of driving schools is to offer driving instruction to individuals who are new drivers, drivers who have relocated from another state or country, or others who simply want to update their driving knowledge. Driving schools are not the appropriate forum for individuals who have medical conditions or are dealing with age-related changes that impact their driving abilities. Driving schools can help individuals acquire a

learner's permit or driver's license, work with an individual's family to guide home practice for the student driver, and offer continued training for students who need more support. Drivers who participate in a remedial program through a driving school may be doing so to get their license reinstated after a lapse, to receive a discount through their auto insurance company, or to reduce the fees associated with traffic tickets. As you can see, these community-based options are most suitable for typical, healthy drivers.

Medical-Based Driving Services

Driver screens and clinical instrumental activities of daily living (IADL) evaluations are among the medical-based driving services. Nearly any healthcare provider can perform a driver screen as it pertains to their scope of practice. This can include generalists such as primary care doctors, case managers, and social workers or specialists such as neuropsychologists and ophthalmologists. In order to effectively screen drivers, a provider must understand medical conditions and symptomatology that impact driving along with the appropriate assessments, interventions, and referral routes. They should also be able to critically appraise assessment measures based on their limitations. For example, self-report checklists may not be entirely accurate for individuals who are fearful of losing their license. Similarly, driving simulations can only give a provider a certain amount of insight into a driver's potential deficits. The services a driver receives as a result of a driver screen will vary based on the interventions the screening provider is qualified to offer and the referrals that provider makes. In general, most providers can impart some education regarding the driving risks associated with certain health conditions. If the screen shows a driver *may* be at risk of unsafe driving, it's recommended to refer them to a driver rehabilitation program that can provide evaluation and, if indicated, intervention. If the screen shows a driver is a major safety risk when operating a vehicle, the provider should counsel

them on driving cessation and offer alternative transportation options. The screening provider should ensure that each of these steps is supplemented with the necessary reporting and documentation workflows outlined by their profession.

Individuals who would benefit from a more in-depth assessment of their driving abilities will likely be recommended for a clinical IADL evaluation. The term IADL is most commonly used in the field of occupational therapy, which is why OTs are most often the providers who perform these evaluations. Generalist OTs and occupational therapists who specialize in driving are equally qualified to administer this evaluation. In some cases, other healthcare professionals may complete an IADL evaluation if it pertains to their job role. For example, a community life specialist and vocational rehabilitation counselor may complete their own IADL evaluations on clients to determine their capacity for independent living skills. These evaluations may look similar to those completed by an OT - with the potential for some additions based on their roles. Such IADL evaluations may even include some of the same standardized assessments, such as the Kohlman Evaluation of Living Skills (KELS) or the Texas Functional Living Scale (TFLS). Whichever provider completes the IADL evaluation, they must understand the skill of driving, its impact on community mobility, and medical conditions that impact this activity. They should also be aware of services that offer driving interventions. IADL evaluations serve several purposes. They help identify and interpret health risks that impact someone's ability to drive, and the evaluations can also serve as a bridge to getting someone remedial services for driving. If an IADL evaluation shows that driving is a concern, the evaluation should lead to the development of a transportation plan. This plan can include potential recommendations, resources, and referrals for driver training based on an individual's results.

It's possible for an occupational therapist who works in an outpatient clinic to complete an IADL evaluation focused on driving skills. If the occupational therapist

has enough experience in this area and is comfortable treating the patient, they can also provide intervention if the patient demonstrates a need for it. This is within an OT's scope of practice. OTs in such settings can offer intervention focused on driving functions, driving skills, and community navigation. An occupational therapist's training allows them to address some of the following areas regardless of what practice setting they provide treatment from:

- Adapting vehicles to compensate for limitations in physical function, cognition, or otherwise
- Addressing special medical needs for children in your vehicle
- Adjusting to a temporary or permanent loss of driving
- Educating new parents (with or without disabilities) about booster seats, infant car seats, and other positioning options for children with any abilities
    - This can also include setting up durable medical equipment such as oxygen tanks and enteral feeding tubes
- Engaging with others in public settings
- Exercising good safety while riding a school bus
- Exercising sound judgment and personal safety in community settings
- Getting or renewing a driver's license
- Navigating appointments and obligations within the community in various settings such as stores, hospitals, doctor's offices, banks, and more
- Operating a bicycle, motorcycle, or other motorized/non-motorized vehicles safely (either recreationally or for the sake of transportation)

- Reading and applying information in maps, signage, and GPS communications
- Remaining mobile and active within the community after a change in disability or driving status
- Remaining socially active regardless of one's recent change in driving status
- Using public transportation
- Walking in the community

Specialized Driving Evaluation and Training

The sole and most advanced intervention in this category is a driver rehabilitation program, which comes along with its own specialized evaluation. Providers in these programs must hold a certified driver rehabilitation specialist credential, which is demarcated through the letters CDRS after one's name. Sometimes providers with a CDRS are simply referred to as driver rehabilitation specialists. Since the certified driver rehabilitation specialist training is both educational and experiential, the requirements for eligibility are not limited to healthcare professionals. In fact, individuals are able to enroll in the course whether they have a four-year degree in healthcare or another field or if they hold a two-year healthcare degree. Although, the training requirements for each of these potential candidates will be slightly different. The main discrepancy between the eligibility rules is that those with a non-healthcare degree are required to log more training hours than those who have a healthcare degree of any caliber. Occupational therapists may also be employed in driver rehabilitation programs if they possess enough experience providing driving interventions and also hold a specialty certification in Driving and Community Mobility. OTs with this credential display it after their name using the abbreviation 'SCDCM.' Providers with each of these

credentials should have an in-depth knowledge of the perceptual, cognitive, visual, behavioral, and physical deficits that influence driving abilities. These providers should be able to comprehensively assess each of these categories, integrate any clinical findings with the results of road tests, and synthesize a driver's needs. Providers who work in driver rehabilitation programs are also responsible for coordinating many moving parts, including but not limited to training components, fulfilling requirements as per driver licensing agencies, assisting with vehicle selections, making choices for transportation modifications and equipment, providing driver education services, and remaining current with interdisciplinary communication across the driver's healthcare team.

Driver rehabilitation programs typically consist of several parts. Firstly, individuals who are referred to a driver rehabilitation program will consult with a driver rehabilitation specialist to complete an evaluation. As with most occupational therapy evaluations, this process involves assessing a patient's physical and mental abilities as well as their driving history. However, these evaluations take a closer look at the physical, cognitive, and behavioral skills that a person uses to drive. The driver rehabilitation evaluation also involves road time with the specialist. This on-the-road evaluation allows providers to gain a better understanding of personal safety concerns that the driver may present with, along with the standard routines and habits a driver engages in during the driving process. Just as with a standard occupational therapy evaluation, the provider will then determine if the patient would benefit from driver rehabilitation services. If so, they will develop goals and a treatment plan to guide the patients' time in a driver training program. Interventions offered through a driver rehabilitation program include a focus on compensatory strategies, skill-building, vehicle adaptations, and equipment recommendations and furnishing for both drivers and passengers. Therapists in driver rehabilitation programs must also advocate for drivers to receive insurance reimbursement or other types of funding for

services. CDRSs are also responsible for writing up reports related to a driver's fitness, which may solely be based on the results of the evaluation or after intervention. Certified driver rehabilitation specialists can make any of the following recommendations:

1. A patient can drive unrestricted
2. A patient can drive with restrictions (e.g. avoid nighttime driving or only drive without passengers)
3. A patient can drive (per the therapist, this may be with or without restrictions), but they must be re-evaluated to reassess their abilities after a certain period of time due to having a progressive disorder
4. Temporary driving cessation, which means the patient should stop driving entirely until they complete a driver rehabilitation program or other driving-related training
5. Complete driving cessation
6. Referral to another program or service

While other healthcare professionals can obtain a CDRS credential and help individuals resume driving, there are many benefits to having an occupational therapist provide this training. Occupational therapists are trained to assess the condition, abilities, and skills of a driver. Yet, the background of an OT allows these professionals to take a scoping view of a driver's lifestyle, medical needs, personal preferences, and more that greatly impacts the process. This includes a heavy emphasis on a person's social and psychological well-being as it pertains to the occupation of driving.

Many driver rehabilitation programs provide services that have a lot of commonalities with the field of occupational therapy, yet these programs are still

considered rather unique settings. Some driver rehabilitation programs operate as mobile clinics do, meaning they do not have a physical location where patients can go visit them. Programs that operate using this model often have CDRSs go to their patients' homes or meet in community locations. However, driver rehabilitation programs usually have clinic spaces where they showcase some of the equipment and vehicle modifications they may recommend for their patients.

When they are first established, it's important for driver rehabilitation programs to partner with hospitals, mobility dealerships, traditional driving schools, and other community-based agencies that help individuals with disabilities to drive. These collaborations not only provide programs with referrals to help build their businesses, but they are also a great way to spread awareness and educate relevant parties about their services. For example, the owners of driver rehabilitation programs may perform in-services at any of the above locations to explain their role to providers and others who may not know about their interventions. In addition, CDRSs may provide driving risk assessments at community events as a way to engage local residents.

It is also common for driver rehabilitation programs to visit with equipment vendors so each business can learn more about the other. Just as therapists in traditional clinics have a go-to list of trusted doctors and providers they refer their patients to, driver rehabilitation programs often contact the same equipment vendors once they have proven themselves to be reliable.

Section 1 Personal Reflection

What organizations should an occupational therapist look into if they wish to begin providing driver rehabilitation services to patients with disabilities?

Section 1 Key Words

Certified driver rehabilitation specialist (CDRS) - An expert who has been trained, both academically and experientially, to rehabilitate individuals who are unable to drive due to health conditions; this professional has passed a certification exam offered by the Association of Driver Rehabilitation Specialists; a CDRS works with all aspects of a driver rehabilitation program, including planning, developing, coordinating, and implementing driver rehabilitation services for those with disabilities

Driver educator - A driving professional who holds a degree in education along with specialized training in traffic safety, driver education, or a similar field; these professionals provide mostly education related to driving rather than experiential training

Driving instructor - A driving professional who is required to hold a high school diploma along with a clear driving record and has also completed a driver education training program; these professionals also hold a driving instructor license granted by the motor vehicle administration in their state; the credential for this title is 'Licensed Driving Instructor' or LDI

Driver rehabilitation therapist - An allied health professional (PT or OT) who has specialized training and/or experience in providing driver rehabilitation services; these professionals can evaluate and train those with disabilities on the act of safe driving along with safe transportation; these professionals are credentialed (board-certified and licensed) in their fields, but they may or may not have a credential naming them as a certified driver rehabilitation specialist

Remedial program - A program that must be completed to make up for poor performance; remedial programs cover basic concepts along with fundamental skills and strategies regardless of what subject they are on; if drivers must take

classes through a remedial program, it is done in response to citations for reckless driving and may be required in order to keep one's license

Section 2: Driving Evaluations

15, 16, 17, 18, 19, 20, 21, 22, 23

Before an occupational therapist can assess a client in the area of driving, they must be aware of the client factors and performance skills that this activity requires along with the components of driving itself. One of the best ways to do this is through task analysis, which is a central part of the profession for its ability to break down complex tasks into smaller and more manageable parts. Therapists most often benefit from breaking down driving into beginner skills, intermediate skills, and advanced skills based on a patient's experience and current abilities:

Beginner Driving Skills

- Adjusting settings in a vehicle
    - Rearview mirror
    - Side mirrors
    - Seat
    - Steering wheel
    - Radio
    - Navigation system
- Backing up the vehicle

- Checking wipers, lights, tires, and fluids for the sake of maintenance and as needed
- How to assume a safe, ergonomic driving posture and adjusting one's position through the journey
- Identifying road signs, including those that mention restrictions (such as 'no right turn on red' signs), those that indicate the presence of highways or interstates (such as exit and entrance ramps), and those that give instructions (such as 'merge' and 'yield')
- Reading and interpreting gauges within a vehicle
- Recognizing when the vehicle is experiencing concerns, and how to address them
    - Low tire pressure
    - Check engine light
    - High engine temperature
    - Loud exhaust system
    - Smoke coming from the engine
- Starting and turning off a vehicle
- Steering and turning smoothly in any direction
- Stopping in a smooth and controlled manner
- Understanding and using the basic features of the vehicle

- Understanding the boundaries of your vehicle, including but not limited to your position in relation to other vehicles on the road along with the vehicle's blind spots

Intermediate Driving Skills

- Achieving and maintaining at least 2 seconds of following distance
- Anticipating and communicating with other drivers
- Keeping attention on the road
- Knowing when to and how to yield to both vehicles and pedestrians
- Managing your speed
- Negotiating intersections and curves in the road
- Parking
    - Alongside a curb without other vehicles nearby
    - At an incline
    - At an angle
- Safe, effective passing techniques on local roads and interstates
- Turning, merging, and passing
    - Use of turn signals, mirrors
    - Checking blind spots
    - Matching your speed to the speed of others and maintaining that speed, when needed

        - Judging space to identify an opening for your vehicle
        - Knowing when it's safe (and legal) to turn

Advanced Driving Skills

- Adjusting driving based on weather conditions, nighttime, and other circumstances
    - Driving in the snow
    - Driving in the rain - specifically, hydroplaning
- Defensive driving
- Driving in rush hour traffic
- Entering, exiting, and driving on freeways and highways
- Handling complex and/or multiple driving hazards
- Knowing what to do at certain traffic structures or landmarks
    - Toll booths
    - Railroad crossings
    - Crosswalks
    - Roundabouts
    - School zones and/or in the presence of school buses
- Looking ahead for escape routes, detours, and other unexpected situations
- Parallel parking
- Safely and legally making U-turns

- Understanding emergency procedures
- Using caution around bikes, semi trucks, and motorcycles

Other Optional Driving Skills

- Driving a recreational vehicle (RV) or motorhome
- Towing

In addition to categorizing driving skills based on their difficulty level, therapists can also break down the activity of driving into the types of demands it asks of the driver. Driving firstly has **operational demands**, which consist of basic actions such as accelerating, steering, and braking. These three actions are essential in allowing an individual to drive, regardless of whether they are completed with or without modifications. In addition to operational demands, driving also consists of **strategic demands**. These include planning, foresight, and judgment. An example of a strategic demand of driving is choosing to forego an event, appointment, or driving trip due to inclement conditions. By analyzing the other factors that play into the act of driving (such as weather or limited time allotted for travel), someone can make sound decisions for their safety and the sake of others' safety. Lastly, driving also places **tactical demands** on individuals. Tactical demands require a driver to make decisions on an ongoing basis during the process of driving. An example of a tactical demand is assessing in the moment whether or not there is enough space between the curb and another driver to safely make a left-hand turn.

While therapists may not refer to these demands by such names, the skills that fall under each of these groups are also considered client factors. Client factors are underlying requirements for performance skills, one of which is driving. Client factors are motor, cognitive, and sensory in nature, and vary based on the specific

task. All of these factors that can be directly treated by occupational therapists whether they have experience in driver rehabilitation or are considered generalists. Occupational therapists can develop treatment plans for any of the below skills:

Essential Motor Skills for Driving

- Fine motor skills, especially with the fingers and hand as a whole (known as dexterity)
- General bodily coordination
- Hand-eye coordination
- Muscle strength, namely in the above areas
- Physical endurance
- Range of motion, specifically in the following areas:
    - Extension and flexion of both hips (in order to comfortably sit in a driver's seat)
    - Extension of both knees (in order to comfortably sit in a driver's seat)
    - Flexion of the right knee (to assist with engaging and disengaging the gas and brake pedal)
    - Dorsiflexion and plantarflexion of the right ankle (in order to engage and disengage pedals)
    - Extension and flexion of bilateral shoulders (in order to safely maneuver the steering wheel and use the hands to adjust other controls)

    - Abduction and adduction of bilateral shoulders (in order to safely maneuver the steering wheel and reach to other areas of the car, if needed)
    - Internal rotation and external rotation of bilateral shoulders (in order to fasten and release one's seat belt)
    - Extension and flexion of bilateral elbows (to safely maneuver the steering wheel and use the hands to adjust other controls)
    - Extension and flexion of bilateral wrists (to safely maneuver the steering wheel and use the hands to adjust other controls)
    - Bilateral hand grip (to safely hold and maneuver the steering wheel)
    - Left and right lateral rotation of the cervical vertebrae in the neck (to check side view mirrors, blind spots, and look out of all windows before turning and at other points while driving)
    - Lateral trunk rotation (in order to check side view mirrors, blind spots, and look out of all windows while driving along with putting on one's seat belt)
- Visual-motor skills
    - Scanning
    - Tracking
    - Eye gaze

Essential Cognitive Skills for Driving

- Attention (divided, focused, sustained, and selective visual attention)

- Cognitive flexibility and reasoning
- Cognitive planning abilities
- Communication skills
    - Ability to read road signs
    - Expressive communication (including the ability to speak
    - Receptive communication (including the ability to read road signs and interpret symbols)
- Concentration
- Estimating distances and speeds
- Executive function
- Information processing speed
- Judgment
- Memory, specifically short-term visual memory, but also long-term memory to recall rules and regulations related to driving
- Mental and emotional stability
- Motor planning abilities
- Problem solving
- Reaction time
- Self awareness/insight

Sensory Skills

- Auditory perception
- Environmental scanning
- Force modulation
- Peripheral vision
- Proprioception, in order to assume the proper posture while driving
- Regulation of the olfactory system, which can help someone identify and act on hazards such as a smoking engine or burning rubber on tires
- Regulation of the tactile system, which can help someone feel abnormal vibration through the seats and steering wheel and act accordingly if it presents as a hazard
- Regulation of the vestibular system, specifically in order to maintain equilibrium while moving the head and neck for the purpose of scanning and awareness of one's environment
- Visual acuity
- Visual perception, including but not limited to depth perception

Driving-Related Occupational Therapy Assessments

There are a range of driving-specific standardized assessments that occupational therapists can utilize for the evaluation of drivers:

- DriveABLE
- Drivers 65 Plus

- The Clinical Assessment of Driving-Related Skills (CADReS) Older-Driver Screening Tool
- The Composite Driving Assessment Scale
- The Driving Habits Questionnaire
- The Driving Observation Schedule
- The Driver Orientation Screen for Cognitive Impairment
- The Fitness to Drive Screening Measure
- The Nottingham Neurological Driving Assessment
- The Performance-Based Driving Evaluation
- The Performance Analysis of Driving Ability
- The Record of Driving Errors
- The Rhode Island Road Test
- The SAFER Driving Survey
- The Sum of Manoeuvres Score
- The Test Ride for Practical Fitness to Drive
- The Washington University Road Test
- Training, Research, and Education for Driving Safety (TREDS)
- Western University's On-road Assessment

In addition, therapists can opt for other standardized assessments that focus on the integral skills (physical, sensory, and cognitive) needed for safe driving tasks. Some examples include:

- ACT Hazard Perception Test
- AD8TM Dementia Screening Interview
- Alternate Toe/Foot Tap Test
- Brief Cognitive Assessment (BCAT)
- Confrontation Testing for Visual Fields
- Eye Gaze Test
- Global Deterioration Scale (GDS)
- Mini Mental State Exam (MMSE)
- Motor-Free Visual Perception Test
- Pelli-Robsin Chart for Contrast Sensitivity
- Prevention of Older Persons' Injuries (POPI) battery
- Rapid Pace Walk and Get Up and Go
- Rapid Pace Walk
- Rey-Osterrieth Complex Figure Test
- Short Blessed Test (SBT)
- Snellen E Chart Test
- St. Louis University Mental Status Exam (SLUMS)
- Test of Functional Living Skills (TFLS)
- The Clock Drawing Test (CDT)
- The Maze Test

- The Montreal Cognitive Assessment (MoCA)
- The Trail Making Test (Parts A and B)
- The Useful Field of View Test (UFOV)
- Timed Get Up and Go (TUG)

Several types of standardized assessments and an observation of a patient's skills are an important part of a driver's evaluation. Many of the above assessments take a look at a patient's cognition, since this is often a major indicator of potentially impaired driving skills. However, therapists should also utilize standardized tests that can identify underlying deficits in any aspect of ADL or IADL performance. This includes home management, health maintenance, financial management, and community mobility as a whole.

There is evidence that supports the use of these assessments. Research shows that dementia patients who scored low on the Trail Making Test and The Useful Field of View Test also demonstrated difficulty maintaining a vehicle's position in its lane, regulating the vehicle's speed, and adjusting to external stimuli in one's environment. Recent research also shows the utility of electroencephalograms (EEGs) in evaluating the brain health of drivers who demonstrate unsafe behaviors on the road. Portable EEGs are becoming more accessible and affordable, which shows promise for the idea of incorporating this diagnostic measure in both simulated and on-the-road driving assessments. In addition, the data retrieved from EEG testing during tasks that require sustained attention (such as driving and other cognitively-intensive activities) can be used for a variety of purposes. In certain settings, occupational therapists may be asked to complete this type of diagnostic testing, but the results would only be used to supplement performance-based assessments. Cognitive markers are an integral component of

on-road assessments, which provides further evidence as to how important related standardized assessments are in a comprehensive driving evaluation.

Yet, occupational therapists must also consider other areas in order to complete a comprehensive evaluation for driving. Firstly, therapists should discuss any medications a patient is taking, including prescription drugs, dietary supplements, herbal medicine, vitamins, minerals, illicit substances, and anything else that doesn't fall under these categories. Many substances and medications have side effects that can significantly impact a person's ability to drive safely, which is why a therapist must be aware of what someone takes - whether the frequency is regularly or occasionally. During the evaluation process, therapists should pay special attention to if the patient reports they are on any of the following substances:

- Anti-anxiolytics
- Antidepressants
    - The class of antidepressants that is most likely to impact driving due to negative side effects are selective serotonin reuptake inhibitors (SSRIs), but serotonin and norepinephrine reuptake inhibitors (SNRIs) and tricyclic antidepressants (TCAs) can also have similar effects on a person.
- Anti-diarrhea medication, specifically those containing loperamide
- Anti-epileptic medication
- Antihistamines
- Antihypertensives
    - In the initial period of taking this medication (specifically antihypertensives in the class of beta blockers), people may

experience increased lethargy. It's common for this side effect to subside after one to two weeks, but it may impact driving for a short time.

- Antipsychotic medication
- Benzodiazepines
- Caffeine pills
- Diet pills
- Medications containing high levels of codeine (often in pain relievers or cough and cold medicine), morphine (typically found in prescription pain relievers), and dextromethorphan (DXM) (found in cough and cold medicine)
- Motion sickness medication
- Muscle relaxers
- Opioid pain relievers
- Sleeping pills, especially those that contain zolpidem
    - Even if individuals take sleeping pills properly (e.g. in the evening before bed or as otherwise prescribed by their doctor), medications containing zolpidem stay in the body longer. This means they are likely to cause side effects even the next morning, which may influence someone's ability to drive.
- Some products containing cannabidiol (CBD)
- Stimulants, especially those containing ephedrine or pseudoephedrine

- It may seem that stimulants can improve someone's driving function due to boosting their alertness, but these medications often worsen working memory and movement perception. These two skills are crucial for driving so these drugs can be more dangerous than most people believe.

Studies suggest that a high number of people have driven after taking some of the above medications within the past 30 days. 73.1% of drivers have operated a vehicle after taking amphetamines, just under 61% of drivers have recently gotten behind the wheel after taking antidepressants, and nearly 39% of drivers have done so after taking antihistamines. Similar results were found for drivers and pain medications (32.6%) and those who used muscle relaxants in the month prior to driving were slightly lower (21.6%). Polypharmacy is also a concern, as 45% of drivers reported taking at least one of these potentially driver-impaired medications in the last 30 days. In addition, 63.3% of drivers have taken two or more of these medications in the last thirty days.

Therapists should educate drivers to avoid or limit medication that has side effects such as dizziness, blurred vision, nausea, drowsiness, fainting, difficulty focusing, slowed movements, and excitability. The effects of many of these medications, especially legal stimulants such as caffeine pills, energy drinks, coffee, and more, will wear off in 3 to 5 hours. However, the exact time is dependent on the person's body weight, metabolism, age, and several other factors. Some of these substances can even remain in the body for an extended period of time, at which point patients are advised to refrain from driving. For specific guidance, therapists should consult a patient's doctor to determine what activities are safe for them to participate in.

In addition to a medication review, occupational therapists should take stock of the patient's driving history. This should include some of the following areas:

- How often the patient normally drives in the absence of health concerns
    - Also ask if this differs from how often they currently drive
- Length, location, and reason for most trips
    - City or rural locations? Short, local trips or longer trips that require highway or interstate travel? Passing through busy intersections or roads with little to no traffic? Daytime driving or nighttime driving? Driving during rush hour or during off-peak times?
- Whether or not someone typically accompanies the patient when they are driving to assist with navigation
    - If the answer is yes, the therapist should inquire if this person can and will be available consistently when the patient drives
- Driver knowledge about their immediate area and adjacent areas, including but not limited to the roadways, traffic patterns, and detours that may be present
- Routine vehicle maintenance history

Any driving evaluation should also include an on-the-road assessment. This involves the therapist riding along with the patient to get a better idea of their driving skills and overall ability to handle the vehicle. Therapists should observe if and how a patient is adjusting seats, mirrors, and other aspects of the car. Therapists should also pay attention to how the patient starts the car and controls it during the drive. When summarizing the results of this assessment section, therapists should also take some of the following factors into account: following distance, vehicle position in relation to the road, the ability to recognize hazards, and driver communication. The on-road assessment is best conducted at the end of the evaluation, since the interview portions allow the therapist to make a

clinical decision regarding where the driving portion should take place. Therapists can opt to have the patient navigate an off-road course, local roads they are familiar with, highway routes, new terrain altogether, or a combination of settings.

Evaluation Results

After compiling and interpreting the results of a driving evaluation, the therapist will take next steps based on the certification they hold. For example, we mentioned earlier that CDRSs must make one of the following recommendations: unrestricted driving, driving with restrictions, driving with a required re-evaluation due to a progressive health condition, temporary driving cessation, complete driving cessation, or a referral to another program. Generalist occupational therapists are not required to make specific recommendations, but can do so while creating driving-related goals to guide the patient's treatment. The patient is not required to follow any of the therapist's driving recommendations. However, it is the patient's responsibility to report any major changes in health status or new medical conditions to the DMV when they renew their license. In most cases, therapists choose to remind patients of this when making their recommendations.

Occupational therapists cannot release the results of a driving assessment to the Department of Motor Vehicles (DMV) or the patient's family unless they receive the patient's consent to do so. If the driving evaluation is completed at a medical facility such as a hospital or an outpatient clinic, it will be part of the patient's medical record just as other documentation is. If a specific doctor referred the patient for the driving evaluation, that provider will also receive the results. In the event a patient does not agree with the results of their CDRS-administered evaluation, they can request a re-evaluation from the DMV. While the DMV is not required to grant the patient this request, they are strongly encouraged to do so for the sake of community safety. It is also considered best practice for the DMV

to complete their own driving evaluation when someone files an accident report on a driver or when DMV receives a report about a driver from a family member, doctor, police officer, or other concerned citizen.

Many states do not require primary care doctors to report impaired drivers – or those who are suspected to be impaired drivers – to their local DMV. However, the American Medical Association (AMA) states that doctors should use their best judgment to make appropriate reports when they are concerned. There are similarly no requirements mandating therapists to report potentially impaired drivers, so OTs should also exercise sound judgment before doing so.

Documentation for Driving Evaluations

When therapists are developing a plan of care following the completion of a driving evaluation, they must keep several things in mind. Firstly, OTs should focus on selecting activities and goals that are within their scope of practice. All occupational therapy goals – even those that are formed with the intention of remediating driving skills – should address deficits in performance skills that are required for pre-driving and driving.

Therapists should also determine what interventions the patient will need to achieve their goals. If at any point the therapist feels they cannot provide those interventions, they should refer the patient to a more appropriate service (such as a driver rehabilitation program) or a specialized therapist.

As with any therapy documentation, providers should always emphasize the patient's rehabilitation potential and use skilled terminology to justify the need for their services. Some examples of this verbiage include:

"Patient was referred by PCP over driving concerns. Comprehensive OT evaluation demonstrated deficits in the areas of coordination, elbow and shoulder range of

motion, and working memory. Interventions for this patient will focus on improving activity tolerance, upper body coordination, upper body range of motion, and cognition. OT will instruct patient and caregiver (wife) on a home exercise program that focuses on strengthening, improving safety awareness, and utilizing other methods of transportation throughout the community. OT recommends temporary driving cessation for this patient pending a referral to local driver rehabilitation program for further evaluation and intervention."

Section 2 Personal Reflection

What goal might an occupational therapist develop for a potentially unsafe driver with decreased hand-eye coordination?

Section 2 Key Words

Cognitive flexibility - The ability to adapt one's behavior as it pertains to new situations

Divided attention - The ability to direct one's mental focus toward more than one task or idea at a time; this is also known as multitasking, which is often discouraged when driving due to the danger it poses; however, divided attention is crucial for drivers who rely on system navigation or other forms of route instructions to get to their destination while still safely driving

Environmental scanning - The ability to analyze trends in order to allow individuals to understand the environments around them and how each component is interconnected; this skill also enables individuals to use this information for the purpose of planning and decision-making

Executive function - The ability to use all information at your disposal to make a plan for a response using all of your known strategies; this is also known as higher level thinking, since it combines multiple processes

Focused attention - The ability to respond to individual stimuli (auditory, visual, or tactile, namely) in order to maintain a consistent, ongoing behavioral response during a task or activity

Perceptual speed - How long it takes for someone to scan their environment and compare symbols, figures, images, and other visual stimuli

Polypharmacy - The act of taking more than one medication (potentially those that have the same mechanism of action) in order to manage symptoms of a single health condition

Sustained attention - The ability to focus on a task or activity over an extended period of time; this skill is less about the length of time someone can sustain attention for and more related to the ability to focus on a task until it's completed, regardless of distractions

Section 3: Occupational Therapy Driving Intervention

24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39

There are several populations that could benefit from driving intervention. Evidence also supports the need for this type of intervention in certain groups as opposed to others, simply based on their standard clinical presentation. Studies show that 14% of women reported driving reductions related to health conditions compared to 8% of men doing the same. Research conducted through the National Health and Aging Trends Study also found that, of the individuals who reported self-initiated driving reduction, 29% did so due to musculoskeletal

concerns or conditions, 13% did so due to neurologic concerns, and 10% did so due to ophthalmologic concerns.

Another study found that 19% of community-dwelling drivers received some type of rehabilitation services in the past year. Out of those individuals, 10% participated in rehabilitation to improve their driving skills while 2% aimed to improve their access to other forms of transportation. The majority of the older adults who participated in driver rehabilitation services were married. Research also shows that being involved in an accident and experiencing a close call on the road are two of the main motivations behind someone seeking driver rehabilitation services.

Research conducted on individuals who recently experienced brain injuries aimed to discover some of the main deficits that contributed to driving errors. Participants used a driving simulator and underwent some standardized assessments focused on perceptual skills and cognition to begin the study. Results showed the majority of participants experienced concerns related to overall driving aptitude, judgment and use of the steering wheel, multitasking to adjust various vehicle features, self-awareness and some other perceptual limitations, and a low total score on the road course. Participants who were older, had less driving experience, and suffered a vascular injury were more likely to display driving errors. The brain hemisphere that was injured also played a role in the patient's performance. In addition, patients logged more driving errors on the simulator if they scored lower on the Mini-Mental State Examination (MMSE) and Modified Barthel Index (MBI).

Results of a study that has strong occupational therapy undertones showed that individuals who decreased the frequency of their driving experienced more muscle weakness (specifically related to grip strength), lower activity levels, and greater lack of interest in standard activities. Participants also demonstrated

higher levels of social and physical frailty after this change in driving status occurred. This shows the need for occupational therapists to support individuals whose driving evaluations recommend cessation or even restrictions.

Populations That Benefit From Driving Intervention

- Individuals with visual impairments such as cataracts, glaucoma, and age-related macular degeneration
    - Visual deficits such as deterioration of contrast vision, color vision, twilight vision, visual acuity, and peripheral vision
- Individuals with auditory impairments such as a deterioration of skills such as detection of signals in noise, lateralization and localization tasks, and temporal processing
- Individuals with central nervous system conditions or injuries, including stroke, dementia and other neurocognitive disorders, depression, multiple sclerosis, Parkinson's disease, and traumatic brain injury (TBI)
    - Individuals with a history of TBI experienced significantly more driving errors, tickets, serious accidents, and verbal aggression while driving after their injuries.
    - Those who experienced a stroke were more likely to return to driving if they had paid employment and scored typically on the MMSE and the National Institute of Health Stroke Scale.
    - There is limited evidence supporting the use of a driving simulator to rehabilitate someone after a stroke, especially one which resulted in visual and cognitive deficits. Other research also suggests that it's unclear what driving-related stroke impairments can be rehabilitated

and there is not enough evidence to support the primary use of remedial or contextual approaches for this purpose.

    - Studies show that 26% to 38% of patients drive against medical advice in the first 30 days after experiencing a stroke.

- Individuals with sleep disorders such as chronic insomnia and sleep-related breathing disorders

    - Individuals with isolated REM Sleep Breathing Disorder (iRBD) and symptomatic REM Sleep Breathing Disorder (sRBD) were both considered more cognitively impaired (with slower processing speeds, greater distractibility, and less visual-spatial attention) than those without the conditions. Those with sRBD had a slower driving speed and reaction time, experienced more collisions, required a greater number of warnings, and had more trouble with following distance and speed matching compared to drivers with iRBD. Drivers with iRBD took longer to recognize stimulus in their environment than those with sRBD did.

- Individuals with cardiovascular disorders such as coronary artery disease, cardiac arrhythmia, congestive heart failure
- Individuals with diabetes
- Individuals with musculoskeletal disorders, such as osteoarthritis, joint prostheses, rheumatoid arthritis, and chronic pain
- Older adults with frailty in the absence of diagnosed chronic conditions

    - Frailty is characterized by five criteria: unintentional weight loss, low levels of physical exertion/activity, generalized weakness, slowness of movement, and self-reported fatigue or exhaustion

    - Research shows most older adults retain certain driving-related skills, including motor time, decision time variability, and reaction time under stressful situations. However, an older adult's inductive reasoning and selective attention both significantly diminish over time.
    - Studies suggest that consistent practice (through driver rehabilitation or other means) can benefit older adults looking to increase their processing speed, while ongoing education can improve an older driver's perceptual speed.
    - Older adult drivers who are able to drive with restrictions in place consistently perform worse in driving tests than older adult drivers who do not have any restrictions placed on their driving.
    - Older adults are more likely to independently adjust their driving habits as they age. This is partly due to typical age-related changes, but also because they are at an increased risk of health conditions.
- Adolescents with ASD or other developmental disabilities

The type of driving interventions an occupational therapist implements will vary based on the patient's needs. For this reason, it's important that therapists determine each patient's potential for driver rehabilitation. Occupational therapy research shows that therapists providing driving interventions rely heavily on conditional and interactive reasoning in practice. Therapists may even encounter ethical dilemmas when they are asked to weigh the safety repercussions of certain patients driving while still helping patients maintain their independence in a preferred manner.

Therapists can utilize several tools to help them in developing an appropriate plan for driver rehabilitation. One such tool is the OT-DRIVE model, which can assist

providers in interpreting evaluation data, creating client-centered intervention approaches, and justifying their referrals to more specialized programs or services. The OT-DRIVE model consists of a spectrum of decision indicators. First and foremost, the model guides therapists in building an occupational profile to determine someone's risk for unsafe driving. The risk categories are as follows:

- High risk
    - This category describes non-drivers whose impairments are beyond those that can be remediated to allow for safe driving.
    - Individuals in this category also have strong evidence supporting such a level of risk, including a history of accidents, infractions, and other driving penalties.
    - It is strongly recommended that therapists recommend drivers who fall under this category for retirement from driving. It's best practice for therapists to focus their intervention efforts on alternate methods of mobility, such as public transit.
- Moderate risk
    - Individuals who fall under the moderate risk category are those who have deficits that influence their driving fitness. However, these drivers are differentiated from those who are high risk due to their potential for recovery and skill optimization.
    - An example of a driver who is at a moderate risk for unsafe driving is someone with a medical issue that is increasingly complex, such as unmanaged diabetes resulting in neuropathy and lower extremity amputations.

    - Upon evaluating a patient who is a moderate risk for unsafe driving, therapists should determine the patient's potential for recovery – both now and in the future – before providing any interventions. The best way to do this is through a comprehensive driving evaluation.

- Low risk
    - Someone is considered at a low risk for unsafe driving behaviors if there is little to no evidence they would be a hazard to others on the road. If drivers in this category present with any impairments, those deficits are below the threshold required for fitness to drive.
    - Therapists who evaluate patients at a low risk of unsafe driving behaviors should encourage them to regularly participate in activities that improve their overall strength, flexibility, and fitness. Many times, therapists will also recommend that low risk patients enter driver safety programs (such as CarFit) to maintain their skills.
    - If caregivers are involved in the patient's daily life, it is a good idea for therapists to educate them on warning signs that may indicate a decline in driving fitness over time. This information should be supplemented with resources and next steps in the event such a decline occurs.

Once therapists determine a patient's risk of unsafe driving behaviors, they can choose a combination of interventions that are best suited for the person they are treating.

Education on Ergonomics of Driving

People may not think of the negative effects associated with seated posture when driving. In addition, drivers and passengers experience low frequency vibration

across their whole body, which can also impact someone over time. Ergonomics is one of the best ways to prevent and exacerbate injuries related to postural concerns. Therapists should be sure to educate and train patients in proper ergonomics when driving, including:

- **Lumbar support:** When in the driver's seat, there should be enough space between the back of the knees and the edge of the seat. Test this out by ensuring there is room for 2-3 fingers in that space. Also take a look at the seat's back support, which should run the full length of the driver's back.
- **Lumbar angle:** The seat should be reclined at a 100-110° angle, which prevents tension in the lower back while still allowing the driver to see and maneuver the car. The seat should also be adjusted so the driver can reach pedals with a slight bend in their knee.
- **Headrest:** The headrest on the driver's seat should be adjusted so it touches the back of the head, giving the driver added support.
- **Hips:** The angle of the seat should be adjusted so the driver's knees are positioned slightly lower than their hips with full support available for the thighs. This allows for sufficient circulation in the lower body and reduces strain on the hip joints.
- **Line of sight:** The car seat should be high enough so the driver can comfortably see at least 3 inches above the steering wheel.
- **Steering wheel:** The driver's chest should be 10 to 12 inches from the steering wheel, which directly faces the driver. This not only protects the driver from injury in the event the airbag deploys, but it also allows for ergonomic positioning of the upper body and proper vision out of the windshield. Most people learned to place their hands at the 10 o'clock and 2 o'clock position on their steering wheel, but the 9 o'clock and 3 o'clock or

the 6 o'clock and 4 o'clock positions are actually more ergonomic for the driver.

- **Mirrors:** Drivers should adjust their side-view and rearview mirrors to minimize blind spots and prevent excessive craning of the neck to compensate for the lack of view.
- **Seatbelt use:** Therapists should remind drivers of the importance of wearing a seatbelt at all times in the car.
- **Securing items:** Therapists must tell drivers to remove items from their back pockets when they are driving, since this causes asymmetry in the pelvis, hips, and lower back and can lead to discomfort over time. This recommendation also applies to purses, backpacks, and tote bags, which should be secured in a safe place where they will not move around and impact the driver's safety.

Therapists should also inform drivers that it's okay to make further adjustments to their mirrors, seat, steering wheel, and more as long as it is safe to do so. Drivers should also know about gentle neck, arm, and leg exercises that can help improve circulation at traffic lights or rest stops. If a therapist notices a driver lacks confidence with their skills, they can also educate them how to plan trips during quiet, off-peak hours (such as mid-afternoon) or use routes with more right turns to reduce their likelihood of an accident.

It's also a good idea for therapists to educate drivers and their caregivers about warning signs that may indicate a notable change in driving skills. Some behaviors that point toward such changes include:

- Becoming easily distracted
- Being involved in two or more collisions or close encounters, even those that the driver says were due to another person

- Being told by family and and friends that they don't want to be a passenger in the driver's car
- Choosing inappropriate driving speeds, either too fast or too slow for the context
- Confusing the brake and gas pedals
- Demonstrating slowed reaction times
- Experiencing excess feelings of anxiety or fear when driving
- Getting confused or frustrated more easily than usual
- Getting lost often, even when in familiar surroundings
- Having difficulty merging onto the highway or at other busy intersections
- Having difficulty managing tasks of any kind (especially those that are finance- and medication-related) that were once familiar to the driver
- Having other cars blow their horn at the driver when they are on the road
- Looking down at one's feet when switching between the brake and gas
- Failing to look over one's shoulder to check blind spots
- Failing to observe traffic signals, signs, or patterns
- Finding new dents and scrapes on the vehicle from bumping into fences, mailboxes, and other immovable objects
- Forgetting or neglecting to put a seat belt on when driving
- Making overly wide turns
- Making turns without signaling

- Maintaining a poor or inconsistent position within the driving lane
- Needing instructions from passengers, even when navigating to familiar places
- Struggling to make decisions (either more slowly or with poor judgment)
- Swerving within a driving lane or drifting across lane markings (either into incoming traffic or into the breakdown lane)

Modifications, Equipment, & Assistive Technology for Driving

Assistive technology used for driving often comes in the form of equipment additions or modifications to a vehicle. These modifications can include but are not limited to the following:

- Adaptive cruise control
- Adaptive ignition controls
- Bioptics
    - This feature involves attaching a small telescope to the driver's prescription glasses, which enables someone with low vision to see their surroundings by looking through the modified lens.
- Audio visual queues (AVQs)
    - These modifications read vehicle features (such as wipers and turn signals) aloud and use various colored lights to allow someone to control certain functions by pressing only one to two buttons.
- Extenders
    - Dash-mounted gear shift extenders

    - Drop-down style turn signal extenders allow drivers to engage the vehicle's turn signals from a lower angle, which is ideal for individuals who have limited shoulder range of motion.
    - Gear shift extenders
    - Parking brake extenders
    - Pedal extenders
    - Right-hand turn signal extenders
    - Steering wheel extenders
    - Turn signal extenders
- Foot controls
    - Accelerator pedal guards
    - Accelerator/brake guards offer added safety for drivers with tremors, spasms, or other involuntary movements that may lead them to accidentally accelerate or brake.
    - Foot steering
    - Left foot accelerators
- Gas cap removal tool
- Hand controls
    - Primary hand controls govern the gas and brakes.
    - Secondary hand controls operate ancillary functions such as temperature settings, windshield wipers, and the horn.

    - Both primary and secondary hand controls can be mechanical or power-supported. Mechanical hand controls require the driver to engage a lever to trigger a certain function. Mechanical hand controls are more common and more affordable. A common example of a mechanical primary hand control is push-pull braking, which is a lever located near the dashboard and steering wheel that assists with slowing the vehicle. A similar feature is a right-angle system function, which replaces the pulling motion with a 90-degree turn of the hand. Drivers can also use joystick controls.
    - Power-supported hand controls are electronic in nature, and are most often seen in fully-modified vehicles. Yet they can be incorporated in other vehicles. An example of a power-supported hand control is a secondary function switch, which allows drivers to keep their hands on the steering wheel while also controlling secondary functions of the vehicle according to its programming.
- Key holders
- Keyless entry
- Reduced effort braking
    - This feature allows a driver to apply about half the force in order to engage the brakes. Reduced effort braking is often ideal for individuals with poor strength or muscle tone in the legs.
- Remote control functions
    - Car horn
    - Dimmer switches
    - Headlights

    - Windshield wipers
- Seat belt modifications
    - Buckle bopper seat belt aids offer a more comfortable rubber button that is easier to engage and disengage.
    - Seat belt adjuster clips can be used to reposition the clipping point of the seat belt so that it's in the middle of a person's pelvis rather than at the right side. This is ideal for drivers with obesity or those who have limited shoulder range of motion and cannot secure the seat belt in the traditional position.
    - Seat belt reachers can also help drivers with limited shoulder or torso range of motion, as they allow someone to reach the seat belt more easily when initially engaging it.
- Seating and transfer options
    - Adjustable driver's seat
    - Assist bars
    - Assist straps
    - Automatic standing aids
    - Orthopedic wedge car seat cushions
    - Pivot transfer discs
    - Power transfer seats
    - Swivel seating
    - Transfer boards

    - Vehicle step stools
- Siren detectors
- Steering aids
    - Amputee rings allow drivers with prostheses to insert a hook into a hole in order to control the steering wheel.
    - Counterweight aids prevent drivers from consistently using their upper body to steer, especially during long trips on straight roads.
    - Gel steering wheel covers help improve dexterity and grip for drivers with arthritis and other hand conditions.
    - Palm grip aids allow someone to control the steering wheel without flexing any of their fingers.
    - Pin-based steering aids similarly do not require the driver to use as much force from the wrist or fingers to grip the steering wheel. There are single pin, tri-pin, or five-pin steering aids to accommodate drivers with varied fine motor needs.
    - Spinner knobs allow drivers to control their steering wheel by turning a dial on a much smaller scale.
    - V-grip aids do not require drivers to use as much force to grip the steering wheel.
- Tie downs and docking systems
    - These allow drivers to secure their wheelchair or scooter while they are driving.
- Tire pressure sensors

- Traction control sensors
- Vehicle body modifications
    - Drivers who exclusively use wheelchairs and remain in them while driving may need more extensive modifications done to the body of their vehicle to allow more space for their mobility aid.
    - Drivers can get a raised roof or a dropped floor modification. However, these modifications are considered less practical since they are a more expensive alternative to purchasing a wheelchair-accessible van.
- Vehicle lifts and ramps
    - Scooter lifts: platform-arm style, space savers, outside lifts, back-saver lifts, chariot lifts, swing-arm style
    - Wheelchair lifts: chair toppers on top of vehicle, side-of-vehicle lifts, under-vehicle lifts
- Visual aids
    - Backup cameras
    - Corner wedge safety mirror for blind spots
    - Glare shields
    - Panoramic rearview mirrors

Driving Simulators

Research supports the use of driving simulators in driver rehabilitation. In fact, studies have demonstrated that driving simulators are the most effective way to

significantly improve a driver's spatial reasoning skills, which provides evidence for occupational therapists incorporating them into treatment. Other research has been conducted on the utility of MDSST, which is a web-based mini-driving scene screening test. MDSST can improve a person's comprehension of driving situations along with their capacity for identifying and appropriately categorizing risk factors, predictive abilities regarding driving situations, and perception of traffic signals and patterns.

Adaptive Driving Instruction

This is another important aspect of occupational therapy treatment for disabled drivers. Adaptive driving instruction, which includes real-time guidance and intervention from a therapist in the passenger's seat, may take place in a vehicle with or without modifications. Early research is even exploring the possibility of using automated vehicles during this instruction, specifically to delay driving cessation for individuals with early dementia. While there are many considerations that come along with such an intervention, there appears to be promise in incorporating this into treatment sessions. More research is needed to solidify the benefit of this modality for drivers with early dementia.

Coordination of Modifications and Services

Coordination is another aspect of occupational therapy intervention that can benefit drivers. This treatment component is all-encompassing based on the driver's needs. If a therapist cannot complete the vehicle modifications or inspections a driver requires, it is appropriate to find someone who can offer these services and coordinate them for the patient. For some patients, this may also include receiving education on alternatives for community mobility. Therapists may need to set patients up with a bus or train pass as well as instruct

them on navigating their immediate area via various bus, train, or subway lines. Patients who do not have access to typical public transportation may need education and coordination services for alternate transit methods such as medical transportation or ride share. In addition, some drivers may benefit from taking advantage of other services such as CarFit. This is an especially good recommendation for seniors who do not benefit from or qualify for driver rehabilitation services, but may need them in the future. CarFit is an education-based program that allows older adult drivers to maintain their vehicle fitness by ensuring it enables their independence. CarFit and other similar programs provide consistent screening, so they can serve as a referral source for driver rehabilitation programs as well as offer education on alternative transportation methods.

Section 3 Personal Reflection

What type of goals might an occupational therapist specializing in driver rehabilitation create for a patient who receives a recommendation to stop driving altogether?

Section 3 Key Words

Decision time variability - The time it takes for each person to make a decision and begin to act on it; this varies based on someone's cognitive and motor abilities as well as other factors

Frailty - A medical diagnosis that is characterized by increased vulnerability due to normal aging across multiple body systems; while typical aging impacts everyone, frailty occurs when the aging process prevents someone from coping with daily stressors and increases their likelihood of hospitalization, falls, mortality, and disability

Motor time - A component of reaction time that is defined as the time between the first electrical impulse in a muscle and the start of that same muscle's contraction or movement

Primary hand controls - Controls that operate the gas and brakes on a vehicle

Secondary hand controls - Controls that operate other vehicle features such as headlights, temperature regulation, and the car horn

Section 4: Case Study #1

A 16-year-old male with high functioning Autism Spectrum Disorder is referred to driver rehabilitation services by his doctor after he complained of worsening attention concerns in the past few months. He already completed traditional driver's education courses and passed his license examination, but he has not stepped behind the wheel on his own yet due to growing anxiety regarding his abilities. The patient has a goal of driving to and from high school each day independently. After completing their evaluation, a therapist determines that this patient has moderate auditory and visual defensiveness, which are likely both contributing to his attention deficits and anxiety. During the initial evaluation, the therapist noticed the patient was friendly, motivated, and willing for treatment, despite being distraught at times when relaying his struggles.

1. Will this patient be diagnosed with an additional condition as a result of the evaluation?
2. Is the patient a good candidate for driver rehabilitation services?
3. Is the patient's goal feasible for an occupational therapist to address?
4. If not, what referrals might the therapist need to make?

Section 5: Case Study #1 Review

1. Will this patient be diagnosed with an additional condition as a result of the evaluation?

   Based on the symptoms above, it's possible the patient may also have co-occurring anxiety disorder and/or attention-deficit/hyperactivity disorder (ADHD). However, further testing would be required in order to make an official statement. Diagnostic testing is not within an OT's scope of practice, so the patient would need to be referred elsewhere if the therapist finds the patient's symptoms are severe or impactful enough.

2. Is the patient a good candidate for driver rehabilitation services?

   The patient demonstrates attention deficits and some affective symptoms that have the potential to impact his driving abilities. In general, he presents with a positive affect and is engaged in the goal creation process, which indicates he would likely benefit from such services.

3. Is the patient's goal feasible for an occupational therapist to address?

   While the core of the goal (driving to and from school) is both functional and appropriate for this patient, the frequency may need to be adjusted as the therapist gets to know the patient more. It's possible that daily driving may prove too taxing to this patient for the time being, as it may impact their academic performance if they expend too much cognitive effort before even getting to school.

4. If not, what referrals might the therapist need to make?

   If the therapist is not able to help this patient or believes they would benefit from diagnostic testing, they should refer the patient to a psychiatrist or psychologist.

Section 6: Case Study #2

An occupational therapist working in a skilled nursing facility just began treating a 46-year-old female who suffered a stroke 3 weeks ago. The patient was admitted to the SNF yesterday to undergo rehabilitation focused on strengthening and ADL function. The patient reports she wishes to return to driving because she wants to travel to see her new grandchild who lives about an hour away. After completing the initial evaluation and the first treatment session with the patient, the therapist determines the patient's deficits are too severe to address driving at this point in the plan of care. The therapist also does not have experience in the realm of driver rehabilitation, but the patient has been requesting it during each of their interactions.

1. What is the best plan of action for the therapist to take in this situation?
2. Should the therapist tell the patient they will not be able to drive again?
3. What should this therapist's treatment focus on?

Section 7: Case Study #2 Review

1. What is the best plan of action for the therapist to take in this situation?

   The therapist should explain to the patient that her current therapies (OT, PT, ST, and any others she is receiving) are all focused on improving her strength, endurance, and other skills that are crucial for the activity of driving. The therapist should encourage the patient to make the most of these services so she can work her way up to rehabilitation focused on driving.

2. Should the therapist tell the patient they will not be able to drive again?

   No. Firstly, this therapist would not be able to accurately and reliably make such a prognosis at this point in the plan of care. This is partly because the therapist does not know the patient's abilities all that well yet, and also because neuroplasticity is strongest within the first 6 months after a patient experiences a stroke. This means the patient has strong potential for rehabilitation for at least a few more months, which means the patient has the potential to regain ADL function and more if they continue receiving therapies. This therapist also doesn't have expertise in driver rehabilitation, so they have no ability to make such a definitive statement about driving.

3. What should this therapist's treatment focus on?

   As we mentioned before, the therapist should emphasize the importance of participating in therapies now to maximize their abilities in the future. The therapist should also collaborate with the patient to create personally important goals for rehabilitation. If the patient is still focused on driving again, the therapist can explain what pivotal skills they will need in order to achieve that goal. For example, the therapist should discuss with the patient the role that building their endurance plays in driving. In order to directly address the patient's priorities, the therapist can also educate them on alternative methods of transportation that will allow them to resume their role as a grandmother in the meantime.

Section 8: Case Study #3

An occupational therapist working in a driver rehabilitation program is asked to evaluate a 73-year-old male. He was referred to driver rehabilitation by his doctor,

who is currently testing him to confirm the presence of open-angle glaucoma. While the results are not back yet, the doctor suspects the glaucoma is at an early stage, which is associated with a good prognosis as long as the patient complies with treatment. The patient's family recently noticed an increase in new scrapes and other forms of cosmetic damage to his car. This patient's family members also report that they are fearful of being a passenger in his car due to certain behaviors, namely attempting to switch lanes without checking the car's surroundings and hitting curbs. The patient demonstrates some awareness of his driving difficulties, but often brushes them off when his family expresses their concern. The patient is generally friendly and open to speaking with the therapist during the initial evaluation. However, he becomes angry when the therapist reviews the results of the evaluation, which suggest that his visual deficits are impacting his ability to safely drive.

1. Is this patient a good candidate for services through a driver rehabilitation program?
2. How can the therapist make the patient more open to working with them?
3. What might driver rehabilitation services look like for this patient?

Section 9: Case Study #3 Review

1. Is this patient a good candidate for services through a driver rehabilitation program?

   The results of the evaluation suggest that the patient does demonstrate visual deficits that impact his driving function. While each case differs slightly, individuals with glaucoma commonly experience headaches, blurred vision, decreased spatial awareness, blind spots, halos surrounding light, and nausea. Each of these symptoms can impact a person's ability to

safely drive. If this patient does have confirmed glaucoma, he would certainly benefit from driver rehabilitation services to address his associated visual deficits.

2. How can the therapist make the patient more open to working with them?

   The therapist should begin with an occupational profile that helps them gain insight into the patient's priorities, goals, meaningful activities, and notable roles. This information can help the therapist collaborate with the patient to create impactful, client-centered goals. The therapist can also speak with the patient's family to get their perspective on how to best approach the patient for services.

3. What might driver rehabilitation services look like for this patient?

   Since the patient is demonstrating difficulty with spatial awareness, he would benefit from intervention using a driving simulator. In addition, the patient may benefit from vehicle modifications to improve their ability to drive. In particular, potential modifications include bioptics and audio visual queues (AVQs) to assist with visual acuity and control of various vehicle features. This patient may also be assisted by other visual aids such as extended safety mirrors to enhance their view of blind spots, backup cameras, and panoramic rearview mirrors.

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