FLEX CEUs

Senior Drivers

OCCUPATIONAL THERAPY FOR SENIOR DRIVERS

Flex Therapists CEUs **Authored By: Devon Breithart, OT** **October 2017**

INTRODUCTION

Due to current demographics in the United States, road safety has become more important today than ever before. By 2020, it is expected that there will be over 40 million older adults (age >65) on the road. (Rudisill, 2016). Though younger drivers form a significant subset of collisions, older adults cause more injuries and fatalities. (Rudisill, 2016). The impairments an older adult experiences as they age have a great impact on driving that has become a major public health concern. (Leproust, 2008).

In most communities, it is challenging to remain engaged in both IADLs and social activities without a driver's license. In fact, older adults who cease driving almost always leads to decreased participation in tasks outside of the home and increased depression. (Marmeleira, 2009). While driver's license restriction often occurs, many seniors, when noticing a change in function, will self-regulate their driving by doing it less frequently or only during the daytime. Regardless if the restriction is implemented by a governing body or an individual, caution must be taken due to the profound effect on quality of life. Instead of a de facto ban on driving for adults over a certain age, individual factors that affect driver safety and competence should be studied. Attention, reaction time, memory, various cognitive skills, visual-perceptual skills, and physical limitations can all affect driving. (Marmeleira, 2009). Various illnesses such as diabetes, depression, and dementia have also been linked with collisions. (Marmeleira, 2009).

This article explores two prominent conditions, osteoarthritis and vision problems, that commonly impair driving in the senior population. Occupational therapy is beneficial to senior drivers by evaluating cognitive, visual, perceptual, psychosocial, and motor aspects of performance and then adapting intervention plans to the individual driver. Medications that can influence the ability to drive safely, along with valid and reliable screening tools for driver capability are also investigated. Lastly, the effect that exercise may have on driver safety is discussed.

MEDICAL CONDITIONS

With the elderly population growing quickly, links between certain diseases or disorders and crashes have been found, such as heart disease, MI, CVA, OA, DM, low vision, sleep disorders, and anxiety and depression. (Marmeleira, 2009). With such a long list of conditions, it is likely that most senior drivers will have been affected by

at least one of them in their lifetime. However, simply having one of these conditions does not necessarily indicate poor driving skills - the rate of physical activity an older adult engaged in has been shown to have a large effect on driving performance. (Marmeleira, 2009).

Occupational therapists have unique knowledge on how various medical conditions affect performance with daily activities. Through activity analysis, they are able to determine if adaptations or skills training could be utilized to increase performance. This skillset enables occupational therapists to be valuable driver's safety evaluators. Beyond this, if a senior driver is still determined unsafe to drive, an occupational therapist can help explore other methods of community mobility and social engagement. Thus, occupational therapists are well-suited to aid in this community health issue. (American Occupational Therapy Association, 2016).

"Modern lifestyle largely depends upon individual flexibility ensured by the possibility of using a motorcar. With an aging society in Western countries, this poses the crucial question: up to what age or physical condition can driving a car be considered safe? One key element of safe traffic participation is the ability to perform an emergency stop and halt the car within a short distance. The time it takes the driver to react is called 'total brake response time' (TBRT)" (Hofmann, 2014). Two ailments that affect TBRT are osteoarthritis and changes with vision.

OSTEOARTHRITIS

Modern brake systems provide more assist than previous models. However, being able to apply a significant amount of force to the brake pedal is still a major component of driving. From a physical standpoint, the most common disease that impacts this skill is osteoarthritis (OA). OA is a degenerative joint disease that affects cartilage, ligaments, and bone, leading to pain and reduced flexibility. It is also thought that OA may have an effect on muscle reflexes, leading to decreased or slower reflexes overall. (Hofmann, 2014). OA can affect any joint, but typically becomes a problem in driving when it occurs in the lower extremities. (Hofmann, 2014).

OA is very common. More than 70% of adults between the ages of 55 and 78 in the U.S. have this diagnosis. (Hofmann, 2014). "Although difficult to quantify due to an undefined cut-off threshold, the incidence of symptomatic knee osteoarthritis is estimated at 1% per year, with a radiographic incidence of 2% per year. Its symptomatic prevalence has been estimated to be about 12-16% in adults aged 45+ years. Symptomatic OA-prevalence of the hip is considered to be about 10% in adults ≥45 years of age." (Hofmann, 2014). OA incidences are expected to grow with the aging population in the future. This condition is poised to become a large public

health concern, both due to increased healthcare costs and its effect on social systems due to decreased mobility. (Hofmann, 2014).

While most cases of OA do not impair driving, OA of the knee can cause TBRT to be significantly longer. (Hofmann, 2014). It has also been found that OA of the hip in some cases may also have an effect. Studies have shown the difference in TBRT caused by OA may be enough to cause a collision, though any change made to driving recommendations should be based on individual testing, and not just diagnosis. (Hofmann, 2014). It has also been found that OA of the left lower extremity may have an effect as well, despite its reduced involvement in driving. (Hofmann, 2014).
In any case, OA should be a red flag that driving ability may be impaired. Medical professionals should continue providing patient education on this fact, especially as it relates to surgeries. (Hofmann, 2014).

Total knee arthroplasty (TKA, or more simply, a knee replacement) is one such surgery. It is one of the most common interventions for knee OA. Its benefits including reduction in pain and swelling and improved mobility/flexibility which overall aid in increasing functional skills. One con of this treatment is that it is a fairly invasive procedure that has a long recovery period. Depending on the prior functional status of the patient, they may need to spend time in the hospital or in a skilled nursing facility after the surgery. Regardless of setting, skilled therapies are usually indicated. Though a patient will likely seek rehab from a TKA by a physical therapist, there are important concepts such as skill building, behavioral, and adaptive approaches that should be considered in training someone to return to driving safely that an occupational therapist can help with as well. Therapists will address strengthening of nearby muscles, proprioception, and ADL and IADL performance. Generally, patients are usually recommended not to drive during this recovery period. Therapists may address pre-driving skills as part of their treatment plan, such as the ability to transfer, maintain a seated position with functional range of motion, and test reaction time. Generally, once these skills are improved, patients can resume driving at low to moderate speeds, such as in urban areas. (Huang, 2014). To assess readiness for highway driving, the 2 Minute Step Test is often used. (Huang, 2014). Performance on this test has been shown to be correlated with the TBRT, as well as gas-off and transition time. (Huang, 2014).

AGING AND VISUAL CHANGES

Visual changes occur in most aging adults. These changes are known to have an driving skills. Many studies suggest that senior drivers have reduced scanning skills, resulting in a "tunnel vision" of sorts. (Optometrists Network, 2016). "An in-vehicle study showed that compared to younger drivers (18-25 and 35-55 years old), the road scanning of older drivers (65-80 years old) at intersections were primarily confined to areas located directly in front of or slightly to the right or left of the

vehicle's direction of motion. [Further,] while turning, older drivers took [a second look less often] than younger drivers for potential hazards. [Additionally, one study] showed that older drivers inspected their blind spot less frequently than younger drivers while changing lanes." (Optometrists Network, 2016). Vision related deficits must be assessed if an individual would like to maintain driving safety.

One treatment is referred to as vision therapy. Vision therapy is a service typically provided by optometrists, though some occupational therapists may incorporate these strategies in their treatment plans as well. While vision therapy remains controversial, its proponents regard it as a highly effective, noninvasive treatment for many vision problems. (Optometrists Network, 2016). It entails various vision exercises, usually conducted in-office with additional home program strategies. (Optometrists Network, 2016). Vision therapy seeks to improve skills, increase comfort, or change visual processing. (Optometrists Network, 2016). Vision therapy also often involves medical tech such as special lenses, eye patches, computer software, or even vestibular devices. (Optometrists Network, 2016). While this treatment is most often done with children, it may be an option for senior drivers who are experiencing age related visual perceptual changes.

VISUAL ATTENTION

Visual attention is a combination of cognitive and visual skills. It involves search, selection, and switching. (Marmeleira, 2009). A decline in these skills, as is common with older adults, can impact driving. (Marmeleira, 2009). A test called "The Useful Field of View (UFOV)" can help screen for visual attention deficits. One study indicated that older drivers scoring with a 40% or greater impairment on the UFOV are 2.2 times more likely be get into a crash during the three year period the study tracked. (Leproust, 2008). Some studies also show that the UFOV may have correlation with higher level cognitive skills that affect driving besides visual attention. (Marmeleira, 2009). Thus, it is a widely used measure in determining safety for older drivers.

General visual testing is also a necessary component of driver safety. Equipment is available to test visual acuity, contrast sensitivity, depth perception, color discrimination, night vision, and glare recovery. It is important that this type of testing include stimuli both at near and far distances to most accurately simulate driving conditions. (Wheatley, 2001).

EXERCISE AND VISUAL ATTENTION

Though visual attention often naturally declines with age, certain treatment can be employed to offset this process. "A study on the relationship between exercise and visual attention [has] shown that 10 weeks of aerobic exercise (aquatic training)

induced a beneficial influence on attention in older adults during dual-task processing. [It has been] concluded that individuals who regularly engage in physical activity [have] significantly better UFOV scores than less active individuals. [A] specific exercise program that incorporated open skills and demanding perceptive activities was successful in improving visual attention in a group of older drivers (60 to 81 years old). It has been suggested that participation in exercise programs can induce brain-vascular and neurochemical benefits that allow the preservation of attention function in the elderly" (Marmeleira, 2009). Occupational therapists can work with individual patients to design an exercise program specific to the needs and abilities of that patient.

AGING AND COGNITION

As discussed, aging affects most body systems, not least of which is cognition. Much like visual attention, various cognitive skills have been shown to be improved by remaining active. Physical activities have been shown to have a positive effect on processing speed, executive functioning, and cognitive flexibility. (Marmeleira, 2009). The benefit gained from physical activities seems most strong with tasks that require attention. (Marmeleira, 2009).

One extreme form of cognitive decline, dementia, can heavily affect driving ability. "Dementia is a syndrome that affects essential cognitive functions like memory, judgment, and psychomotor abilities. The risk of dementia, cognitive impairment, cognitive decline, and Alzheimer's disease is lower among persons engaging in high levels of physical activity, compared with those performing low levels of physical activity" (Marmeleira, 2009).

Executive function, often referred to as one skill, is really a collection of higher-level cognitive abilities that Executive function is integral in planning and coordinating motor and cognitive responses. Generally, the type of collisions older adults are involved in happen after complex driving situations. It is thought that this may be due to limits in executive function. "Recently, it was reported that executive dysfunction may be an important contributor to pedal error among older drivers and that poor planning ability is independently associated with driving difficulties. The frontal neural system (region that mediates executive function) is the primary locus in which aging-related cognitive changes are found and where physical fitness appears to exert its greatest influence. In older adults, it has been suggested that aerobic fitness has a larger impact on tasks that require controlled and effortful processing compared with tasks that are executed using automatic processing" (Marmeleira, 2009).

Exercise that is specific is more likely to improve both cognitive and physical functioning. An occupational therapist can help a client select exercises that requires scanning, using peripheral vision, and reaction time. Exercises that include these

components may aid in generalization of skills to the road setting. (Marmeleira, 2009).

DRIVING SIMULATION AND PERFORMANCE FEEDBACK

Driving simulation is an emerging area that may assist senior drivers in staying on the road longer. It has been shown to increase the chances of a driver looking for a hazard when making a turn by almost 100%. (Lavallière, 2012). This more active style of training has been shown to translate to actual on-road skills, perhaps due to allowing for more specific and real-time feedback to be given. (Lavallière, 2012). It has been shown to increase performance with a variety of cognitive-visual skills, such as checking blind spots, rearview mirror, and side mirrors. Additionally, it has been found to be more effective than written practice. (Lavallière, 2012). Older drivers have been shown to be largely unaware of their deficits. Similar to young drivers, they are able to identify hazards in theory, but do not visualize themselves being susceptible to these situations. This sort of self-concept can be very dangerous. One way to combat this involves video recording during active practice sessions. With this recording, older drivers are more easily able to identify their errors and improve on them in future sessions. While on-road practice is still considered the best way to ensure safe driving, advances in technology make the combination of driving simulators and real-time feedback an efficient and cost-saving option. (Lavallière, 2012).

After practice, a Comprehensive Driving Evaluation (CDE) may be performed. An occupational therapist with specialized training may be an administrator for this type of testing. A evaluation will generally consist of two parts. The first is a preliminary examination, usually taking place in office, that will assess physical, visual, and cognitive abilities necessary to operate a vehicle. After passing this, a driver will also have to complete a skills-based component actually done on the road. This will typically be in a specialized vehicle equipped with safety features like an instructor's brake. After initial assessment, an occupational therapist may choose to include adaptive equipment as part of the testing. (American Occupational Therapy Association, 2016)

Once the entire evaluation is complete, an occupational therapist can make recommendations if the driver could benefit from adaptations, increased training, or other strategies. An occupational therapist may also make the determination that it would be in the adult's best interest to cease driving. If this is the case, the occupational therapist may help the adult learn coping strategies and other ways to access community mobility, or they may refer out for this service. (American Occupational Therapy Association, 2016)

MEDICATION

Medications can influence the ability to drive safely. "At high doses, Tramadol is known to affect balance [and] poor balance has been linked to an increased risk of motor vehicle collision, particularly in older populations. [In fact, in one study,] those taking Tramadol were at a significantly increased risk of motor vehicle collision if they took this substance 14 days prior to collision compared to control times. [This same] analysis also showed that approximately 50% of patients had a traceable prescription for benzodiazepine or opiates within the year before collision. Numerous other medications in this study were also trending toward an increased risk of motor vehicle collision, but were not found statistically significant, including: Clopidogrel, Gabapentin, Citalopram, Insulin, Hydrochlorothiazide, Metoprolol, Zolpidem, and Nitroglycerin. The findings from this analysis have several key clinical implications." (Rudisill, 2016). An occupational therapist may work with a patient on medication management, such as taking certain medications during the evening versus the morning to offset side effects. They may also suggest speaking with a physician or pharmacist on medication modifications.

TESTS FOR PREDICTING UNSAFE DRIVING

People who administer CDEs, such as occupational therapists or certified driver rehabilitation specialists (CDRSs) require standardized and quick assessments that can aid in determining fitness to drive. (American Occupational Therapy Association, 2016). Ideally, one comprehensive assessment will be used to save both money and time. Several such assessments exist. The Occupational Therapy Driver Off-Road Assessment (OT-DORA) Battery is a collection of various assessments that test an individual's mental, perceptual, physical, sensory, and behavioral skills that affect driving. (American Occupational Therapy Association, 2016). It also includes a section that collects medical history and current medications. This is assessment is done in office before getting on the road, and has a process for screening drivers out who should not progress to the practical component of the evaluation. The assessment can also be done as a start to treatment for driver rehabilitation to determine areas of strengths and weaknesses and aid in goal setting. (American Occupational Therapy Association, 2016).

Assessments are also important because they allow evaluators to to examine the individual effect that a disease or disorder has on a driver. "Although age itself is not a predictive factor of an increased risk for dangerous driving, the prevalence of medical conditions that may impair driving ability increases with age. The need for valid and reliable screening tools applies to: 1) the diagnosis of the medical conditions; 2) the detection of unsafe behaviors due to this medical condition; and 3) the prediction of the actual risk of collision of a driver diagnosed unsafe. The main issue lies in the availability of tools to detect unsafe driving due to the medical condition and to predict the real-condition risk of collision of the driver considered unsafe. [Therefore,] the aim of the screening test is not only to distinguish drivers

who pass or fail the test but to detect drivers who are really at risk of severe collisions" (Leproust, 2008).

Contrary to what one may think, memory has been shown to have little effect on safe driving. However, visual processing speed has been shown to have a strong correlation. The Trail Making Test (TMT) is a short (less than 5 minute) screen that assesses this skill. "Studies have shown the TMT to be one of the best performing paper-and-pencil-based neuropsychological tests in predicting driving difficulties. The first part of the TMT measures the time participants need to connect 25 numbered circles in an ascending order (part A). In the second part (B), 13 numbers and 12 letters have to be alternately connected in their numerical and alphabetical order. Participants [are] notified of errors immediately and required to correct them without assistance with the clock running. " (Vaucher, 2014).

Adults not affected by cognitive decline can pass both sections of the TMT in about two minutes. If the assessment takes longer to complete, it is likely that that test-taker may be more affected and thus have poor road skills. However, evaluators should take caution to not use this measure alone in determining whether an adult should remain a driver. It is instead a valuable tool in a comprehensive evaluation. (Vaucher, 2014).

RANGE OF MOTION AND EXERCISE TRAINING

Besides cognitive benefits, exercise has obvious physical benefits such as improving range of motion. "Exercising daily not only contributes to a more positive driving experience overall, but also may improve the types of driving-related movements that many people find challenging" (AARP, 2013). An occupational therapist can help each driver tailor an exercise program to meet his or her individual needs. The styles of exercises and their respective influence on driving ability are as follows (AARP, 2013):

- ***Strength Exercises:*** *Strength is important for many driving tasks, such as pressing down on a brake pedal. Exercises like biceps curls and squats can help enhance a driver's strength.*
- ***Range of Motion Exercises:*** *Range of motion is central to actions such as putting on your seatbelt easily. Performing exercises such as back stretches and heel drops can improve your range of motion.*
- ***Flexibility Exercises:*** *Flexibility is necessary for movements such as getting in and out of your car easily. To enhance your flexibility, consider exercises such as chest and shoulder expansions and shoulder stretches.*
- ***Coordination Exercises:*** *Coordination can help with the integration of movement in your upper and lower body, such as simultaneously braking*

and turning. Soccer kicks and lateral steps are good exercises for boosting your coordination.

Another common area that occupational therapists assess, falls and mobility, is related to driving performance. Older adults who have a history of falls are often unsafe drivers. (Marmeleira, 2009). Difficulty with overall joint mobility may cause increased likelihood to crash. (Marmeleira, 2009). As one may be able to guess, many older drivers who have limited neck and back flexibility are less likely to turn to check blind spots. (Marmeleira, 2009). Exercise that focuses on range of motion, especially of the spine, has been shown to improve flexibility required for safe driving. (Marmeleira, 2009). An occupational therapist can help a client develop a home program on activities that will promote and increase functional range of motion.

CONCLUSION

Driving is an occupation. Although driving is essential for well-being and quality of life, older drivers are at higher risk of collision because of function impairment. Occupational therapists can help by administering comprehensive driving evaluations and developing a plan to address found deficits. (American Occupational Therapy Association, 2016). Osteoarthritis of the lower extremities is one such deficit and requires close monitoring from the OT. Visual attention has also been proven to be a problem in the elderly, and the Useful Field of View test is the best developed screening measure for visual attention, while the Trail Making Test is an indicator of reduced visual processing speed. Finally, it has been demonstrated that physical activity can promote several skills that are associated with driving performance in older drivers. With the help of an occupational therapist, older adults experiencing these deficits can remain as independent as possible for as long as possible.

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