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Occupational Therapy Driving Protocol for the Elderly Population

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Occupational Therapy Driving Protocol for the Elderly Population

by

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This Scholarly Project Paper, submitted by Terra Nelson and Courtney Marrs in partial fulfillment of the requirements for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

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CHAPTER I
INTRODUCTION

The population of elderly individuals in this country is growing due to the baby boomers. This in turn is increasing the number of older drivers on the road. Many of these drivers are not re-evaluated for driving capability. Some individuals are seen for other medical reasons; however, unless the individual requires rehabilitation services, their driving abilities are rarely questioned. To date, there is not a comprehensive occupational therapy protocol that investigates the elderly individuals’ ability to drive. Furthermore, there is not a test or protocol an entry-level therapist may use to evaluate the individual’s ability to drive. A comprehensive protocol that would allow an occupational therapist to determine if they need further testing to drive is needed.

The number of elderly individuals is increasing rapidly in the United States. Fain (2003) projects that in twenty years more than 25% of the driving population will be over the age of 65. Reuben (1993) projected an estimated 28% of the population in 2000 would be over 65, and 39% by the year 2050. In general due to aging, older adults have poorer visual acuity, decreased depth perception, decreased nighttime vision, sensitivity to glare, reduced muscle strength, slower reaction times, decreased flexibility with neck and trunk, decreased divided attention to task, decreased ability to filter out unimportant stimuli, and a decreased ability to make quick judgments (Stutts & Wilkins, 2003). A great deal of the research in
professional literature discusses what abilities deteriorate with age, what illnesses affect the elderly individuals' ability to drive, whether simulated or on-road testing is appropriate, what adaptations could be made to the vehicle and/or the road, and who is qualified to assess these issues. Although all of these areas are pertinent and need to be explored, it is necessary to have a driving protocol that could further assess what exactly the individual is having problems with and treat that particular issue.

For the purpose of this project, the meaning of the word ‘independence’ will be synonymous with autonomy. To the elderly individual, independence is connected with the ability to drive. The term ‘occupation’ is used in relation to the occupation of driving. According Neistadt, M.E. & Crepeau, E.B. (1998), an occupation is everything an individual does to give meaning to their lives. For many older drivers, driving is an occupation and the gateway to other activities. Driving enables the individual to participate in social events, shop, attend appointments, etc. Without the ability to drive, they may be dependent on family, friends, or alternate transportation for basic needs and social engagements.

The conceptual model chosen for the foundation of this scholarly project is the Occupational Functioning Model (OFM) by Trombly. According to Trombly (2002), individuals try to achieve a sense of self-efficacy and self-esteem, which come from the desire to be in control of one’s life and roles. It is also assumed that an individual’s ability to carry out the activities of life is dependent on personal capabilities, such as cognition, endurance, strength, etc. Another assumption of the model is that in order to perform a task or activity one must have the necessary “units of behavior” that comprise
the given task. These units of behavior may include: cognitive, emotional perceptual, social, and sensorimotor skills.

In understanding the meaning of driving to an individual it can be useful to approach it from the perspective of the OFM. An individual becomes reliant on driving as their way to continue to carry out roles and engage in activities. It is a personal expression of independence and competency in life roles. One may classify driving as a personal capability since the task of driving constitutes many abilities. With this in mind, driving can be viewed as a way to achieve a sense of self-efficacy.

Driving for an elderly individual allows them independence and autonomy. Developing a protocol that would determine if they are safe to continue in this area is necessary. A protocol would also save time and provide valid assessment recommendations to the occupational therapy practitioner during an evaluation of the older driver. An assessment protocol may also be beneficial to the community as it may provide a window of opportunity for therapists to intervene with unsafe drivers on the road. It is the intent of this scholarly project to propose a protocol that can be used by all occupational therapists in evaluating the elderly population for the necessary abilities needed to drive. Using the OFM as the conceptual model for this project, the product will represent an assessment profile that will allow the therapist to identify which abilities may need to be further developed through treatment. In identifying these areas of improvement it may be necessary to make adaptations to the environment the client intends to drive in or to make other necessary changes to driving patterns. The protocol will guide the assessment process, in turn, guiding therapy, which will provide the client with the necessary tools to achieve maximum independence.
The next few chapters will discuss the relevant literature and research, the method that the researchers used to develop their protocol, and the protocol that was developed. The conclusion will summarize the project and will outline the limitations and further recommendations for this protocol.
CHAPTER II

REVIEW OF LITERATURE

Introduction

This chapter will give an overview of the current literature that addresses the older driver. The importance of driving and who the older individual is will be discussed in detail. The sections following will examine relevant statistic and gender information. The remainder of the literature review will focus on what a driving program looks like, important assessment information, and finally the qualifications necessary to evaluate the older driver. Occupational Therapy, and what it has to offer the driving program and the older driver, is illustrated.

Occupation and the Older Driver

To many older adults, driving represents a means to engaging in occupations and other activities. Driving provides the older individual with opportunities to shop and socialize, which are reported to be the most common activities in which driving is a precursor to completion (Lee, Lee, Cameron, & Li-Tsang, 2003).

According to McGregor (2002), driving is not a privilege but a necessity, to many older drivers, especially if they live in a rural or suburban area. For an elderly individual losing their license may result in a decline in their perceived roles in relation to their family and fulfilling expectations and obligations (Lee, Cameron, & Lee, 2003). According to Lee, Drake, and Cameron (2002), driving is considered to
be useful and relevant to an individual’s life. Stutts and Wilkins (2003), found those older adults that have had to give up their license suffer a loss of mobility, make fewer trips, engage in fewer activities outside of the home, experience less satisfaction with their ability to go places, have decreased life satisfaction leading to depression, and a loss of independence and personal identity. Stutts and Wilkins (2003) found that due to the overwhelming amount of losses that these individuals feel it is no wonder that maintaining their driver’s license is of top priority.

**Independence**

It is important for clinicians to understand the meaning of driving to the elderly. Studies have shown that many elders describe the inability to continue to drive as the ending of life (Ralston, Bell, Mote, Rainey, Brayman, & Shortwell, 2001). Loss of independence and control are common phenomena reported by those who are no longer able to drive. Driving allows these individuals to maintain a sense of autonomy. Subsequently, for many individuals driving is a symbol of freedom and independence.

The older driver without a license or with forced withdrawal of a license becomes more dependent on others, finds a reduction in their activities, loss of social contact, and isolation. Due to these factors driving is important for autonomy in an older individual’s life (Fain, 2003). Although it can be dangerous for some older adults to continue driving, driving is an important part of independence and decreases the chances of depression for these individuals (Messinger-Rapport, 2003). Carr (2000) found reports of increased depression in the elderly when they were no longer able to drive. Carr reported, “those who stop driving are at risk for isolation and depression and often have functional
impairment” (p. 141). The dependence on others for basic needs may contribute significantly to the degree of depression resulting from the inability to drive.

Hunt (1993) discussed the importance of independent transportation and how a disease or illness affects the freedom of an elderly individual by taking away their ability to drive. She stressed that society must recognize the worth an individual places on meeting their own transportation needs.

The Older Driver

Who is the older driver? According to Cox, Fox and Irwin (1989), the older driver is typically male, drives at a slow speed, drives less frequently than when he was younger, makes few lane changes, brakes more, accelerates less and tends to drive less at night and in bad weather. They are usually involved in an average of 48% of all automobile accidents and account for 7.6% of all licensed drivers. Fain (2003) projects that in twenty years more than 25% of the driving population will be over the age 65.


The population of the elderly has dramatically grown in the last several years. It is expected to rise as is other age groups in the near future and in the projected future. Specifically, Reuben (1993) projected an estimated 28% of the population in 2000 would be over 65, and 39% by the year 2050.
Foley, Heimovitz, Guralnik, and Brock (2002) were interested in the health, socioeconomic changes, and other transitions occurring in a nationally representative sample of community-dwelling men and women aged 70 years and older in United States. The results of their analysis of older driver studies showed that approximately 13.7 million persons aged 70 years or older were driving in 1993. This was equivalent to two-thirds of the community-dwelling population of persons aged 70 years and older nationwide. The study showed that the prevalence of driving decreased with age. It is estimated that 88% of men in their early 70's who drove decreased in frequency to 55% of those aged 85 years or older. Among women, the prevalence of driving ranged from 70% among those aged 70 to 74 years of age to 22% among those aged 85 years or older.

**Car Accidents and Mortality**

Car accidents have been reported as the leading cause of accidental deaths in the population over 65. Cox, et al. also reports that the skills needed to drive safely begin to decline at the age of 55 with an even steeper decline after the age of 75. Similarly, Reuben (1993) reported that over the age of 78, car crashes are the second leading cause of death next to falls.

Foley, et al. (2002), looked at the total life expectancy and driving life expectancy of the elderly U.S. driver, 70 years and older. It was estimated that male drivers aged 65 years drove 10,000 miles per year and this was an increase of 74% over the last 3 decades. In comparison, elderly females drive 5,000 miles per year, which was a 31% increase in driving exposure over the same period. Older drivers also had a three-fold increased risk of crashing per mile, even though they drive fewer miles than the average middle-aged person. The elderly are at a high risk for fatality in car crashes. Insurance for
the elderly rarely increases significantly from middle age. On average, teenage drivers have a very high risk of an annual crash despite the number of miles driven. Teenage drivers also pay higher premiums for their automobile insurance.

Referring to the work of Foley et al. (2002), mortality and driving cessation rates increased among the older age groups both male and female. When analyzed for the mortality rate during the follow-up interview 2 years later, approximately 7% of the 13.7 million drivers had died, and another 9% survived but quit driving. Male drivers had a higher mortality rate than the female drivers by 62%. Male driver deaths were estimated at 89 deaths per 1,000 drivers, in contrast to the female deaths of 55 per 1,000 drivers. The data showed that the driving cessation rate among female drivers was 78% higher than the rate among male drivers. Each year, more than 600,000 persons aged 70 years and older nationwide stop driving and another 400,000 of these older drivers will die within the year. Following driving cessation, men will have about 6 years of dependency on alternative sources of transportation, as compared to about 10 years of dependency for women (Foley et al. 2002).

According to Cox et al. (1989), drivers under the age of 25 account for the highest incidence of automobile accidents; the second highest population is the elderly population over age 60. Car accidents are the second major cause for emergency room attention among the 65 and older group. The elderly individual is 3.5 times more likely to be killed in a car crash than the younger populations. Older drivers account for 7.6% of all licensed drivers. They also are involved in an average of 48% of all accidents.

Messinger-Rapport (2003) found that motor vehicle accidents are the third leading cause of death in older adults preceded only by cancer and heart disease. Older drivers
are more likely to be involved in an accident due to slower speeds. Older drivers are more at risk of being involved in a multiple car crash, crash at intersections, crash during the day, and crash close to home. Crashes can be more devastating to an older adult because they have decreased bone density, sepsis, and increased potential for multi-organ failure.

Gender Differences

There are differences that males and females report concerning driving cessation. According to Ragland et al. (2004), females were more likely to report stress as a main factor causing driving cessation. Due to this, females were more likely to avoid difficult driving conditions, including driving during rush hour traffic or in high traffic areas (Ragland et al., 2004). Males reported medical conditions as the main reason for driving cessation. The number one medical condition that was reported to decrease an older males driving ability was a decrease in eyesight (Ragland et al., 2004).

A study by Raglund, Satariano, and Macleod (2004) recruited 2,092 men and women between the ages of 53-97 years and the median age of 70. The study took place between May 1993 and December of 1994. Baseline data and comparisons were made with the Study of Physical Performance and Age-Related Changes in Sonomans, (SPPARCS). Participants included those only who reported limited or avoidance driving. The participants were asked questions regarding: socioeconomic status, living arrangements, functional limitations, medical conditions, cognitive function, and visual function. Visual functioning was assessed via the SmithKettlewell Institute Low Luminance (SKILL) Card.

The results of the study showed that men are more likely to report ownership of a license, however the likelihood of having a license will decrease with age. In the age
group 75 and older, 40% of women reported having vision problems, contrasted with 29% of men in the same age group. The two most common non-medical reasons for driving cessation included, anxiety with the potential of being in an accident and no reason to drive. In all three categories, (medical, non-medical, and at least one of either), more limitations were reported by women in each age category compared to the men (Raglund, Satariano, & Macleod 2004).

Illnesses

Along with normal aging comes a decline in function and in some cases illness. According to Reuben (1993), it is up to an older individual’s physician to notify the state if an individual should not continue to drive based on their health. Common illnesses that are screened by a physician include: cardiovascular disease, lung disease, diabetes, neurological disease, arthritis, and alcohol use during a normal physical examination (Reuben, 1993). A quick mental exam that is used often by physicians is the Mini Mental State Examination, but this should not be the only assessment used when determining whether an individual should continue to drive or not.

There are a number of illnesses that can affect an individual’s ability to drive. According to Carr (2000), medical illnesses that should be monitored include: musculoskeletal disorders, sensory disorders, dementia, psychiatric disorders, stroke, sleep apnea, alcohol/drug use, epilepsy, diabetes, and heart disease. For the older driver, there are some health conditions that are more apt to impede driving than others according to Di Stefano and Macdonald (2003). These conditions include: a history of falls, stroke, kidney problems, diabetes, cardiac conditions, poor vision, hypertension, soft tissue disorders, arthritis, and mental/behavioral difficulties. Driving is a task that
requires many abilities, and as an individual becomes older a disease becomes more likely to interfere with one or more of the abilities necessary to drive.

Alternative Transportation

Stutts and Wilkins (2003) found that older drivers depended on transportation for personal reasons including 92% of older adults over the age of 65 take trips and drive themselves. Though older drivers face the dilemma of being able to continue to drive or not continue to drive, it is important that they have access to alternative modes of transportation in their areas. A few alternatives include: public transportation (bus), taxis, community sponsored, or church sponsored vans, family, or friends. (Foley et al., 2002) Cost of alternative transportation does need to be taken into consideration for older adults. For those that do not have family or friends close and cannot afford public transportation, continuing to drive is of utmost importance. (Foley et al., 2002)

Assessment

Due to the reality that goes along with aging, older adults experience a decrease in cognition, physical, and visual skills. Older adults in general have poorer visual acuity, decreased depth perception, decreased nighttime vision, sensitivity to glare, reduced muscle strength, slower reaction times, decreased flexibility with neck and trunk, decreased divided attention to task, decreased ability to filter out unimportant stimuli, and a decreased ability to make quick judgments. (Stutts & Wilkins, 2003)

Vision is an important performance skill used in driving, without it, independent driving would be impossible. Visual abilities that need to be taken into consideration include: visual changes, decrease in visual acuity, decrease in visual attention, and a decreased resistance to glare. (McGregor, 2002) According to Messinger-Rapport (2003),
Age related changes in visual function include decreased static and dynamic visual acuity, decreased temporal fields, decreased resistance to glare, and reduced low luminescence vision. Hearing can impair driving but it has been found that those with hearing loss compensate with their visual attentiveness (Messinger-Rapport, 2003).

According to Messinger-Rapport (2003), the cognitive skills that are needed to drive safely and often can become impaired with older drivers include: divided attention to task, selective focusing, and being able to switch attention as needed. McGregor (2002) found that cognitive changes that should be monitored include: memory loss, decreased attention span, and judgment deficits.

Older adults tend to have a decreased range of motion in all areas of the body and a decreased strength. McGregor (2002) found physical changes that need to be monitored include: loss of motor strength and psychomotor slowing. More specifically, older individuals have a decrease in strength, coordination, slowed reaction time, decrease in range of motion with the extremities, neck, and trunk (McGregor, 2002). A decreased reaction time and motor response are contributing factors to older drivers being unsafe (Messinger-Rapport, 2003).

According to Carr (2000), physiological changes should be monitored before an individual gets behind the wheel of a car. These include: static visual acuity, visual fields, visuospatial skills, complex reaction time, selective attention, divided attention, and hearing. It has been found that foot abnormalities, fewer blocks walked, and poor design copying increase the risk for an older driver to crash a motor vehicle (Carr, 2000). The extra time an elderly individual requires to respond to the environment when driving may impede safety of the individual and others around them (Cox et al., 1989).
Contents of Driving Program

According to Carr (2000), a driving assessment for the older driver could be brought up by the client, a concerned family member, a friend, or a healthcare professional. The assessment should begin with the client's driving history. If there are mentions of close calls, mishaps, disorientation, or becoming lost in familiar areas, a physician should be contacted. A review of medications should be performed to look for those medications that could impact an individual's ability to drive safely (Carr, 2000).

Hunt (1993) reported that driving programs usually have two goals in mind. The first is to offer a decision on whether the individual is capable of driving safely. The second is to offer assistance to those with the capability to drive. In order to assess whether the individual should be able to drive, these programs often use a pre-driving assessment, psychometric tests, and an in-car, on the road-driving test (Hunt, 1993). Simulators, which are a safe way to look at reaction time and other factors, are also common. Some experts have criticized simulated driving evaluations. Specifically, in that they fail to capture real life driving due to the lack of cause and effect with the driver and the picture on the screen. Some also go even further into saying that this lack of cause and effect may further confuse the elderly client (Hunt, 1993).

In contrast, driving simulators have become popular over the past 20 years to help identify older drivers that are a risk on the highways (Lee et al., 2003). A study conducted by Lee et al. (2003) found that the older senior drivers were less likely to use indicator lights to change lanes, committed more speed violations, drive at slower speeds, and they responded poorly to divided attention tasks while using a driving simulator. These findings are consistent with the literature that driving ability decreases with age.
During this study it was suggested that transmission of neural impulses slows with age (Lee et al., 2002). The results of this study prove that the driving simulator is appropriate to use when assessing whether an individual can continue driving or not (Lee et al., 2003).

In comparison, Lee et al. (2003) used the driving simulator, STISIM. During this task, the older adult drivers were asked to perform different traffic scenarios to investigate their knowledge of on road driving, and cognitive perceptual skills. The driving simulator looked at driving speed, use of indicator lights, decision and judgment, attention to task, and confidence on high speed driving. (Lee et al., 2003) The participants were then taken on a road test. During the road test, it was found that the majority of participants seldom used the rear or side mirrors. The individuals tended to check the traffic on their right when approaching a T-junction but over 95% failed to look to their left before continuing on (Lee et al., 2003). While steering it was found that 45% of the drivers used two hands to cross midline or used only one hand to steer (Lee et al., 2003). The high correlation between the on road test and the simulated driving validate the simulated driving as a screening tool (Lee et al., 2003). The driving performance of the elderly drivers when correlated with age determined a negative correlation. This remains consistent with the literature that with the increase in age driving skills and abilities decline (Lee et al., 2003).

According to Hunt (1993), a pre-driving evaluation involves an interview, motor evaluation, and sensory evaluation. The main goal in the pre-driving evaluation is to determine why the client needs the assessment. Answers gained from the interview portion will serve as a baseline for the test results. Hunt (1993) reported that examiners
should be aware that the individual is often unaware of their lack of insight to their problems. In questioning the client the following questions are commonly used: Are you able to perform all you everyday activities as you did prior to your illness? Why do you and your doctor feel your abilities should be evaluated? Do you have any fears about driving? (Hunt, 1993)

To assess older drivers a health care provider should use an assessment that will look at the individual’s safety record, attention skills, family reporting, alcohol/drug use, reaction time, intellectual impairment, vision function, and executive functions (McGregor, 2002). Older drivers are more apt to use adaptive strategies when driving and decrease the amount that they drive but are still at risk if not properly assessed before getting behind the wheel of a car (McGregor, 2002).

Areas assessed in the motor evaluation include: range of motion, muscle strength, proprioception, light touch, reflexes, reaction time, balance, interaction with controls, and transfer procedures (Hunt, 1993). Many evaluation tools are available to assist in examining these elements of driving in detail. A goniometer is used to measure range of motion in the extremities, a dynanometer is used to assess hand/grip strength by pounds, and manual muscle testing can determine strength of any particular muscle or muscle group (Marottoli & Drickamer, 1993). Specific movements and range ability should include: wrist flexion and extension as well as elbow, shoulder, neck, and ankle flexion and extension (Marottoli & Drickamer, 1993). Hip and knee flexion, neck rotation, forearm pronation and supination, hip abduction and adduction, and all shoulder movements should also be included in testing (Marottoli & Drickamer, 1993). Trunk
mobility and sitting balance can be assessed through observation. Proprioception should be tested as well.

Specific quantitative information on driving requirements must be further investigated. According to a previous study, however, it is determined that 7 lbs of outside force is needed for steering and 60 lbs of force for braking (Marottoli & Drickamer, 1993). Manual muscle testing should show at least a grade 4/5 in the right, lower, and bilateral upper extremities (Marottoli & Drickamer, 1993). Marottoli and Drickamer (1993) report that due to the fact that each car is different, there is no recommendation as to minimal range of motion requirement.

It was found in one study, that range of motion was the most predictive factor in determining physical driving ability (Hunt, 1993). It was also determined that the freedom of body motion is necessary for the safe operation of the vehicle. The cognitive evaluation determines the clients' ability to understand and react to information while driving (Hunt, 1993). The main area that has potential to limit the driver is poor judgment. Judgment and attention are areas that cannot be compensated for and usually a deficit in these areas result in the withdrawal of licensure (Hunt, 1993). A sensory evaluation assists the examiner in understanding how the client perceives his or her environment.

According to Hunt (1993), critics of the driving rehabilitation programs claim older adults may enroll in classes in order to reduce their driving insurance premiums. It is also criticized that the programs fail to correct the main problem, in that medical conditions and age-related changes are the root of the problem (Hunt, 1993).
Adaptive Strategies

According to Messinger-Rapport (2003), many older drivers have adaptive strategies that they work with to help them stay on the road longer. Some recommended adaptations or changes to the older individuals driving may include counseling in regards to seat belts, medication use with alcohol, and training program referrals (Fain, 2003). Some of these strategies include driving less, not driving at night, self-regulate when to drive and when not to, and some older couples assist each other with driving (Messinger-Rapport, 2003). One of the individual’s will do the driving while the other reads road signs, navigates, assists with hazard detection, and reminds the other of driving tasks that need to be completed (Messinger-Rapport, 2003).

Fain (2003) reported that older individuals are usually involved in crashes that involve slow speeds, intersections, and failing to yield with left hand turns. According to Fain (2003), some adaptations that could be made to improve the roadways for older drivers include: reflective pavement markings, sloped medians, protected left turn areas, improvements in seat belts, changes with seat and pedal placement, headlight positioning to decrease glare on the road, and clear simple instrument panels. Due to the independence that an individual gains from driving a mandatory evaluation that is valid should be used and based on individuals driving history and functional performance and not solely on age (Fain, 2003).

Qualified Evaluators

Currently, multiple disciplines contribute a unique part to the assessment of the ability of an elderly individual to drive (Reuben, 1993). It is included in the roles of health professionals to identify medical conditions and then go further to examine how
individual conditions may impair abilities necessary to drive. It is also the responsibility of state departments and governmental agencies to enforce rules of the road and that of driving licensure (Reuben, 1993). In regard to medical conditions and driving ability, a medical advisory board (MAB) assists in ensuring all individuals on the road are capable of handling a motorized vehicle (Reuben, 1993). In 1990, 41 states were using MABs. According to Reuben (1993), the main responsibilities of the MABs include: examining individual cases, developing reporting forms, education for the physicians and drivers, evaluation of the review process, assisting the Department of Motor Vehicle in policy making concerning medical conditions and providing a connection between state departments and the medical community.

Stutts and Wilkins (2003) formed a focus group as part of their study exploring the possibility of using on road driving evaluations with the older adult driver. The focus group was comprised of driver educators, occupational therapists, and physicians. The driver educators concluded that they liked providing tests to the older adults but the majority felt that they did not have the necessary skills and qualities needed to teach and evaluate older adults (Stutts & Wilkins, 2003). The biggest challenge for these individuals was when and how to tell an older adult that they should stop driving. The occupational therapists that performed clinical evaluations noted that they begin with an initial interview. They gain knowledge into the older adult's medical and driving history and then proceed to vision, cognition, range of motion, strength, sensation, and coordination screening (Stutts & Wilkins, 2003). The final step to their evaluation is the behind the wheel test. Not all of the older adults that come in need the full clinical assessment that is offered. Some clients surprise the evaluator and perform better than
expected, where as others that are expected to perform well do not (Stutts & Wilkins, 2003). The occupational therapists report that the driving evaluations are important to help some client’s realize their inability to continue driving. The physician’s were involved in the focus group to primarily learn how to deal with driving issues with their client’s (Stutts & Wilkins, 2003). They unanimously decided that they would use services from a driving school to assist them in evaluating and counseling their client’s (Stutts & Wilkins, 2003).

Occupational therapists (OT) are good teachers for a driving program (Hunt, 1993). Classroom skills may be taught, but the acquisition of the skills can be offered through OT. Actually performing the driving maneuvers is the way to offer training to clients in need. Occupational therapists offer knowledge concerning adaptive equipment and the training needed to use it (Hunt, 1993). Some common pieces of equipment used include: spinner knobs, signal switches, and spot mirrors. Occupational therapists are well prepared to teach others the necessary skills to drive as safely as possible and to use the equipment needed in a safe environment (Hunt, 1993).

According to Reuben (1993), occupational therapists contribute valuable information relating to how the individual diagnosis directly affects an individual’s ability to drive. The OT assessment usually involves physical evaluation, cognitive evaluation, and sensory evaluation. Disabled drivers may also learn methods by which to operate a modified vehicle allowing safe and independent driving ability (Reuben, 1993). Occupational therapists are important health professionals in the role of education and driving (Cox et al., 1989).
Cox et al. (1989) reports that OTs may provide defensive driving training, compensatory strategies, applicable skill acquisition, and adaptive equipment use. All of the professions working together as a team can help to increase the skills and abilities of older adult drivers and help to prolong their independence in mobility (Stutts & Wilkins, 2003).

Summary

Most studies to date focus on the occupation and meaning of driving for the older driver. The statistics and dangers of individuals with illnesses or medical conditions have been well researched, however few elderly individuals are assessed for their driving capacity while in rehabilitation for medical conditions that may impact their ability to drive.

The next chapter will examine the several appropriate assessment tools that may be used by entry-level occupational therapists to evaluate the older driver. The assessments were chosen based on validity, reliability, and how they contribute to the holistic assessment of the individual.
CHAPTER III
METHODOLOGY

There is currently an increase in the number of elderly drivers on the road. This is due to the aging baby boomer generation reaching retirement age and health improvements leading to greater activity in the older age ranges. As individuals’ age, certain skills start to deteriorate and some of those skills are needed in order to continue to drive safely. There have been many studies conducted that examine what may cause these deteriorations such as certain diseases. Areas that are commonly affected and examined with the older driver include: vision, cognition, and physical capacity. The occupational therapy protocol for use with the older driver is a compilation of different occupational therapy assessments that address the areas of vision, cognition, and physical capacity.

The process for the development of this product began with examining the current literature on older drivers. A number of articles and studies were found that address this issue. The articles were sorted into categories addressing the following topics: occupation, independence, the older driver, car accidents and mortality, gender differences, illnesses, alternative transportation, assessment, contents of a driving program, adaptive strategies, and qualified evaluators. When all of the literature had been sorted it was compiled into a literature review.

Through the use of the current literature it was found that an evidence-based assessment tool to determine if an elderly driver needed further testing in order to
continue to drive would be beneficial. An entry-level occupational therapist has skills and abilities that can be used for assessing the elderly driver. This protocol comprises tests an occupational therapist at any level of experience may feel comfortable using and therefore contributes to the treatment continuum.

The act of driving is complex and in order to develop a comprehensive testing protocol, the skills used in driving were carefully evaluated. The research provided evidence of the main areas of focus for a therapist’s awareness during an evaluation due to the demands of driving. According to Hunt (1993), the area of physical abilities to be assessed includes: range of motion, muscle strength, reflexes, and reaction time, to name a few.

Hunt emphasized that judgment and cognitive capabilities are areas an evaluation should consider carefully. Martottoli and Drickamer (1993) emphasized reaction time as an important aspect of one’s physical abilities. This area is one that tends to become affected with aging. Martottoli and Drickamer discussed other important assessments in driving capacity to include: range of motion, grip strength and manual muscle testing.

Vision was mentioned by a variety authors as the most important sensory tool used in driving and an area that should be considered heavily during the evaluation process. Klavora and Heslegrave (2000) along with Cox, Fox and Irwin (1989) described vision as the main reason an elderly individual is not able to continue driving. Slowed processing ability was also mentioned as contributing to the inability to drive.

The performance skills that comprise the act of driving have been divided into the three main areas of vision, cognition, and physical abilities in this scholarly project product. A wide variety of occupational therapy assessments addressing the three
pertinent areas were examined and chosen based on the literature, what they assessed, the level of difficulty to administer, and the reliability and/or validity.

The following assessments were chosen to be compiled into the protocol: near visual acuity, distance visual acuity, confrontation with and without an eye patch, ocular pursuits, Motor-Free Visual Perception Test, Mini Mental State Examination, reaction time, Cognitive Assessment of Minnesota, quick manual muscle testing, dynamometer, Box and Blocks Test, Nine Hole Peg Test, and lateral pinch. The protocol was organized according to the three categories of vision, cognition, and physical capabilities. Under each assessment a purpose of the assessment/test, description, reliability, validity, and source are explained. This information may be useful in demonstrating the evidence-based data behind each test the occupational therapists are using. It may be of interest for occupational therapy departments to have this information on file in order to retrieve it to use as proof of evidence-based practice.

The protocol begins with a table of contents making it easier to flip directly to a certain assessment quickly. Next, the compilation of assessments is laid out, each on a separate page. Finally, the protocol ends with a list of references as to where the assessment information is located. The protocol is comprehensive in each of the three main topic areas and allows an entry-level therapist to generate an understanding of the clients’ area(s) of deficit(s). The format is designed to be user friendly.

Therapists may choose to use a section of the protocol, e.g. vision, or selected tests, as they feel is appropriate for the client. The goals of this protocol are to be user friendly for all entry level and experienced occupational therapists and to be used in its
entirety or in parts to contribute to the overall assessment of the client. The protocol used comprehensively may take an estimated two hours to complete.
CHAPTER IV

PRODUCT

Occupational Therapy Driving Protocol

This assessment protocol is a compilation of occupational therapy evaluations addressing vision, cognition, and physical aspects important to driving. The assessments were chosen based on the evidence in the literature and the specific performance skills determined necessary in order to drive safely. Therapists may choose, as appropriate, which tests should be used with each client. The protocol in its complete form is comprehensive and covers all performance skills alleged to be required to drive safely according to the literature. The tests may be used individually or in sections. For example, a client with visual deficits, however remaining physically functional, may benefit from the administration of all the vision tests and perhaps one or two of the cognitive assessments and manual muscle testing.

The vision assessments that were chosen include the following: near visual acuity, distance visual acuity, confrontation with and without the eye patch, ocular pursuits and the Motor-Free Visual Perception Test (MVPT). The cognition assessments include the following: Mini Mental State Examination (MMSE), reaction time, and the Cognitive Assessment of Minnesota (CAM). The physical assessments include the following: manual muscle testing (MMT), dynamometer, Box and Blocks Test, Nine Hole Peg Test, and lateral pinch strength. Each of the above tests are
formatted on separate pages with their purpose, description, reliability, validity, and source(s).

The above vision assessments were chosen based in relation to the performance skills necessary for driving. As mentioned previously, Klavora and Heslegrave (2000) along with Cox, Fox and Irwin (1989) described vision as an important sensory tool in driving. The near visual acuity test examines the client’s clearness of vision within an arm’s length. The distance visual acuity test assesses the client’s clearness of vision from a distance. Confrontation with and without the eye patch examines the client’s peripheral vision and identifies possible field deficits. Ocular pursuits assess the client’s ability to follow objects with smooth eye movements. The MVPT examines an individual’s spatial relations, visual discrimination, figure-ground, visual closure, and visual memory.

The cognitive assessments for this protocol examine a combination of cognitive skills and functions relative to the demands of driving. The MMSE measures orientation, registration (memory), attention, calculation, recall, and language. The CAM covers a wide range of simple to complex cognitive abilities. The reaction time measures how fast an individual can process what they are seeing and react. According to Hunt (1993), cognitive abilities must be assessed when determining if an individual is capable to continue driving safely.

The physical assessments were chosen based on different aspects of driving and what the minimum physical requirements are for safe driving. Manual muscle testing is used to determine the strength and function of the client’s individual muscles and muscle groups. The dynamometer examines the client’s grip/grasp strength. The box and blocks test assesses the client’s gross manual dexterity. The nine-hole peg test examines fine
motor dexterity. Lateral pinch assesses the client’s strength to grasp and hold small objects between the pad of the thumb and lateral aspect of the index finger. Marottoli and Drickamer (1993) have completed investigations into the psychomotor abilities needed by drivers and those often impaired with age. Reaction time, range of motion, manual muscle testing, grip strength, and cognitive abilities (e.g. attention) are emphasized as fundamental areas in the evaluation process of the elderly individual (Marottoli & Drickamer, 1993).

In conjunction with the use of this protocol, a more detailed analysis of the client’s abilities may need to be formulated. Therapists using this protocol will have an evidence-based outcome to determine if further testing is needed. It is suggested that a referral to an accredited driving program or an occupational therapist certified as a driving evaluator may be required for some clients. Occupational therapists specializing in the area of driver evaluation and rehabilitation will be able to recommend adaptive equipment or compensatory methods if necessary.

The following pages include the driving protocol and detailed descriptions of each of the assessments. The protocol may be taken out and used as is necessary. A summary of the protocol will follow in the next chapter, including further recommendations.
Occupational Therapy Driving Protocol for the Elderly Population

by

Terra Nelson and Courtney Marrs

Advisor: Jan Stube, PhD OTR/L

A Scholarly Project

Submitted to the Occupational Therapy Department

of the

University of North Dakota
# OCCUPATIONAL THERAPY DRIVING PROTOCOL

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Near Visual Acuity

**Purpose:** To test clearness of vision at near (4cm) or within an arm’s length (13 to 16 inches).

**Description:** Examiner utilizes a near visual acuity card, either letters or pictures, and hold card at appropriate distance noted by each card (13 or 16 inches). Right eye is tested first while the left eye is occluded. Ask the individual to read the smallest line or pictures, if the individual is correct move to the next smallest line. Continue until the individual misses letters or pictures. Glasses or contact lenses should be worn during the examination if the individual normally does so. Lighting should be appropriate during testing. Encourage the individual to guess if they are unsure. Do not allow squinting. Once right eye has been tested occlude it and test the left eye. (Zoltan, 1996)

**Reliability:** not stated in this source

**Validity:** not stated in this source

**Source:**
Distance Visual Acuity

**Purpose:** To test clearness of vision at a distance (20 ft).

**Description:** Examiner utilizes a distance acuity card (Snellen, picture card, tumbling E, Broken Wheel). Right eye is tested first while the left eye is occluded. Ask the individual to read the smallest line or pictures, if the individual is correct move to the next smallest line. Continue until the individual misses letters or pictures. Glasses or contact lenses should be worn during the examination if the individual normally does so. Lighting should be appropriate during testing. Encourage the individual to guess if they are unsure. Do not allow squinting. Once right eye has been tested occlude it and test the left eye. (Zoltan, 1996)

**Reliability:** not stated in this source

**Validity:** not stated in this source

**Source:**
Confrontation Without the Eye Patch

**Purpose:** This assessment is used to evaluate for visual field deficits.

**Description:** The therapist sits approximately 18 inches directly in front of the client. The client is instructed to fixate on the examiners’ nose. The test objects are two dull black 2-foot wands with white balls on the ends of the wands. The therapist alternates using one or two wands and moves either both or one of the wands from the right or left periphery of the client. The client is instructed to indicate whether he/she sees one or two targets and whether they are located on their right or left. The target is moved in three visual planes: eye level, forehead, and below chin level. The therapist performs three repetitions at each of the above levels. (Zoltan, 1996)

**Reliability:** When used in conjunction with other visual skills evaluations this evaluation performed an acceptable inter-rater reliability of .82. When used with the confrontation with eye patch examination it had an almost perfect correlation of .97. (Zoltan, 1996)

**Validity:** The validity of this examination increases when aphasia, poor visual attention, and scanning as causes of poor performance are ruled out. (Zoltan, 1996)

**Source:**
Confrontation with Eye Patch

**Purpose:** This assessment is used to evaluate for visual field deficits.

**Description:** The client sits 18 inches directly in front of the therapist. The client is instructed to fixate on the examiner’s nose. One eye is covered with an eye patch. The test object is a 2 foot black wand with white balls on the ends of them. The test object is moved into the clients’ periphery from the left and right in an arc motion simulating the imaginary sphere. The object is moved slowly at eye level, then forehead level, and then below chin level. It is performed three times at each of the above levels. The client is to respond or gesture when he/she can see the target. The eye patch is then switched and the other eye is evaluated. (Zoltan, 1996)

**Reliability:** When used in conjunction with other visual skills evaluations this evaluation performed an acceptable inter-rater reliability of .82. When used with the confrontation with eye patch examination it had an almost perfect correlation of .97. (Zoltan, 1996)

**Validity:** The validity of this examination increases when aphasia, poor visual attention, and scanning as causes of poor performance are ruled out. (Zoltan, 1996)

**Source:**
Ocular Pursuits

Purpose: Ocular pursuits are assessed to observe an individual’s ability to keep their head stationary while tracking a moving object. Smooth ocular pursuits indicate that an image is steadily placed on the retina.

Description: The target object used is an orange rubber ball on the end of a dowel. The target is moved back and forth at eye level in front of a client that is seated 18 inches away from the therapist. The object is used two to three times slowly in the following order: horizontally, vertically, diagonally, clockwise, and counterclockwise. The client is instructed to move only their eyes and not their head. (Zoltan, 1996)

Reliability: This evaluation has an inter-rater reliability of 1.0. (Zoltan, 1996)

Validity: Aphasia and poor visual attentiveness must be ruled out to increase the validity of this evaluation. (Zoltan, 1996)

Source:
**Motor-Free Visual Perception Test (MVPT)**

**Purpose:** This is a standardized test that examines individuals' spatial relations, visual discrimination, figure-ground, visual closure, and visual memory abilities.

**Description:** The test cannot be measured on anyone that has a 20/80 visual acuity or less. The clients are asked a series of questions and what they see in pictures. The therapist times them and compares their scores to the raw score data sheets to interpret the results. Each of the subtests addresses an area of spatial relations, visual discrimination, figure-ground, visual closure, or visual memory. (Colarusso & Hammill, 2003)

**Reliability:** The test-retest reliability for the MVPT-3 is .92 for the 11-84 age group. Median reliability coefficient for ages 11 and older is .89. Due to objective scoring procedures for this test, the inter-rater reliability was not investigated. Due to the reliability it was found that this test shows increased reliability with individuals aged 5 and older. (Colarusso & Hammill, 2003)

**Validity:** Construct validity addressed in this test included the categories of chronological age, cognitive ability, and academic achievement. Chronological age showed an increase in performance up to age 39 and then it slowly decreased due to aging with coefficients ranging from .37 to -.46. Cognitive ability and the MVPT-3 displayed a low correlation with a full-scale coefficient of .36, performance coefficient of .37, and a verbal coefficient of .22. Academic achievement presents a low to moderate relationship with a median correlation of .41. (Colarusso & Hammill, 2003)

**Source:**
Mini-Mental State Examination (MMSE)

Purpose: To quantitatively assess cognitive performance; also a quick clinical measure.

Description: The test is a questionnaire consisting of 11 questions in five areas of cognition. The test measures orientation, registration (memory), attention, calculation, recall, and language. Questions are individually scored and total to a maximum score of 30. The test requires 5 to 10 minutes to administer. (Beatty, 1990)

Reliability: Test-retest reliability with a 24-hour interval is .887 with one examiner. Test-retest reliability for clinically stable patients over a 28 day period is .98. (Beatty, 1990)

Validity: The test showed discrimination among diagnostic categories and distinguished cognitive disorders in the normal group, which indicated an existing disorder as well as the severity of a disorder. In patients with improving cognitive status, scores reflect their improvement. Concurrent validity was demonstrated in correlations with the Wechsler Adult Intelligence Scale, specifically, .776 correlation of MMSE with a Verbal IQ, and .66 of MMSE with Performance IQ. (Beatty, 1990)

Source:

Cognitive Assessment of Minnesota (CAM)

**Purpose:** To screen a variety of cognitive skills in order to design a specific treatment approach. This assessment is also commonly used a baseline measure and may be used to indicate changes throughout a patient’s treatment.

**Description:** The CAM is a standardized test with written directions for each subtest. There are 17 subtests covering a wide range of simple to complex cognitive abilities. The CAM may be administered in one or two sessions. Each subtest is scored and the total will amount to a score between 0-80. The test takes approximately 40 minutes to administer. (Rustad et al., 1993)

**Reliability:** Internal consistency by inter-item analysis indicated all items measure the same construct. Interrater reliability showed statistically significant agreement for 39 impaired subjects on all items as well as on the total score (.94). Test-retest reliability over a one week period showed a consistent total scale score (.96). (Rustad et al., 1993)

**Validity:** Total CAM score discriminated between 95% of impaired and nonimpaired subjects, establishing a cut-off score for probable impairment. Concurrent validity is supported by agreement of total Cam scores with clinical appraisal of cognitive skills and with scores on the Porteus Maze Test and Mini-Mental State Exam in the impaired population. (Rustad et al., 1993)

**Source:**

Reaction Time

**Purpose:** To test the individual speed of reaction

**Description:** The test includes a photo obtained from the source identified below. The numbers 1-14 have been sporadically placed over certain points of the picture. The client is asked to start at the number one and then as quickly as possible touch all the numbers in numerical order. The individual is timed for 10 seconds and the last number touched in the 10 seconds is the client’s score. The test includes a reaction time score chart that identifies reaction time in terms of average, above average, or below average based on age. (AARP, 1992)

**Reliability:** not stated in this source

**Validity:** not stated in this source

**Source:**
Manual Muscle Testing

**Purpose:** Manual muscle testing is used to determine the strength and function of the client’s individual muscles and muscle groups.

**Description:** The client is positioned to isolate the muscle or muscle group to be tested in either a gravity eliminated or against gravity position. Full active range of motion should be assessed before against gravity manual muscle testing is initiated. The site of attachment of the origin of the muscle is stabilized and the muscle belly is palpated. Resistance is applied against the muscle groups to be tested. The amount of resistance that is applied is dependant on the muscle group that is being tested. The strength of a muscle is graded on a scale of one to five. One indicates a trace or flicker of muscle contraction and a five indicates normal resistance tolerated on a muscle or muscle group. (Clarkson, 2000)

**Reliability:** Using a standardized procedure for testing, reliability of inter-rater manual muscle testing results with complete agreement of muscle grades as low. Inter-rater and intra-rater reliability within the range of one whole muscle grade and inter-rater reliability within one half a grade is very high. To increase the reliability manual muscle testing should be completed at the same time of day to decrease fatigue. (Clarkson, 2000)

**Validity:** There is a lack of evidence to demonstrate the validity of manual muscle testing, however manual muscle testing has been compared with hand held dynamometer measures and is suggested that muscle strength is measured by both techniques. Furthermore, manual muscle testing seems to measure the torque producing capability of the tested muscles and thus appears to have content validity. (Clarkson, 2000)

Dynamometer

Purpose: Dynamometer is used to assess hand grip/grasp strength.

Description: The client should be seated with his or her shoulder abducted and neutrally rotated, elbow flexed at 90° and the forearm and wrist in a neutral position. The handle of the dynamometer is set at the second position. The therapist urges the client to squeeze as hard as they can throughout the attempt. This is completed three times with each hand with a two to three minute rest in between trials. (Mathiowetz et al., 1985)

Reliability: Test-retest reliability of this method using the Jamar dynamometer was found to be .88. Inter-rater reliability is .99. (Mathiowetz et al., 1985)

Validity: Dynamometer validity increases when used in combination with manual muscle testing. There is a high validity correlation between the dynamometer and manual muscle testing of grip. The dynamometer was found to be a good predictor of overall strength. (Mathiowetz et al., 1985)

Source:

Box and Blocks Test

Purpose: Box and Blocks Test is used to measure gross manual dexterity.

Description: The client sits at a standard height table with the test box lengthwise directly in front of him/her. The examiner sits directly across from the client to monitor the blocks being placed. The client transfers the one-inch blocks from one side of the box to the other. Each hand is tested separately. The client is timed for one minute and he/she tries to get as many blocks transferred to the other side as fast as possible. (Mathiowetz et al., 1985)

Reliability: Test-retest reliability is .94 for left hands and .98 for right hands. Inter-rater reliability is 1.0 for right hand and .999 for left hand. (Mathiowetz et al., 1985)

Validity: Concurrent validity was established with the placing subtest of the Minnesota Rate of Manipulation test (.91). (Mathiowetz et al., 1985)

Source:

Nine Hole Peg Test

Purpose: The nine hole peg test measures finger dexterity.

Description: A five-inch square board with nine holes is placed directly in front of the client. The pegs are placed in front of the hand that is being tested. The client is instructed to place the pegs as fast as possible and remove them as fast as possible one at a time. Each hand is tested separately. (Mathiowetz et al., 1985)

Reliability: Inter-rater reliability is .97 for right hand and .99 for left hand. Test-retest reliability is .69 for right hand and .43 for the left hand. (Mathiowetz et al., 1985)

Validity: not stated in this source

Source:

Lateral Pinch

**Purpose:** A pinch meter is used to evaluate lateral pinch.

**Description:** The client holds the pinch meter between the pad of the thumb and lateral surface of the index finger. The client is instructed to pinch as hard as they can. Three trials are completed with a rest between each trial. Each hand is evaluated separately. (Mathiowetz et al., 1985)

**Reliability:** Inter-rater reliability of the B&L pinch meter scores was .98. The test-retest reliability was .81. (Mathiowetz et al., 1985)

**Validity:** not stated in this source

**Source:**

References


CHAPTER V
SUMMARY

In summary, the protocol for the assessment of elderly drivers is a tool that may be utilized by all occupational therapists. Entry-level therapists will find that they may feel comfortable utilizing this protocol since the tests do not require experience or additional skills in order to administer. The tests may be used individually or as an entire comprehensive evaluation tool. In its entirety, the test protocol is designed to evaluate all the skills an individual uses to drive.

The act of driving is a complex task that requires many skills in order to carry it out in a safe manner. It is essential to have all the necessary skills in order to drive safely, effectively, and independently. Visual skills, cognitive ability, and physical aspects of the driving task are among the main categories examined in this scholarly project. The protocol developed in this project examines each of these areas in detail and it is recommended that the individual evaluated for driving capability be able to successfully complete all tests. If an individual is unable to complete one or more of the tests a consultation with and/or a referral to a certified driving rehabilitation specialist is recommended.

Planning for intervention may be guided through use of the protocol. Areas of deficit related to driving skills may be specifically isolated and identified through administration of the tests. The tests may also assist in guiding intervention for remedial therapy of the elderly driver. Adaptive equipment or other compensatory
methods may be useful in assisting the individual in driving safely. Individuals may be capable of driving safely and independently through the use of adaptive equipment or other compensatory techniques. Compensatory methods and adaptive equipment should be determined on a case-by-case basis with individuals meeting the necessary cognitive standards, due to the fact that it is difficult for an individual to compensate for cognitive deficits. Occupational therapists specializing in driver rehabilitation are the skilled professionals able to recommend further intervention and adaptive equipment appropriate for permanent use when driving.

When conducting the testing of the older driver it is the responsibility of the occupational therapist to provide the physician and other members of the treatment team with accurate, valid testing results and other recommendations as to the ability of the individual to drive safely. Referral to other professionals may be necessary when an individual is not able to successfully pass the evaluations chosen from this protocol. The therapist performing the evaluation will need to subjectively determine if the client needs further assessment and intervention. If the therapist questions the client’s ability to drive safely in any way it will be appropriate to seek further consultation with colleagues or other disciplines. Referral to an accredited driving program may be of benefit to the individual as well as their family. Lee, Cameron, and Lee (2003) determined that an on the road driving test or a simulated driving test using a driving simulator (STISIM) are both highly effective and valid tools to determine if an individual can perform the activities necessary to drive safely.

The tests chosen for this protocol are specific for occupational therapy and are commonly used by occupational therapists. A team approach with evaluations provided
by other disciplines may also be effective in determining the client's ability to drive.

Some individuals may also seemingly pass the tests of this protocol and not be capable of
driving independently or safely. Additional testing and referral to an accredited driving
program may be necessary. Clinical reasoning, observation, and experience are
important tools for the therapist to use during the evaluation process in addition to
specific test results.

Future research is needed in determining the effectiveness of occupational therapy
based evaluations regarding clients’ readiness to or ability for safe driving. Each of the
tests included in this protocol examine specific skills. Whether or not the client is able to
generalize the passing of these simulated tests to successful completion of the simulated
skill on the road must be determined. The area of driver rehabilitation is an emerging
area of occupational therapy practice. The American Occupational Therapy Association
(AOTA) website has dedicated links to research and information that may provide
therapists with knowledge and other products. As the specialty area of driver
rehabilitation in occupational therapy continues to grow, efficacy of treatment and
interventions used in this area must be established in order to ensure that quality, skilled
therapy has the desired outcomes for older American drivers.
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