COMPARING THE EFFECTIVENESS OF VIDEO TRAINING ALONE VERSUS HANDS-ON TRAINING FOR OLDER ADULTS USING GPS TECHNOLOGY

By

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Rationale: The number of older drivers is expected to grow substantially in the coming years, making research regarding older adult mobility critical. Research related to enhancement of driver safety is imperative, as older adults have a much greater risk of injury and fatality when in a crash. One of the options is to use advanced technology to improve safety; however, training older adults to use technology requires different learning strategies than younger adults. In a recent study, it was demonstrated that older adults performed better after receiving video tutorial training on how to program and use a GPS compared to a control group. **Purpose:** The purpose of this study was to examine whether one-to-one, hands-on training is more effective in training older adults to program a GPS device as compared to video training alone and to no training. **Design:** A posttest only design that included three groups: two interventions (video-only training and one-to-one, hands-on training), and a control group was used. **Participants:** Participants were 60 adults over the age of 60, and all unfamiliar with GPS technology. **Method:** The two intervention groups used the same videos with the one-to-one, intervention providing opportunities for a hands-on/interactive experience. The video tutorials provided information on how to set up and drive with a GPS unit. The control group watched unrelated videos. Participants in all three groups completed nine destination entry tasks on the GPS unit without any assistance. **Analysis:** Outcomes were compared between the three groups. A one-way ANOVA was used to compare total time on each of the nine destination entry tasks between the groups and chi-square tests were used to determine the accuracy of entry method. **Results:** There were significant differences among the groups on the outcome measure of time for four of the nine destination entry tasks; the one-to-one, hands-on group had significantly lower times on three of those tasks while the video-only group had significantly lower times on one. Considering the mean time spent on tasks among groups, the one-to-one, hands-on group had lower average times on all but one destination entry tasks. Regarding accuracy of entry method, although results did not show the expected significance for the one-to-one, hands-on group as compared to the other groups, the one-to-one group had a higher percentage of correct entry method used than the other groups on seven of the nine tasks. Additionally, the one-to-one, hands-on group had a lower percentage of incorrect entry method used on all tasks. **Discussion:** Compared to the control group, training, both in the video-only and one-to-one, hands-on format, was an effective method for increasing performance. In addition, the one-to-one, hands-on training was an effective method for decreasing the amount of time spent on the destination entry tasks compared to the video only and control groups. Although accuracy varied between groups, the one-to-one, hands-on group showed improved performance on many tasks compared to the other groups. These results support the use of a one-to-one, hands-on training method when educating older adults to use technology systems such as GPS. The use of a training method which meets the unique needs of older adult learners may increase performance and confidence when using in-vehicle technologies, and therefore may promote on-road safety and allow older adults to remain driving for longer.

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Chapter 1: Introduction

Owning a personal vehicle and driving affords many conveniences to the older adult. Within the baby boomer generation, the largest cohort population in world history, the number of adults aged 85 and older is expected to increase to 9.6 million by the year 2030 (Dellinger, 2012). This generation is marked by their transient nature and high mobility and activity patterns, making the convenience of owning and driving a vehicle an important factor in their daily lives. Of note is this generation's strong desire to sustain personal independence, thus placing high demands on mobility, which is most often characterized by their personal vehicle (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012). Using vehicles, older adults can access needed services and activities. Older adults use their vehicles to continue to travel to work or volunteer opportunities, to attend medical appointments, to shop, and to participate in social activities (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012).

The rapidly growing aging population poses concerns for driver safety. Research related to the older adult population has reported several key areas of vulnerability that exist within the aging population (Anstey, Wood, Lord, & Walker, 2004). Within the normal aging process, there is a decline in cognitive capacities that may affect participation in complex activities such as driving. Age-related changes in visual attention, speed of visual processing, reaction times, and executive functioning create concerns in the abilities of older adults to process the complex nature of driving (Anstey, Wood, Lord, & Walker, 2004). Normal aging is associated with various conditions related to the visual system that lead to decreased visual acuity, decreased contrast sensitivity, and sensitivity to glare (Anstey, Wood, Lord, & Walker, 2004). In addition, decreased grip and muscle strength, endurance, and flexibility because of age or age-related disease can impact driving capacity. Lastly, physical frailty and many medical conditions such as stroke, heart disease, and arthritis increase the risk of unsafe driving and likelihood of injury when involved in motor vehicle accidents in this population (Anstey, Wood, Lord, & Walker, 2004). Of serious concern to driving performance are conditions characterized by cognitive decline such as dementia and Alzheimer's (Silverstein & Turk, 2016).

Regarding motor vehicle accidents in the older adult population, the risk of serious injury or death is higher than in younger adults. According to Silverstein and Turk (2016), by 2030, older drivers are expected to make up 25% of all fatal crash involvements. Both older drivers and passengers are at an increased risk for injury and fatality after a crash (Silverstein & Turk, 2016). In a study exploring the role of fragility and crash involvement of older adults, it was found compared to adults aged 30-59, adults older than 75 had increased rates of driver deaths per vehicle-mile traveled (Li, Braver, & Chen, 2003). The highest death rates were among drivers 80 years of age and older. Fragility, defined as susceptibility to injury, was found to begin to increase around the age of 60 and continue to steadily increase with age, accounting for excess death rates per vehicle-mile traveled in this population (Li, Braver, & Chen, 2003).

Research regarding age-related changes, health conditions, and crash statistics in the older adult population have resulted in increased attention to the subject of driving cessation (Dickerson et al., 2007). To many lifelong drivers, it can be impossible to imagine planning for a time when driving is no longer an option. It is estimated that 80-90% of older adults hold a drivers' license (Marottoli et al., 2000). Most drivers value the convenience and spontaneity of owning a vehicle and being able to travel to destinations they need or want to, making it hard to plan for a time when driving is no longer possible (Silverstein & Turk, 2016). Statistics suggest that life expectancy surpasses driving expectancy after the age of 70, and that more than 600,000 adults over the age of 70 cease to drive each year (Silverstein & Turk, 2016).

Many factors influence older adults' decision to stop driving, but one of the key influences in this decision is health status (Adler & Rottunda, 2006). Because of age related or disease related changes, many older adults compensate by practicing self-regulation when it comes to driving. Self-regulation may include not driving at night, during poor weather conditions, on highways, or in situations that make them uneasy (Adler & Rottunda, 2006). Although health status is an important factor, many older adults will continue to drive out of necessity. This necessity is due to the increased reliance on personal vehicles within this population, because many live in suburban or rural areas, increasing their need to drive to maintain daily activities (Adler & Rottunda, 2006). Gender differences exist when it comes to driving cessation; compared to females, older males make less changes to their driving habits as they age and are more unwilling to give up their driving status while females voluntarily stop driving at younger ages and in better health than men (Adler & Rottunda, 2006).

The growing number of older drivers and the perception of crash involvement has led to diffuse concern about road safety. Although there is no standard when it comes to licensing and assessment of fitness to drive, some jurisdictions mandate the use of age-related assessment to determine fitness to drive (Langford & Koppel, 2006). The case for mandating a regular and continued assessment of the older driver is based on demographic shifts, the consequences that aging may have on driving abilities, and perceptions of crash involvement of older adults (Langford & Koppel, 2006).

While driving cessation, either by professional suggestion or by personal decision, increases the safety of the older adult and other road users, there are implications for the individual who must discontinue driving. Research indicates out-of-home activity influences older adults' well-being and physical status (Marottoli et al., 2000). Driving cessation decreases the amount of out-of-home activity levels in the older adult population. This decrease in activity leads to lower levels of social integration, which may impact overall well-being (Marottoli et al., 2000). In addition to contributing to diminished social activities, driving cessation leads to decreased independence and less access to essential services. The discontinuation of driving can influence an individual's roles, identity, and life satisfaction (Ragland, Satariano, & MacLeod, 2005). In a study intended to explore the relationship between driving cessation and depressive symptoms, it was found that drivers that had stopped driving reported increased levels of symptoms related to depression (Ragland, Satariano, & MacLeod, 2005). The impacts of driving cessation pose many problems that warrant further research and solutions for the older adult population.

In summary, with the rising number of older drivers across the nation and the consequences related to driving cessation, many communities are addressing issues surrounding older adults' driving rights and public safety concerns (Golisz, 2014). According to Golisz (2014), "[v]arious levels of government, along with professionals from health care, social services, education, business, and law enforcement are collaborating to meet the community mobility needs of older adults" (p. 655). To safely continue to engage in driving and community mobility, research and policy changes are needed in regard to older drivers. Many research endeavors, especially those in the field of occupational therapy, are dedicated to analyzing aspects related to older adult driving and community mobility (Golisz, 2014). While one goal of occupational therapy research is to identify unsafe drivers and use intervention strategies to improve performance, another goal is to extend the time in which safe drivers can drive through education and training (Golisz, 2014). Occupational therapists have the knowledge and skills to address older adult driving and plan interventions considering the individual needs of clients (Golisz, 2014). Certain interventions that utilize technology, such as GPS, can be used to increase the length of time that older adults are able to drive. In-vehicle technology systems are designed to keep drivers safe and compensate for driver error, but the driver must have a good understanding of how the systems work, requiring specific training and practice. Learning to implement new technologies poses certain barriers in the older adult population, such as technological acceptance and perceptions of privacy violations (McCormick, Underwood, & Wang, 2012). With the use of interventions that utilize technology, it is important to determine the best method for this population while keeping in mind the unique learning needs of older adults.

Chapter 2: Literature Review

Driving and Older Adults

The staggering number of individuals that were born during the “baby boom” has caused a change in the overall age structure of the United States. The number of adults over the age of 65 increased 11-fold in the 20th century, with statistics indicating that one in five people will be 65 or older by 2030 (Dellinger, 2012). Although chronic health conditions are common among the older adult population, advancements in health care have allowed current older adults to live longer than previous generations (Dellinger, 2012). Within this population, licensing rates are substantial, as is dependence on personal vehicles. Previous generations of older adults relied on alternative transportation options such as walking or public transit, but this is not the case for the current older adult generation. Between 1983 and 2001, it was estimated that the total number of miles driven by individuals over the age of 65 doubled and that the amount of time spent driving increased by three-quarters (Rosenbloom, 2012). This increased reliance on personal vehicles may be attributed to the fact that most older adults live in suburban or rural areas, creating a need to rely on personal vehicles as a mode of transportation. Furthermore, the number of older adults living in low-density areas is expected to grow over the coming years (Rosenbloom, 2012). Although advances have allowed for alternative methods of transportation such as highways, transit systems, bike lanes, and sidewalks, these methods are designed for younger users (D’Ambromsio, Coughlin, Pratt, & Mohyde, 2012).

Generally, the age of 65 is considered the age of retirement. Given the economic lability of the past decades, many baby boomers will continue to work until the age of 67 or beyond for financial reasons, and therefore remain mobile for longer (D’Ambromsio, Coughlin, Pratt, & Mohyde, 2012). Furthermore, this generation is marked by a desire to preserve their independence and have access to goods, services, and social activities; making their mobility needs high (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012). Although the convenience of the internet and catalog shopping can curb shopping trips of older adults, this generation makes up the largest spending group in terms of shopping, increasing their tendency to remain mobile (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012). In addition, baby boomers are more likely than previous generations to continue to engage in a range of social and leisure activities. These leisure activities include travel, physical activities that focus on wellness, spending time with family and friends, volunteering, and hobby related activities (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012).

While the current older adult generation has a longer life expectancy than previous generations, chronic conditions and disability among this population are not uncommon. It is estimated that approximately 80% of older adults have at least one condition and 50% have at least two chronic conditions (Dellinger, 2012). Common conditions in the older adult population that may impact driving include hypertension, cerebrovascular accident, diabetes, arthritis, heart conditions, and chronic obstructive pulmonary disorder. In addition, medications used to treat common conditions may impact an individual's ability to drive. Because of this, more family members will feel pressure to meet the mobility needs of elderly family unless advancements can accommodate their needs (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012).

In summary, driving is more than the ability to get from one place to the other for older adults, it marks independence, freedom, and self-sufficiency. Research suggests that driving cessation may lead to an increase in depressive symptoms and social isolation (Ragland, Satariano, & MacLeod, 2005). Failing to provide transportation needs for this generation will have many consequences. These consequences include isolation; leading to increased medical expenditures, economic costs due to the inability of older adults to participate in spending, and loss of labor (D'Ambromsio, Coughlin, Pratt, & Mohyde, 2012). For these reasons, research involving older adult driving should focus on alternative transportation needs, identifying at risk individuals, and developing methods to lengthen the time that older adults are able to remain driving.

Older Adult Learning and Education

While there are many learning styles, one of the significant distinctions is the difference between adult learning and learning designed for children and young adults. Two main principles have been proposed in adult learning theory; andragogy and self-directed learning (Merriam, 2011). Andragogy is known as the "art and science of helping adults learn" (Gallagher & Bell, 2016). Originally, andragogy was based on five assumptions about adult learning: 1) adult learners have an independent self-concept and can direct their learning, 2) they have many life experiences that are a source of learning, 3) their needs are related to social roles, 4) they are more interested in direct application of learned knowledge, and 5) internal factors motivate them to learn rather than external (Merriam, 2011).

Similarly, Malcolm Knowles describes five principles related to andragogy that acknowledge the unique learning needs of adults; 1) adult learners are independent and self-directed, 2) have accumulated a large collection of experiences, which serves as a resource for learning, 3) value learning that integrates experiences of everyday life, 4) are more interested in immediate, problem centered approaches, and 5) are motivated to learn by internal drives rather than external (Gallagher & Bell, 2016). Much debate has taken place over whether these assumptions apply only to adults and is now thought to be more of a continuum between andragogy and pedagogy given the unique circumstances of the individual (Merriam, 2011). To apply the principles of adult learning theory, an effective learning climate should be established in which learners can feel comfortable expressing themselves. In relation to educating older adult patients, previous studies have shown that patient education can be enhanced by following adult learning principles that include components that integrate real life contexts and enable patients to problem solve through situations with the support of others (Gallagher & Bell, 2016). In addition, Gallagher and Bell (2016) state that adult learners should be encouraged to engage in self-reflection of their learning and be an equal and key player in the learning process while the instructor acts as a facilitator.

The second principle underpinning adult learning theory is self-directed learning. This type of learning is extensive and occurs in the everyday lives of adults, independent of instruction (Merriam, 2011). Adult education focuses on fostering the ability of reflection and self-direction in adult learners. Although both concepts have been debated, they are widely used in the development of adult education (Merriam, 2011).

Based on the premise that providing education for older adults can help find solutions to problems that arise during the aging process, a program, *Empowering Older adults with Assistive Technology to Shop, Cook and Eat*, was developed (Hermann, Johnston, Brosi, & Jaco, 2012). This program was designed to provide education for older adults, their family, and care providers about assistive technology that can help with transportation, shopping, meal preparation, and eating. The curriculum focused on the use of empowerment and awareness for individuals and their support systems (Hermann, Johnston, Brosi, & Jaco, 2012). Included in the program were presentations, handouts, video clips, and hands-on demonstrations. The program was then evaluated by participants using a questionnaire (Hermann, Johnston, Brosi, & Jaco, 2012). The results revealed increased feelings of empowerment and likeliness of using the information presented. Providing education and hands-on demonstrations increased the awareness of technologies available and the confidence in using those technologies for the participants (Hermann, Johnston, Brosi, & Jaco, 2012).

In a different study, Leung et al. (2012) conducted a survey and a follow up field study with the goal of better understanding how older adults learn to use mobile devices, their learning preferences, and barriers to learning. Adults aged 65 and older, middle aged adults, and young adults completed a survey and were then interviewed. The results of this study found similarities and differences between the younger and older adults. First, the older adults valued understanding task steps rather than gaining a general understanding of the task, compared to younger adults who value both aspects equally (Leung et al., 2012). Similarly, older adults preferred step-by-step directions in learning resources. Older adults did not prefer trial and error as compared to younger adults and used the instruction manual more, but had more difficulties using it (Leung et al., 2012). While younger adults used the internet to help them learn, older adults did not utilize this resource as frequently but used the device's help feature more so than younger respondents. Older adults tended to take notes while learning more than younger adults. In addition, it was found that older adults placed more value on a variety of learning resources and desired demonstrations more so than younger respondents (Leung et al., 2012). Compared to younger adults, older adults felt that interacting with the learning resource was important and valued individual learning (Leung et al., 2012). Practice and feedback were also desired more in older respondents. The follow up field study consisted of semi-structured interviews and the use of current technology to better understand the learning of six older adults. Although a small number of participants were used in the field study, the findings supported the conclusions that were drawn from the survey regarding learning styles, preferences, and needs (Leung et al., 2012).

Based on the information concerning adult and older adult education and learning, education aimed towards older adults should include elements of self-direction, step-by-step directions, demonstrations, hands-on learning, and a variety of resources. These elements will help tailor education and training to meet the specific needs of this population.

Driving and Community Mobility Education

Much research is dedicated to the identification of unsafe drivers, however, this in turn may decrease the independence of those identified older adults (Bedard, et al., 2008). While recognizing that deficits can impact the safety of older adults and other drivers, it may be important to focus efforts on modifying training for older adults. These efforts help to preserve and encourage older adults' ability to drive safely. Some of the factors that could impact older drivers could be a lack of formal driving education, changes in technology, changes in the environment, and the reinforcement of unsafe driving habits (Bedard et al., 2008).

Furthermore, it is important to determine how well older adults respond to driving education. Marottoli et al. (2007) conducted a randomized control trial to determine if a combination of classroom and on-road instruction could improve driving performance in older adults with driving difficulties. This study included 126 current drivers, 70 years of age and older. The participants underwent baseline assessment that included assessment of health, function, demographics, and driving practices. The participants were given an on-road assessment of driving performance and a knowledge test. The participants were then randomly assigned to a control group or the intervention group, which consisted of classroom and on-road training. Of the 126 participants, 69 were assigned to the intervention and 57 were assigned to the control group (Marottoli et al., 2007). The classroom instruction was based on the AAA Driver Improvement Program, including topics such as driving risk, visual habits, communication, speed, margins, emergencies, vehicle technology, alcohol, medications, and aggression. The on-road instruction addressed seat positioning, mirror adjustment, visibility, seat belts, speed, following distance, signaling, intersections, right of way, turns, and reversing. The intervention group received eight hours of classroom training and two hours of on-road training over an eight-week period. After the eight-week period, both groups underwent driving and knowledge re-evaluation (Marottoli et al., 2007).

Despite limitations within the study, it was found that the combination of classroom and on-road training improved driving performance and knowledge test scores compared to the participants in the control group. The road test score post intervention was 2.87 points higher for those in the intervention group compared to those of the control group at eight weeks. The knowledge test score of the intervention group at eight weeks was 3.45 points higher than the control group (Marottoli et al., 2007). These results are encouraging and suggest that older adults respond well to a combination of classroom and hands-on education.

In addition to the previously described study, Bedard et al. (2008) conducted a study in which older adults, 65 and older, participated in both an in-class and on-road training program to determine whether changes in safe driving knowledge and behavior occurred. This study noted that increased knowledge may support safe driving by supporting the improvement of safe driving behaviors. The overall goal of this study was to determine if there were changes in safe driving knowledge following an intervention that had both in-class and hands-on elements. The hypothesis was that upon comparison to a control group, participants that received the intervention would show improvement during a driving evaluation and increased safe driving knowledge following the in-class component of the intervention (Bedard et al., 2008).

Participants were first given a safe driving questionnaire that consisted of questions relating to knowledge about road rules and preventative measures. The participants were then given an on-road evaluation (Bedard et al., 2008). Those assigned to the intervention group received the 55-Alive/Mature Driving program designed by AARP to enable participants to gain confidence behind the wheel, have a chance to voice concerns related to driving, provide updated information about driving laws and conditions that impact driving, and provide information related to new driving technology (Bedard et al., 2008). This program was then followed with two, 40-minute on-road practice sessions. The second on-road evaluation was completed four to eight weeks after the intervention (Bedard et al., 2008). While limitations exist, results of this study suggest that the participant’s knowledge of safe driving practices increased from 61% to 81% and on-road driving performance improved in some areas (Bedard et al., 2008).

While both studies used participants that were current drivers and met certain medical, cognitive, and visual requirements, they show that older adults respond to an easily implemented, educational program directed towards the specific needs of this population. When provided with education in both a classroom and on-road, hands-on manner, the older adults included in the studies improved in driving performance and safe driving knowledge. The results of both studies indicate that using training methods that are conducive to the unique learning needs of older adults is an effective method for improving performance.

Older Adult Technology Use

Advancements in society have brought increases in technology use. Technology can be intimidating to those who are more familiar with traditional venues of communication, mobility, and entertainment, but new technologies can provide potential benefits to the older adult. In a study designed to determine the prevalence of technology use in older adults, Gell, Rosenberg, Demiris, LaCroix and Patel (2015) state "[t]he prevalence of using e-mail or text messaging for communication in the last month was 40.2% and 42.7% reported accessing the internet for reasons other than e-mail" (p. 5). In addition, this study revealed that technology use varied depending on socioeconomic and health status (Gell, Rosenberg, Demiris, LaCroix & Patel, 2015).

In a similar study, Gitlow (2014) found comparable statistics regarding prevalence of technology use, but also sought to determine why older adults want to use technology, and the success and barriers that are experienced. It was found that over half of those who owned a computer or cell phone had moderate levels of success while using the technology. The most common problems associated with technology were vision, memory, cognition, and lack of knowledge about the technology (Gitlow, 2014).

In relation to driving technology use, several technologies have been added to vehicles to increase safety and performance. In a study conducted through the National Highway Safety Traffic Administration (NHSTA), Jenness, Lerner, Mazor, Osberg and Tefft (2007) explored the use of backing aids and rear-view cameras in vehicle owners in two groups: those 65 and older and those under 65. It was found that older drivers relied on owner's manual to learn how the backing aid system and the rear-view camera worked, were more likely than those who were younger than 65 to say that the systems were difficult to use, and that visual and weather conditions impacted their success in using the technologies (Jenness, Lerner, Mazor, OsBerg & Tefft, 2007). With this knowledge, it is important to consider the development of technology training and education programs directed towards older adults.

Technology Potential to Assist Older Drivers

While it is established that almost half of older adults use technology such as cell phones and computers (Gell, Rosenberg, Demiris, Lacroix & Patel, 2015), it is important to understand how older adults use vehicle related technologies and how these technologies can help to keep older adults driving longer. A report synthesizing knowledge about advanced in-vehicle technologies relating to older adults was sponsored by the AAAFTS. Eby, et al. (2015) grouped technologies into three categories: crash avoidance systems, in-vehicle information systems, and other systems. Crash avoidance systems provide warning to the driver when a potentially hazardous situation is present, these include lane departure warning/mitigation, curve speed warning, forward collision warning, blind spot warning, and parking assistance. In-vehicle information systems are used to provide the driver with information that can be used to make better driving decisions. These include global positioning systems (GPS), intelligent speed adaptation, and congestion warning. Other systems include adaptive cruise control, automatic crash notification, adaptive headlights, drowsiness/fatigue warnings, and voice activated control (Eby et al., 2015).

In short, these in-vehicle technologies provide benefits that could improve older adult driving performance and safety. Although individuals with specific visual, hearing, or cognitive deficits may have difficulty using these technologies, there could be considerable benefits to the general older adult population. This report noted that there is a need to determine how older adults are learning to use these in-vehicle technologies, since older adults have more difficulty learning new technologies and take longer to do so (Eby et al, 2015). Previous studies have shown that older adults refer to owner's manuals, dealership instruction, or that some never learn how to use the technologies at all (Eby et al., 2015).

While many new technologies will be helpful for the future, it may take up to 30 years for a fleet of vehicles to include all new technologies available (Insurance Institute for Highway Safety-Highway Loss Data Institute, 2012). However, in-vehicle information systems, specifically GPS, can be easily used as an aftermarket product and have been found to be helpful for older drivers in wayfinding (Eby et al., 2015). Previous studies have shown that older adults that use a GPS travel to places that they would not normally have gone, traveled more often on roads that they would typically avoid, and had more feelings of confidence and safety when using the GPS (Eby et al., 2015). On the other hand, older adults took longer and had more difficulty in learning how to implement the GPS device, had more difficulty in visualizing the displays of the GPS, and frequently used the system with a co-passenger. It was also found that older drivers prefer verbal wayfinding instructions to a navigation system (Eby et al., 2015).

Current Global Positioning System Research

In a recent study, GPS use in older adults that were familiar and unfamiliar with GPS devices was explored. The objective of this study was to explore the driving performance and safety of older adults during driving tasks (Thomas et al., 2018). Two phases of this study were completed. The first phase included 80 healthy participants; 40 of which were familiar with GPS, 40 of which were unfamiliar. Each group was counterbalanced by age; 20 participants were aged 60-69, and 20 participants were aged 70-79 in each group (Thomas et al., 2018). Those who met the requirements went on four driving routes using their own car in the city of Greenville, North Carolina, accompanied by a driving rehabilitation specialists (DRS), who scored driving performance and safety during the routes (Thomas et al., 2018). The four routes were as follows: a familiar route with no directions (as a baseline), a route with paper directions, and two routes using a GPS device (Garmin®). The DRS used a modified version of the Miller Road Test to score participants on their driving performance and safety while driving (Thomas et al., 2018).

After completing the 4 drives, participants were asked to program a GPS device using a set of 3 destination entry tasks. Participants were given the *Quick Start Guide* for the Garmin® device and a set of printed instructions. They were given time to practice and were informed that they could refer to the materials at any time during the destination entries. Participants were scored on the accuracy of each destination entry (Thomas et al., 2018).

The results of Phase 1 indicated that when driving on the routes with a GPS device, the familiar participants made fewer driving errors than participants that were unfamiliar with the use of GPS (Thomas et al., 2018). Additionally, Participants in their 60's made fewer driving errors than those in their 70's. These results show that age and familiarity with the technology were indicators of safer, on-road performance (Thomas et al., 2018). In relation to the destination entry task, age group again served as a predictor of performance in that those in their 60's performed better than those in their 70's. The 60-69 group that was familiar with GPS devices were the most successful in the task whereas the 70-79-year group that were unfamiliar with GPS devices performed the worst (Thomas et al., 2018).

Phase 2 of this study was designed to explore if training in GPS programming would increase the ability of older adults to use GPS devices. The research questions were as follows: does GPS training increase the user's ability to operate the device and use specific device functions and does it improve safety and driving performance for route-following while using the device? Phase 2 included 40 participants over the age of 60, all unfamiliar with GPS devices. Participants were randomly assigned to either the intervention (GPS video training) or the control group (Thomas et al., 2018). The intervention group consisted of a training that involved the use of six video tutorials that explained how to use the GPS device. These videos were designed to cover information relating to programming the GPS, searching for destinations using the device, how to set up the device, and the actions of the device while using it. Participants were informed that they could practice the task during the 30-minute training time frame and were given the *Quick Start Guide* to study and refer to during the destination entry task. In addition, participants could view the videos as many times as they wanted during the 30-minute training period (Thomas et al., 2018).

Participants in the control group watched six unrelated videos that contained information related to common health conditions that may have an impact on older drivers. The videos were similar in length to the training videos but did not contain information relating to GPS use. The control participants were also given the *Quick Start Guide* to study and refer to while completing the destination entry task. Participants were informed that they could practice as much as they wanted to during the 30-minute training time (Thomas et al., 2018).

After watching the video tutorials, participants in both the GPS training and control group were asked to complete nine destination entry tasks on the device. The tasks included using the address function, the enter search function, locating points of interest (POI), and using the gas station function; all of which were covered in the GPS video tutorials but not in the control group videos (Thomas et al., 2018). The participants were scored on the total time it took them to complete each task and their ability to correctly enter the destinations. The participants were not allowed to ask questions or receive feedback from the researchers during this time (Thomas et al., 2018).

After completing the video session, participants from both the intervention and control group completed an on-road portion of the study, like Phase 1. The results of Phase 2 showed similar results to Phase 1 in that age appeared to be related to performance on the destination entry tasks; those in their 60’s performed better than those in their 70’s (Thomas et al., 2018). While the on-road performance results did not show significant differences between the training group and the control group, the participants that received the GPS training videos performed better than those in the control group on the destination entry tasks (Thomas et al., 2018). Surprisingly, despite receiving the GPS video tutorial training, there were some older adults who experienced significant difficulty programming the GPS as well as following directions when driving on road. Researchers hypothesized that the Human Computer Interaction (HCI) of the GPS device appeared to be too complex and caused confusion in participants. Researches suggested that GPS device manufacturers need to improve the interface and create a standard entry dialogue that is less confusing for users (Thomas et al., 2018). Although the GPS video training used in this study provided adequate information for an individual to learn how to program a GPS device, the results of this study beg the question as to whether watching video tutorials alone is a sufficient educational method for the older adult learner? Are there additional needs that must be taken into consideration when designing a training program specifically for the older adult?

Summary

When older adults lose the ability to drive, they lose their independence, which can have significant consequences for the community and for the quality of life of individuals (D’Ambromsio, Coughlin, Pratt, & Mohyde, 2012). Given that the numbers of older drivers are increasing and will continue to in the coming years, dedicating research to education of older drivers, identification of at risk drivers, and technology use that has the potential to benefit this population, is integral.

One of the ways in which research can be of benefit to older drivers is through the identification of learning styles and techniques that allow older adults to continue to learn. Based on tenets relating to androgyny and self-directed learning, adult education should involve adult learners in as many aspects of their learning experience as possible and ensure that the setting is appropriate for optimal learning (Merriam, 2011). Several research studies have identified that older adults benefit from step-by-step directions, demonstrations, and hands-on learning, as compared to younger adults (Leung et al., 2012). In relation to driving education specifically, it has been demonstrated that older adults respond well to a combination of classroom and on-road training in which they had an opportunity to practice what was learned during the training (Marottoli et al., 2007).

In-vehicle technology systems such as GPS can benefit the older adult population, aiding them to traverse to places that they would not normally go without the device, travel more in places they would normally avoid, and feel more confident and safe on the road (Eby et al., 2015). However, older adults may experience problems when using technology relating to vision, memory, cognition, and lack of knowledge regarding the technology (Gitlow, 2014). Although several technologies have been added to vehicles, such as GPS, to increase safety and performance, older adults find difficulty in using them (Jeness, Lerner, Mazor, Osberg & Tefft, 2007).

Recent research has sought to determine how well older adults respond to GPS use and training. It was determined that older adults performed better when using a GPS as compared to a paper route during a driving task (Thomas et al., 2018). In addition, those who were familiar with GPS prior to the study performed better when programming the GPS than those who were unfamiliar. Thus, the second phase of that study sought to determine if and what kind of training might improve older adults' ability to use and program the GPS, and if it would increase driving safety (Thomas et al., 2018). Results of this study were expected in that participants that received training via video tutorials performed better than those who watched unrelated videos. However, the results also indicated that some older adults, despite receiving the video tutorial training, experienced significant difficulties when asked to enter destinations into a GPS device (Thomas et al., 2018). Therefore, because of the unique learning needs of older adults, differences between learning by video tutorial alone versus "hands-on," one-to-one learning should be explored. Thus, the present study used the previously collected data from the GPS study mentioned above to determine what type of training is most effective for older adults, specifically comparing the results of video tutorial training, the control group, and the proposed one-to-one, hands-on training in a GPS destination entry task. The research question for the current study was: Is one-to-one, hands-on training more effective compared to video-only training and to no training at all in teaching older adults to learn to use GPS technology?

Chapter 3: Methodology

Design

This study was a posttest only design that included three groups; two interventions (e.g., video-only training, one-to-one, hands-on training) and a placebo (control) group. Data collection was completed for the control group and video-only training intervention as part of Phase 2 of the larger study described previously. As a further exploration of training methods, the present study collected data for a second intervention, specifically, one-to-one, hands-on training, using the same selection criteria and outcome measures as Phase 2 of the larger study. With permission, this study intended to compare the learning experience of the video-only training to the one-to-one, hands-on GPS training as well as to a control group (no training), as measured by outcome measures (i.e., destination entry tasks). The dependent variables in this study were the performance scores and completion time on a series of destination entry tasks using a GPS device.

The present study required approval by the University and Medical Center Institutional Review Board (UMCIRB) at East Carolina University. The IRB reviewed and approved all protocols, the recruitment flier, and questionnaires used in the present study (see Appendix A).

Participants

The participants consisted of a convenience sample of 23 individuals over the age of 60. Three participants were omitted from data analysis. They were recruited from the Pitt County Council on Aging, Cypress Glen Retirement Community, local churches, and a local senior group. Referrals from the participants were also utilized. A screening tool (as used in the larger study) was used to collect information as well as to identify inclusion/exclusion criteria (see

Appendix B). In addition to age, the inclusion criteria were that participants had to be unfamiliar with GPS navigation, as outlined on the screening tool (i.e., the first three answers to question seven on the screening tool). Participants were required to be a current driver with a valid driver's license. Exclusion criteria included individuals with significant hearing, visual, cognitive, or physical deficits that would limit their ability to learn and complete the tasks given during the study. Individuals who had little to no experience with driving were excluded.

If participants utilized email, the screening tool was sent to the participant via email to complete prior to the training session. If the participant did not utilize email, the researcher confirmed their age and their experience with GPS over the phone, and the screening form was completed in person and reviewed prior to starting the training session. All subjects filled out a consent form prior to partaking in the study (see Appendix C).

Instrumentation

Participants were scored on their ability to enter nine destinations into the GPS device, using the same scoring system and sheet as the previous study. A scoring sheet was developed to record the completion time of each destination entry and if the proper entry method was used (see Appendix D). Although the scoring system is not a standardized tool, the instructions were procedural and specific. The researcher who scored the data from the control and other intervention group in the larger study scored the data from the current study to increase interrater reliability. The principle investigator for this study also observed the data entry tasks from all three groups. This not only supported accuracy with two measurement sources, but also assisted with increasing familiarity with the data.

Materials

Videos. A series of six professionally developed video tutorials created by experts in the field of transportation safety for the previous study were used. Each video provided detailed information about GPS units and development, how to program typical units, and how to follow the directions when using a GPS. Descriptions of the six videos are as follows:

1. "Getting Started and Basic Operations"

   This video provided general information about how GPS technology works, how to mount a unit in a car, how to plug the unit into a power source in the car, and the ways in which the unit can be powered on and off.

2. "How a GPS Unit Thinks and Communicates"

   This video provided more detailed information about how the GPS unit functions. Information on navigation, maps, auditory guidance, and re-calculation of routes if a turn is missed or if a driver is uncomfortable with the guidance was provided.

3. "Safety"

   Examples of ways in which the GPS should be mounted, used while driving, and how navigation guidance can be followed were given in this video. Safe use of GPS technology was described.

4. "Entering a Specific Destination"

   This video provided instructions on how to enter a destination into the GPS unit. The video demonstrated how to enter a sample destination using both the address shortcut and enter search functions. This video also demonstrated how to change the city in which the user is searching near.

5. “Entering Points of Interest”

   Points of interest (POI), such as specific places like a restaurant, or a type of place, such as a gas station were described. Two examples of how to use the GPS unit to get to a POI were demonstrated in this video, using the enter search function and the gas station shortcut.

6. “Demonstration”

   This final video demonstrated how to enter a destination using the enter search function and how to follow the navigation guidance to the destination. This video provided footage of the narrator driving while following the navigation guidance after entering a POI into the device.

Camera. A Sony © camera was used in this study to film the testing session. The camera was mounted on a tripod stand and the zoom feature was used to film each participant’s hands while they completed the destination entry tasks. Each recording was uploaded to a secure laptop and was later scored by both the primary investigator and a member of the research team from the previous study.

GPS Device. A Garmin Nüvi 2555LMT® was used in this study, as well as the previous study. The unit had a 11.1 by 6.3 cm touch screen that participants used to enter destinations. This model was pre-loaded with maps and a list of points of interest (POIs). The unit gave visual and voice-guided directions once a destination was entered in to the device. The unit was mounted on a bean bag mount so that it could be easily accessed by participants.

Procedure

Participants who met inclusion criteria were scheduled for one session at the ECU Allied Health Sciences Building. Participants were informed that the training session would last for about 1.5 hours. At the start of the training session, the researcher provided a summary of what would take place. Participants then completed the consent form and a survey regarding technology use (See Appendix E).

One-on-One Training. Participants were asked to watch each of the six previously described videos. After each video, the participant was asked a comprehension question regarding the content (see Appendix F). If the participant did not answer the comprehension correctly or by their own admission did not understand, they were verbally corrected and the video was repeated as necessary. After the fourth video, the researcher demonstrated a destination entry on the GPS device (the participant's home address). This demonstration involved using both entry methods that were detailed in the fourth video (using the address shortcut and using the enter search bar) and using the keyboard, back arrow, space bar, and delete features. Each participant was asked if they had any questions regarding the demonstration and were then asked to practice completing the same task that was demonstrated by the researcher; entering in their home address using both the address shortcut and enter search entry methods. Participants were permitted to ask questions and receive feedback at any time during the training. If the participant made a mistake during practice, they were verbally corrected and shown how to complete the task again. After the sixth video, the researcher demonstrated a point of interest (POI) destination entry (Walmart Supercenter). The participants were again asked to practice completing this same POI entry, while receiving feedback and being corrected if an error was made. After practicing this task, questions were encouraged to assure understanding of data entry.

Testing. Participants were given the *Quick Start Guide* provided by Garmin® and a binder that contained the testing materials. The binder included the instructions page in 15-point font (see Appendix G), and each of the nine destination entries (see Appendix H) on separate, numbered pages. The destinations included in the testing session involved entering street addresses into the unit using both the address shortcut and the enter search function, finding POIs, and using the gas station shortcut to locate a gas station. The instructions page indicated that each participant should enter each destination as quickly as possible and to press "Go!" to begin calculation of the route. Each participant was informed that their hands would be filmed while completing the destination entries. After the camera had been adjusted, the participant was instructed to start with the first destination entry and to turn the numbered pages until all nine destinations had been completed. The participants were not allowed to re-watch the videos or ask questions during this time. After completion of the destination entry, as demonstrated by the participant selecting "Go!" after entering an address into the device, the researcher stopped the navigation and used the back arrow to return to the home screen. If participants were exhibiting signs of frustration or distress during the task, they were informed that they could keep attempting the task or to move on to the next destination entry task. If participants spent more than 5 minutes working on a single destination entry task, the researcher instructed them to move on to the next destination entry.

After completion of testing, if the participant experienced problems while entering the destinations into the unit, the researcher provided a demonstration on how to correctly enter the destination that the participant had entered incorrectly or had difficulties completing. Additional questions about the destination entries were encouraged during this time to promote retention of learned information. Each participant was then asked to complete a post-session survey based on their experience (see Appendix I). After completing the survey, each participant was given a $30 Target gift card and asked to sign a form stating that they received the gift card (see Appendix J).

Comparison Groups. In the previous study, 40 older adults without any experience using a GPS also completed the same destination tasks. The training group (video-only), watched the same videos, but were not allowed provided with demonstrations or allowed to ask questions. The control group, watched six online NHTSA videos related to driving and medical conditions. These videos contained no information about GPS navigation or how to program a GPS. Participants were randomly assigned to either group and their tasks were all recorded and scored.

Data Analysis

Data from the scoring sheet was manually entered in to an Excel sheet and then imported into IBM Statistical Package for the Social Sciences 25 (SPSS-25) for analysis. The current study sought to answer the research question: is one-to-one, hands-on training more effective compared to video-only training alone and to no training at all in teaching older adults to learn to use GPS technology? To address the research question, total time spent on each of the nine destination entry tasks and accuracy in entry method on each task were compared between the three groups. The total time the participant spent entering each destination entry was compared among the three groups using a one-way Analysis of Variance (ANOVA). Additionally, the average and standard deviation of total time spent on each task were calculated.

To compare accuracy among the three groups, two-way tables with Chi-square tests were used for each task. The first three destination entry tasks asked the participant to “find a route to…”, whereas tasks four through nine attached qualifiers to the directions such as “use the address function to find a route to…” or “use the gas station shortcut to find…”, which created more opportunities for individuals to use a partially correct method to complete the task. The first three destination entry tasks were more closely related to the purpose of the training; to use the GPS to find a route to a destination, whereas tasks four through nine added increased demands to the task. Therefore, the first three tasks were analyzed as being either incorrect (0) or correct (2), whereas tasks four through nine were analyzed in terms of being incorrect (0), partially correct (1), or correct (2).

Recorded videos of each participant of the three groups performing the nine destination entry tasks were scored by two raters. Cohen’s Kappa Coefficient was used to assess the level of agreement between raters for the accuracy scores on each task, and intraclass correlation was used to determine the level of agreement between raters on the outcome measure of total time spent on each task.

Responses to the screening form were used to analyze demographics among the three groups; the mean and standard deviation of age were calculated as well as frequencies of gender, race, and familiarity with GPS use. A one-way ANOVA was used to analyze differences between groups regarding age. Additionally, two-way tables with Chi-square tests were used to analyze differences between groups on gender, race, and familiarity with GPS use. The one-to-one, hands-on group were asked comprehension questions after viewing each of the six videos, given a technology survey prior to beginning the training session, and a post-session survey, therefore frequencies of responses to these documents were also analyzed.

Chapter 4: Results

Participants

The current study included 60 adults over the age of 60. The age of participants ranged from 60-84 years with a mean age of 68.92 years and standard deviation of 5.83 years. Of the 60 participants, 44 were female and 16 were male. Twenty-two participants identified as being black/African American, two Asian, 35 white/Caucasian and one as other. Thirty-three of the participants had never used a GPS unit before and did not know how to use one, 13 had tried to use a GPS before but did not feel comfortable using one, and 14 used a GPS sometimes but did not feel confident when using one. Results of the one-way ANOVA between groups in regard to age indicated that there was not a significant difference between groups ($p=0.49$). Post hoc comparisons further supported that there were no significant differences between groups. Chi-square tests indicated that there were no significant differences between groups in relation to gender, race, and GPS experience.

For the one-to-one, hands-on group, Table 1 illustrates responses to the technology survey administered prior to the start of each training session, indicating the comfort level of participants when using an ATM machine, smart phone, and computer/laptop. Table 2 displays frequencies of correct and incorrect answers to the six comprehension questions participants were asked after viewing each of the GPS training videos in the one-to-one hands-oj. Seven of the participants answered all questions correctly, eight missed one question, and five missed two questions.

Table 1: Technology Survey Responses (n=20)

Statement	Agree	Neutral	Disagree	N/A
I am very comfortable using an automated teller machine (ATM).	12 (60%)	2 (10%)	2 (10%)	4 (20%)
I am very comfortable using a smart phone.	7 (35%)	4 (20%)	7 (35%)	2 (10%)
I am very comfortable using a computer or laptop.	11 (35%)	6 (30%)	3 (15%)	

Table 2: Comprehension Question Responses (n=20)

Question	Number of Correct Responses	Number of Incorrect Responses
How do you shut down the GPS unit?	20 (100%)	0
What button is pressed to start the GPS unit in guiding you to your destination?	13 (35%)	7 (35%)
What should you do if you are not comfortable making a turn that the GPS unit instructs you to?	20 (100%)	0
When entering an address into the unit, what would be the first thing that you enter?	15 (75%)	5 (25%)
How would you find a gas station using the GPS device?	20 (100%)	0
If you were to start to enter an address into the “enter search” bar and the GPS device is familiar with the address, what will happen?	14 (70%)	6 (30%)

Post-Session Survey

A post-session survey was given to all participants that completed the one-to-one, hands-on training (n=23), three participants were omitted from data analysis, but their feedback from the post-session survey was kept. The results of the post-session survey demonstrate that after receiving training, the participant's confidence in the GPS unit was high, they were satisfied with the training, and they thought GPS training was important for novice or all users (see Table 3). When indicating what delivery method of future trainings would be best for participants, the responses varied, showing the individuality of preferences when it comes to learning how to use certain technology. Upon leaving the training sessions, the majority of participants verbalized they felt more comfortable using the GPS and over half asked where they could get a unit for personal use.

Table 3: Responses to Post-Session Survey (n=23)

Question	Response	Frequency	Percentage
Did you experience any problems programming the GPS unit?	Yes	6	26.1%
	No	17	73.9%
Which of the following problems did you have?	I never got the destination entered correctly	1	16.7%
	Had a problem touching the correct place on screen	3	50%
	Menus were confusing	1	16.7%
	Other- not specified	1	16.7%
Based upon my experience in the study, my interest in using a GPS is:	Much higher	10	43.5%
	Higher	11	47.8%
	About the same	1	4.3%
	Slightly lower	1	4.3%
Based on my experience in this study, if I used a GPS in the future, I am confident that the directions provided by a GPS will get me to my destination:	Strongly agree	9	39.1%
	Agree	11	47.8%
	Strongly Disagree	3	13%
Which statement best describes your opinion of training for GPS use?	A well-designed program would help novice users	10	43.5%
	A well-designed program would help all users	11	47.8%
	Training should be mandatory before using GPS	2	8.7%
How would you rate the training you received today?	Excellent	21	91.3%
	Good	2	8.7%
How interested would you be in receiving additional training in the use of GPS?	Not at all interested	2	8.7%
	Somewhat interested	7	30.4%
	Moderately interested	8	34.8%
	Very interested	6	26.1%
If you decide to get training in the use of GPS, what would be the best delivery method for you?	On the GPS itself	5	21.7%
	By watching a video	5	21.7%
	Using my computer/smartphone as a reference	1	4.3%
	In person by an instructor	8	34.8%
	By a knowledgeable friend	2	8.7%

Outcomes Measures

Results of the ANOVA on the outcome measure of time spent on each task indicate there were significant differences among groups on the three find route tasks, as well as the search mall task (see Table 4). Post hoc tests of total time spent on each task further demonstrate the differences between groups on these tasks (see Table 5). Post hoc comparisons indicate the one-to-one, hands-on group had significantly lower times than the control group on find route 1 task ($p= 0.01$), and significantly lower times than both the video-only and control groups on find route 1 and 2 tasks ($p=0.04$, 0.01, respectively). On the search mall task, both the one-to-one, hands-on group and video-only group had significantly lower average times than the control group ($p=0.02$, 0.02, respectively). Additionally, Figure 1 illustrates these differences with the one-to-one, hands-on group having lower average times on all destination entry tasks, except for the search mall task, in which the video only group had a slightly lower average time.

Accuracy on the nine destination entry tasks was compared to determine the percentage of incorrect, partially correct, and correct entry method within each group. Results indicate there was a significant difference between groups on the address shortcut 2 ($p=.0048$), search address ($p=0.03$), search mall ($p=0.01$), and search ATM ($p=0.01$) tasks. The one-to-one, hands-on group had higher percentages of correct entry method on these three tasks than the other groups. Although not significant, results indicate the find route 1 and 2 tasks to be very close to being statistically significant ($p=0.06$, 0.07, respectively). Table 6 demonstrates although the results were not significant, the one-to-one, hands-on group had higher percentages of correct entry methods than the video-only and control groups on find route tasks 1-3, ($p=0.06$, 0.07, 0.11, respectively) and the gas station shortcut task ($p=0.75$). On the remaining two tasks, the video-only group had higher percentages of correct answers on the address shortcut 1 and 2 tasks (p=0.18, 0.05 respectively); however, the one-to-one, hands-on group had lower percentages of incorrect answers on all nine tasks. Figure 2 shows the percentage of participants which used the correct entry method on the nine tasks between each group. This figure demonstrates the participants in the one-to-one, hands-on group had a higher percentage of correct entry method used on seven of the nine tasks while the video-only group had a higher percentage of correct entry method used on two of the tasks. Figure 3 demonstrates the distribution of partially correct entry method used between groups. The percentage of participants which used an incorrect entry method in each group is shown in Figure 4; this graph indicates that the one-to-one, hands-on group had the least amount of incorrect responses across all nine tasks, while the percentage of incorrect entry method was higher for participants in the control group in all but one of the nine tasks.

Table 4: Mean, Standard Deviation, and ANOVA of Time on Tasks Between Groups (n=60)

	Task1 Find Route 1	**Task2** Find Route 2	**Task3** Find Route 3	**Task4** Address Shortcut 1	**Task5** Address Shortcut 2	**Task6** Search Mall	**Task7** Search Mall	**Task8** Search ATM	**Task9** Gas Station Shortcut
Mean and (Standard Deviation)									
One-to-One (n=20)	1.70 (1.71)	1.12 (0.57)	1.01 (0.85)	1.08 (0.76)	1.45 (1.20)	1.16 (0.71)	1.04 (0.87)	1.45 (1.48)	1.16 (1.34)
Video-Only (n=20)	3.41 (1.94)	2.63 (1.71)	2.28 (1.99)	1.85 (1.97)	1.55 (1.14)	1.33 (1.01)	0.99 (1.73)	2.27 (1.98)	1.88 (1.79)
Control (n=20)	4.08 (2.16)	2.95 (2.03)	2.25 (1.92)	1.90 (1.74)	2.14 (1.54)	1.78 (1.44)	1.98 (1.73)	2.31 (1.53)	1.75 (1.36)
F Statistic	7.9	7.8	3.76	1.70	1.65	1.73	3.85	1.66	1.31
P Value	0.01	0.01	0.03	0.19	0.20	0.19	0.03	0.20	0.28

*p<0.05= significant

Table 5: Post Hoc Multiple Comparisons of Time on Task Between Groups (n=60)

	Task1 Find Route 1	**Task2** Find Route 2	**Task3** Find Route 3	**Task7** Search Mall
P Value and (Confidence Interval)				
b/w Video and Control	p=0.28 (-1.91, 0.56)	p=0.51 (-1.32, 0.67)	p=0.97 (-1.04, 1.08)	p=0.02 (-1.80, -0.19)
b/w Video and One-to-one	p=0.28 (0.47, 2.94)	p=0.04 (0.52, 2.50)	p=0.02 (0.21, 2.32)	p=0.90 (-0.86, 0.75)
b/w Control and One-to-one	p=0.01 (1.15, 3.61)	p=0.01 (0.84, 2.83)	p=0.02 (0.19, 2.30)	p=0.02 (0.13, 1.74)

*p<0.05= significant

Figure 1: Average Time Spent on Tasks

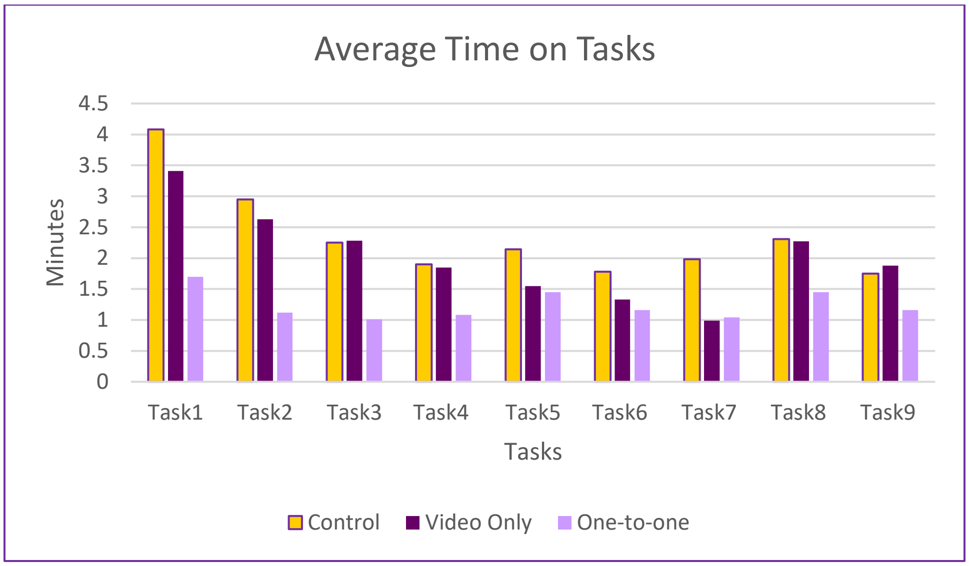


Table 6: Percentage Distribution of Accuracy of Entry Method on Tasks (n=60)

	Task1 Find Route 1	**Task2** Find Route 2	**Task3** Find Route 3	**Task4** Address Shortcut 1	**Task5** Address Shortcut 2	**Task6** Search Address	**Task7** Search Mall	**Task8** Search ATM	**Task9** Gas Station Shortcut
Percent of Incorrect (I), Partially Correct (P), and Correct (C) Destination Entry Method between Groups									
One-to-one (n=20)	I-15	I-15	I-10.5	I-5	I-5	I-10	I-10	I-35	I-15
	P-0	P-0	P-0	P-50	P-50	P-25	P-15	P-15	P-20
	C-85	C-85	C-89.5	C-45	C-45	C-65	C-75	C-50	C-65
Video Only (n=20)	I-35	I-45	I-25	I-15.8	I-21.1	I-15.8	I-15.8	I-57.9	I-21.1
	P-0	P-0	P-0	P-26.3	P-21.1	P-21.1	P-42.1	P-31.6	P-26.3
	C-65	C-55	C-75	C-57.9	C-57.9	C-63.2	P-42.1	C-10.5	C-52.6
Control (n=20)	I-50	I-45	I-40	I-30	I-35	I-35	I-30	I-80	I-30
	P-0	P-0	P-0	P-30	P-15	P-45	P-50	P-5	P-15
	C-50	C-55	C-60	C-40	C-50	C-20	C-20	C-15	C-55
Chi-Square Value	5.55	5.28	4.47	6.21	9.59	10.73	12.74	14.91	1.94
Asymptotic Significance	p=0.06	p=0.07	p=0.11	p=0.19	p=0.048	p=0.03	p=0.01	p=0.01	p=0.75

*p<0.05= significant

Figure 2: Percentage of Correct Entry Method Between Groups

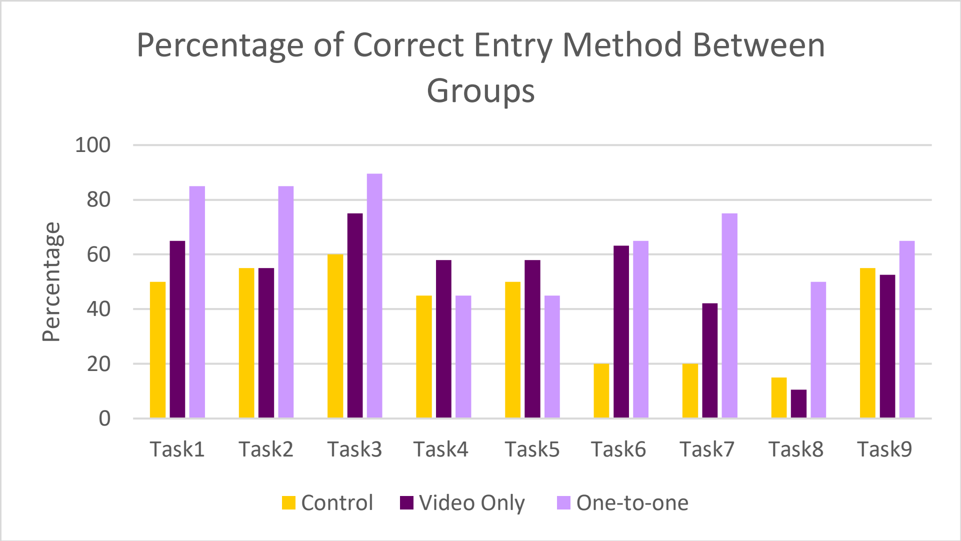


Figure 3: Percentage of Partially Correct Entry Method Between Groups

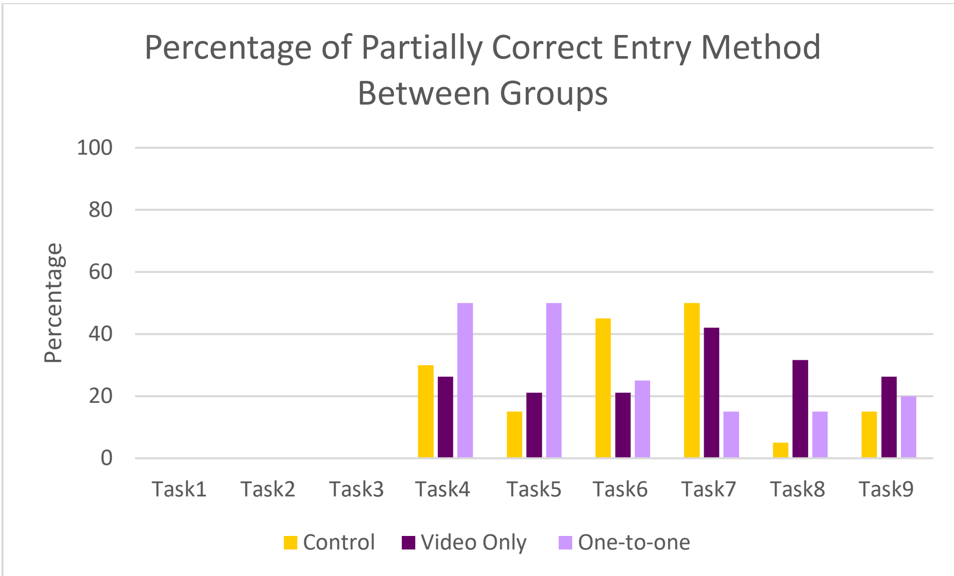
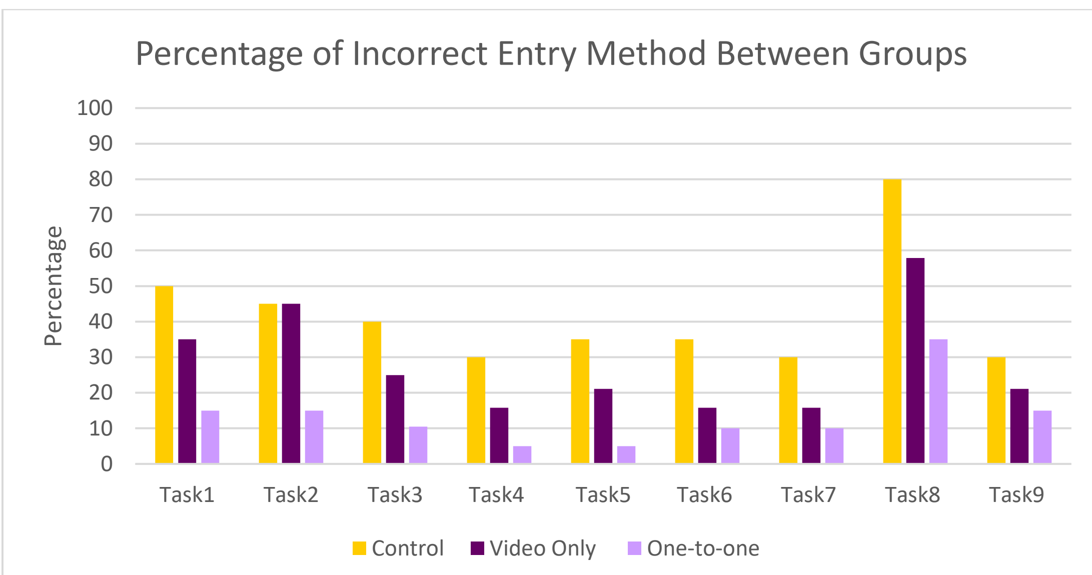


Figure 4: Percentage of Incorrect Entry Method Between Groups



Interrater Reliability

On all nine destination entry tasks, the strength of agreement between the two raters for accuracy scores was very good, indicated by the Cohen's Kappa Coefficient, ranging from *k*=0.86 to *k*=1.00. The results of the intraclass correlation conducted between raters for the outcome measure of time showed there was excellent reliability between raters, with values ranging from 0.92 to 0.99, (see Table 7).

Table 7: Interrater Reliability

	Task 1	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**	**Task 7**	**Task 8**	**Task 9**
Cohen's Kappa Coefficient	*k*=1.00	*k*=0.93	*k*=1.00	*k*=1.00	*k*=0.95	*k*=0.92	*k*=0.97	*k*=0.86	*k*=0.94
Intraclass Correlation Value	0.99	0.99	0.99	0.99	0.99	0.99	0.92	0.99	0.99

Chapter 5: Discussion

The objective of the current study was to investigate how best to improve older adults' ability to use driving technology such as GPS to improve driving safety. Results of a previous study indicated viewing videos that detailed how to set up and program destinations in a GPS unit did improve older adults' performance in completing destination entry tasks as compared to a control. However, there were still some older adults who experienced significant difficulty programming destinations on the GPS, even with the video training (Thomas, et al., 2018). Thus, this study was intended to determine if the addition of one-to-one, hands-on training to viewing videos would improve the ability of older adults to program the GPS unit, as compared to video-only training and to no training at all. Results demonstrated the one-to-one, hands-on training improved the performance of participants programming the GPS and thus, suggests that one-to-one, hands-on training is a more effective method for older adults.

Specifically, the one-to-one, hands-on group was faster when following directions and entering the nine destination tasks into the unit, as compared to both the video-only and control group. This was especially evident when comparing the control group to the other groups. As the control group, these participants did not receive any instruction on how to program the GPS unit, and demonstrated longer times completing the tasks. Additionally, although not significant for all tasks, results indicated the one-to-one, hands-on group used the correct entry method more often and had fewer incorrect responses on all nine of the tasks, as compared to the other two groups. Again, the participants in the control group had fewer correct responses and more incorrect responses to the tasks when compared to the two intervention groups. Thus, these results indicate training, both through the video-only and the one-to-one, hands-on method, is an effective way to increase older adults' performance when using and programming driving technology such as GPS. When considering the video-only method specifically, the video-only group performed better compared to the control group overall, supporting the results of the previous study. Use of a video-only training method could be a cost and time effective training method when educating older adults to use technology, however, when possible, a hands-on method may be more effective and yield better results.

The post-session survey given to all 23 participants who completed the one-to-one, hands-on training session revealed important information about their experience. Overall, the survey results showed after receiving training, the participant's confidence in the GPS unit was high, they were satisfied with the training, and they thought that GPS training was important for novice or all users. When indicating what delivery method of future trainings would be best for participants, the responses varied, showing the individuality of preferences when it comes to learning how to use certain technology. Additionally, most of the participants rated the training they received as excellent. Upon leaving the training sessions, the majority of the participants verbalized they felt more comfortable using the GPS and over half asked where they could purchase a unit for personal use.

In considering why results did not support the expected significance for the one-to-one, hands-on group in all tasks and accuracy when compared to the other groups, there are two potential possibilities. First, the method of determining accuracy was not specific, but had to be coded in a nominal data, leading to less powerful nonparametric statistics. The other may be an issue of too few participants. Continued research should include larger groups. However, the data is significant in the salient tasks and trends clearly suggest that training, especially one-to-one, hands-on training will assist older adults in learning how to use GPS technology, which has been shown to improve their driving performance in unfamiliar areas (Eby et al., 2015).

The reason the one-to-one, hands-on training was more effective likely relates to adult learning principles which specifically suggests how to create an effective learning climate for adult learners. Training should include components which integrate real life contexts and enable individuals to problem solve through situations with the support of others (Gallagher & Bell, 2016). Older adults value understanding task steps, prefer step-by-step directions, place value on a variety of learning resources, and desire practice and feedback more so than younger age groups (Leung et al., 2012). The one-to-one, hands-on training provided a supportive environment for the participants to receive feedback, practice skills, and problem solve through the process of entering destinations into the unit after viewing the videos and demonstrations, therefore increasing performance. Compared to younger generations, older adults do not prefer trial and error as a learning method (Leung et al., 2012). The one-to-one, hands-on training session allowed participants to practice using the GPS while the researcher corrected any mistakes; this may have mitigated the frustrating effects of trial and error that older adults may experience without training. The videos and demonstrations broke the steps of GPS use into understandable parts. Furthermore, the use of both the videos and the hands-on demonstrations as an education method provided a variety of learning resources for participants. A previous study (Hermann, Johnston, Brosi, & Jaco, 2012) involving the creation of an educational program related to technology for older adults found providing education with hands-on demonstrations increased the awareness of available technologies and increased confidence when using those technologies. The findings of the current study support this; the participants in the one-to-one group were faster when entering destinations into the GPS unit as compared to the other groups, indicating increased confidence and ease when using the technology.

Previous studies have shown a combination of both classroom and hands-on training for older drivers is an effective method for increasing performance, and without hands-on instruction, older drivers may not show improvement, because they do not feel comfortable trying new techniques (Bedard et al., 2008). The current study used videos to train older adults to learn to use the GPS, but additionally provided hands-on components in which the participants were able to practice learned skills before performing the destination entry tasks. Having the opportunity to view demonstrations and then practice the tasks may have made the participants more comfortable when performing new techniques to use technology.

Vehicle technologies such as GPS, have the potential to benefit the older adult and improve driving performance and safety. Navigation systems have been found to be helpful for older drivers in wayfinding; they travel to places they would not normally go or would typically avoid and have feelings of increased confidence and safety (Eby et al., 2015). Although these technologies have the potential to benefit the older driver, many older adults report difficulties when learning to use them (Eby et al., 2015). The results of this study as well as previous (Dennis) demonstrate the difficulties older adults experience when learning these technologies may be mitigated by the use of a video training or hands-on approach when training older drivers to use technology systems such as GPS. Furthermore, the use of training tailored to meet the needs of older adults may be used across settings to train older drivers to use technologies and strategies which would increase on-road safety; therefore, enabling older adults to remain driving for longer.

In summary, the results indicated the hands-on/one-to-one training was an effective method for decreasing the amount of time spent on the destination entry tasks compared to the video only and control groups. Although the accuracy of entry method varied between groups, the one-to-one group showed improved performance in many tasks compared to the other groups. Additionally, the results of the post-session survey indicated participants were satisfied with the training, felt it was important, and felt confident the GPS unit would get them to their destination if using it in the future. The results of the current study support the use of training, both in a video only and one-to-one format, however, a one-to-one, hands-on training method may be the most effective way to educate older adults to use technology systems such as GPS. The use of a training method which meets the unique needs of older adult learners may increase performance and confidence when using in-vehicle technologies, and therefore, may promote on-road safety and allow older adults to remain driving for longer.

Implications for Occupational Therapy Practice

This study informs occupational therapists of the importance and effectiveness of using one-to-one, hands-on training methods when educating older adults to use any type of technology. Occupational therapists should consider the differences in the needs of older adult learners and ensure that interventions are tailored to meet those needs. When working with older adults, it should not be assumed that they understand technology in the same way as younger generations. Therefore, occupational therapists should be sensitive to language or terminology used, and the speed at which training takes place when teaching older adults to use technology. Hands-on training can be used across settings when working with older adults to improve performance in using adaptive equipment, assistive technology, and driving specific technology.

Driving technologies have the potential to increase the safety of older drivers (Dickerson, et al., 2017), but consideration should be made regarding the accessibility of technology to older adults. When training older adults to use technology, occupational therapists should create an effective learning climate and provide demonstrations with opportunities to receive feedback and practice learned information. For occupational therapists working in the driver rehabilitation setting, it is important to consider the unique learning needs of older adults when training them to use in-vehicle technologies that could increase their confidence, safety, and enable them to remain driving.

Limitations

Several limitations were present in this study. Participants were recruited using convenience sampling and a snowball method, decreasing the representativeness of the general population; potentially limiting the external validity of the study. Although the screening form, outcome measures, and the study procedures were consistent between groups, standardized assessments were not used in this study, limiting control and reliability of the instruments used. To minimize the impact of the non-standardized assessments, two research team members were used to score the destination entry tasks and to increase inter-rater reliability.

Another limitation was the sample size; only 20 participants were used in each group. Increasing the number of participants in each group would increase the representativeness of the older adult population and would increase the ability to determine if patterns or relationships were present between groups when analyzing the outcome measures.   Furthermore, since the present study was designed to examine older adult learning using two training methods, long term effectiveness was not considered, limiting the validity of the study. A limitation existed in the scoring method; the method of determining accuracy was not specific, leading to less powerful nonparametric statistics. Future studies should consider an alternate method of determining accuracy. Finally, since the study took place in a controlled setting, the translation to on-road GPS use is limited; future studies should consider the on-road experience of GPS use.

Future Research

To generalize about one-to-one training for the older adult population, additional research should take place that includes more participants. Future studies should consider the use of multiple training sessions to increase opportunities to practice learned skills as well as post-tests to determine long-term retention. Future research regarding translation from material learned in training sessions to on-road performance would strengthen the relationship between one-to-one, hands-on training and increased performance Researchers have theorized that the human computer interaction of the GPS unit used in these studies was unnecessarily complicated and may have contributed to difficulties when entering destinations into the unit (Thomas, et al., 2018). Additional studies could be used to determine the best human-technology interface that is conducive to older adult use. Furthermore, training in the use of similar technologies such as GPS applications on smart phones should be explored. Training sessions that include other in-vehicle technologies that have the potential to benefit older drivers should be considered in determining the best method for increasing older adults' performance when using various forms of technology. In-vehicle technologies have the potential to extend the time that an older driver can remain driving; some technologies have been shown to help with crash avoidance, increase comfort of driving, and improve older driver's ability to travel to places they may typically avoid (Eby et al., 2015).

Conclusion

The results of this study indicate that a one-to-one, hands-on training method improved older adults' performance when using GPS technology. Although the results did not support the expected significance of the one-to-one, hands-on group in terms of accuracy, the results suggest that training that is tailored to meet the unique needs of older adult learners can improve confidence and performance. Technology such as GPS has the potential to benefit the older adult and enable them to remain driving for longer. This information is important when considering the staggering number of older adults that are expected to remain mobile in the coming years and the problems that may experience related to driving. Furthermore, the findings of this study are important to occupational therapists working with older adults in various settings; education and training should consider adult learning principles and incorporate demonstrations, opportunities to practice, and feedback. This study supports further exploration of older adult learning needs when using technology.

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Appendix A: IRB Approval

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
4N-70 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** · **www.ecu.edu/ORIC/irb**

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
To: Michael Coleman
CC:
Anne Dickerson
Date: 8/7/2017
Re: UMCIRB 17-001190
Older Adult GPS Study

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) is for the period of 8/7/2017 to 8/6/2018. The research study is eligible for review under expedited category #6, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Coleman Research Proposal 6.19.17.docx	Study Protocol or Grant Application
GPS Study Flyer Revised.docx	Recruitment Documents/Scripts
GPS_Survey(1).docx	Surveys and Questionnaires
Informed Consent Revised 7.10.17.doc	Consent Forms
Screening Questionnaire.docx	Surveys and Questionnaires
Technology Survey.docx	Surveys and Questionnaires

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

IRB00000705 East Carolina U IRB #1 (Biomedical) IORG0000418
IRB00003781 East Carolina U IRB #2 (Behavioral/SS) IORG0000418

Appendix B: Screening Form

1. Date of Birth ____________

2. Sex? ___ Male ___ Female

3. Which race category best describes you? (Check one)

   ___ White ___ Black/African American ___ American Indian or Alaska Native

   ___ Asian ___ Other

4. Are you of Hispanic or Latino origin? ___ Yes ___ No

5. Do you currently have a valid (i.e., not expired, not suspended) North Carolina driver's license?

___ Yes ___ No (Stop, you are not eligible for the study)

If yes, do you have any of the following restrictions on your license? (check all that apply)

___ Corrective lenses

___ Hearing aids

___ Daytime only

___ Limited distance from home

___ No interstate/highway

___ Adaptive (hand) controls

___ Alcohol interlock

___ Other______________________

6. In a typical week, do you drive at least 3 times?

___ Yes ___ No

7. Which of the following statements best describes your use of in-vehicle electronic navigation systems such as built-in or add-on GPS units, Onstar®, or cell phone navigation applications? (Check one)

___ Have never used one myself and do not know how to use one

___ Have tried to use one but do not feel comfortable using one now

___ Use one sometimes but I don't feel confident

___ Use one sometimes and I feel confident

___ Use one regularly and confidently

8. What type of electronic navigation system do you use most often? (Check one)

___ Built-in with map display ___ Built-in audio only ___ Portable dash/window mount ___ Cell phone ___ Other__________ ___ None

9. When you go to an unfamiliar place, what is your preferred navigation method? (Check one)

___ Paper Map ___ Electronic Navigation Device ___ Turn-by-turn directions

___ Passenger navigating

10. Your involvement in this study could include 1 visit to the East Carolina University campus, taking around 45 minutes. Are you willing to participate if chosen?

___ Yes ___ No

Appendix C: Consent Form

Study ID:UMCIRB 17-001190 Date Approved: 8/30/2017 Expiration Date: 8/6/2018

East Carolina University

Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Older Adult GPS Training
Principal Investigator: Michael Chandler Coleman
Institution, Department or Division: East Carolina University, Occupational Therapy Department
Address: 3325 Health Sciences Building
Telephone #: (828) 606-5446

Researchers at East Carolina University (ECU) study issues related to society, health problems, environmental problems, behavior problems and the human condition. To do this, we need the help of volunteers who are willing to take part in research.

Why am I being invited to take part in this research?
The purpose of this research is to determine if one-on-one training is more effective than video training alone in regards to GPS education in an older adult population. You are being invited to take part in this research because you are over 60 years of age, are a current driver with a valid license, and have limited knowledge of GPS devices. The decision to take part in this research is yours to make. By doing this research, we hope to learn that one-on-one training is more helpful than video tutorials alone for older adults learning to use a GPS device.
If you volunteer to take part in this research, you will be one of about 20 people to do so.

Are there reasons I should not take part in this research?
You should not take part in this research if you have significant hearing, visual, cognitive, or physical deficits that would impact your ability to complete a task relating to a GPS device. You should also not take part in this research if you have extensive knowledge about GPS devices.

What other choices do I have if I do not take part in this research?
You can choose not to participate, but there are no similar programs.

Where is the research going to take place and how long will it last?
The research will be conducted at the East Carolina University College of Allied Health Sciences building. You will need to come to room 1330 in the Allied Health Building one time during the study. The total amount of time you will be asked to volunteer for this study is about 45 minutes.

What will I be asked to do?
You will be asked to do the following:

- Complete a questionnaire relating to your demographic information and experience with GPS devices.
- Complete a short survey relating to your experience with technology.
- Watch video tutorials that provide information about GPS and how to program GPS devices. After each video, you will be asked a question relating to the content of the video.
- Watch a demonstration of entering a destination into the device.
- Enter nine destinations into the GPS device using the knowledge from the video tutorials.

- Complete a survey about your experience with the GPS training.

What might I experience if I take part in the research?
There are no known risks associated with this research. You may benefit from taking part in this study in that you will receive one-on-one training with the GPS, which may be helpful to you in the future, if you choose to use a GPS. If you do not use a GPS in the future, you will at least help us in understanding how older adults learn to use GPS technology.

Will I be paid for taking part in this research?
If all requirements of the study are completed you will receive a $30 Target gift card.

Will it cost me to take part in this research?
It will not cost you any money to be part of the research.

Who will know that I took part in this research and learn personal information about me?
ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- The members of the research team will know that you took part in this research and may see information about you that is normally kept private.
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff have responsibility for overseeing your welfare during this research and may need to see research records that identify you.

How will you keep the information you collect about me secure? How long will you keep it?
Your name will not be connected with your data. We will be using a code number, so all information will be confidential. Information will be kept for a minimum of three years after the completion of the study.

What if I decide I don't want to continue in this research?
You can stop at any time after it has already started. There will be no consequences if you stop and you will not be criticized. You will not lose any benefits that you normally receive.

Who should I contact if I have questions?
The people conducting this study will be able to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator, M. Chandler Coleman, at 828-606-5446 (days, between 8:00 am-5:00 pm.)

If you have questions about your rights as someone taking part in research, you may call the Office of Research Integrity & Compliance (ORIC) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the ORIC, at 252-744-1971

Are there any Conflicts of Interest I should know about?
The Principal Investigator and co-investigators have no conflict of interests related to this study.

I have decided I want to take part in this research. What should I do now?
The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.

- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

____

Participant's Name (PRINT) **Signature** **Date**

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

____

Person Obtaining Consent (PRINT) **Signature** **Date**

Appendix D: Scoring Form and Scoring Variables

participant ID	StartTimeTask1	EndTimeTask1	TotalTimeOnTask1	AccuracyTask1	CommentsTask1	StartTimeTask2	EndTimeTask2	TotalTimeOnTask2	AccuracyTask2	Comments
T01										
T02										
T03										
T04										
T05										
T06										
T07										
T08										
T09										
T10										
T11										
T12										
T13										
T14										
T15										
T16										
T17										
T18										
T19										
T20										

Entire Entry Made Correctly. In order to be fully correct, a person had to enter the address as shown on the task sheet and press Go! to calculate the route. An entry was scored as incorrect if a person entered the wrong address, did not calculate the route, timed out, or gave up on the task. The following numbers were used for scoring:

0 -Incorrect entry method

1 - Partially correct: either correct entry method but wrong address or incorrect entry method but correct address

2- Correct entry method

Total Time on Task. Duration of entry task from start (when the participant is given the instructions) to the end of task (when the participants presses “Go!”, participant gives up on task, or researcher terminates task.)

Appendix E: Technology Survey

1. Express your agreement with this statement: I am very comfortable using an automated teller machine (ATM) machine.
A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

2. Express your agreement with this statement: I am very comfortable using a smart phone.
A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

3. Do you use features on your smart phone beyond the telephone functioning? If so, please list below.

4. Express your agreement with this statement: I am very comfortable using a computer or laptop.
A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

Appendix F: Comprehension Questions

Video 1. How do you shut down the GPS unit?

Answer. Press and hold the power button, turn off the ignition of car, or pull the power cord.

Video 2. What button is pressed to start the GPS unit in guiding you to your destination?

Answer. The green “Go!” button.

Video 3. What should you do if you are not comfortable making a turn that the GPS unit instructs you to?

Answer. Keep going straight, the GPS unit will re-calculate the route and find another way to the destination.

Video 4. When entering an address into the unit, what would be the first thing that you enter?

Answer. Enter the street number first and then the street name.

Video 5. How would you find a gas station using the GPS device?

Answer. Press the “Gas Station” shortcut, select the gas station, and press “Go!”

Video 6. If you were start to enter an address into the “enter search” bar and the GPS device is familiar with the address, what will happen?

Answer. The full address will show in the blue bar below the search box as soon as the unit recognizes the address, which can be selected and navigation to that address will begin by selecting “Go!”

Appendix G: Destination Entry Instructions

- You will be using the GPS device to find a route to a specific address or location. The researcher will provide you with a piece of paper for each task.
- Your goal is to follow the directions to enter an address or location as quickly and accurately as possible. You must press Go! after you enter each address in order to calculate the route.
- You will have time to review the GPS unit's Quick Start Guide and familiarize yourself with the device for a few minutes before the first official destination entry. This can include practicing on the device for a few minutes.
- You can use the Quick Start guide throughout the trials if needed.
- Do not pick up or move the GPS unit since a camera is recording the GPS screen.
- The researcher is not allowed to provide instructions on how to use the GPS at any time or help you in any manner during this task.

Appendix H: GPS Destinations Entry Tasks

1. Find a route to:
101 Kenwood St
Belmont, NC 28012
2. Find a route to:
437 Daniels St
Raleigh, NC 27605
3. Find a route to:
713 Airport Rd
Kinston, NC 28504
4. Use the **"Address"** shortcut to find a route to:
2225 Stantonsburg Rd
Greenville, NC 27834
5. Use the **"Address"** shortcut to find a route to:
1040 Blakeslee Ave
Goldsboro, NC 2753
6. Use the **"Enter Search"** window to find a route to:
399 Commerce Ave
Lumberton, NC 28358
7. Use the **"Enter Search"** window to find a route to:
Greenville Mall in Greenville, NC
8. Use the **"Enter Search"** window to find a route to:
ATM in Greenville, NC
9. Use the **"Gas Station"** shortcut to find a route to:
Hess
210 W 10^{th} Street in Greenville, NC

Appendix I: Post-session Survey

Q1 Did you experience any problems programming the GPS unit?

- ❍ Yes (1)
- ❍ No (2)

Q2 If so, which of the following problems did you have? (check all that apply)

- ❑ Had problem touching the correct place on the screen (1)
- ❑ Menus were confusing (2)
- ❑ Keyboard was confusing (3)
- ❑ Couldn't read the screen well (4)
- ❑ Got the sequence of city, street and number wrong (5)
- ❑ It took too long to enter the destination (6)
- ❑ I never got the destination entered correctly (7)
- ❑ Touch screen did not respond as expected (8)
- ❑ Other, type in the space below. (9) ____________________

Q3 Based upon my experience in the study, my interest in using a GPS is:

- ❍ Much Lower (1)
- ❍ Slightly Lower (2)
- ❍ About the Same (3)
- ❍ Higher (4)
- ❍ Much Higher (5)

Q4 Based on my experience in this study, if I used a GPS in the future, I am confident that the directions provided by a GPS will get me to my destination:

- ❍ Strongly agree (1)
- ❍ Agree (2)
- ❍ Neutral (3)
- ❍ Disagree (4)
- ❍ Strongly disagree (5)

Q5 Which statement best describes your opinion of training for GPS use:

- ❍ There is no need for training (1)
- ❍ A well-designed training program would help novice users (2)
- ❍ A well-designed training program would help all users (3)
- ❍ Training should be mandatory before using GPS (4)
- ❍ Other (5) ____________________

Q6 How would you rate the training you received today?

- ❍ Terrible (21)
- ❍ Poor (22)
- ❍ Average (23)
- ❍ Good (24)
- ❍ Excellent (25)

Q7 How interested would you be in receiving additional training in the use of a GPS?

- ❍ Very interested (1)
- ❍ Moderately interested (2)
- ❍ Somewhat interested (3)
- ❍ Not at all interested (4)

Q8 If you decided to get training in the use of GPS, what would be the BEST delivery method for you? Select one.

- ❍ By a knowledgeable friend (1)
- ❍ In person by an instructor (2)
- ❍ Using a printed book or manual (3)
- ❍ By watching a video (4)
- ❍ Using my computer/table/smartphone as a reference (5)
- ❍ On the GPS itself (6)
- ❍ Other, type in the space below. (7) ____________________

Q9 How much time do you think most people would be willing to devote to learning more about using a GPS?

- ❍ None (1)
- ❍ Half hour or less (2)
- ❍ 30 minutes to an hour (3)
- ❍ Up to 2 hours (4)
- ❍ However long it might take (5)

Q10 What topics do you think GPS training should focus on? Indicate the response for each item.

	Critical to provide training. (1)	Important to provide training. (2)	It might be important for some people. (3)	Not important to provide training. (4)	Not sure. (5)
How to use the mounting system(s) (1)	❑	❑	❑	❑	❑
How to use the cords to power up (2)	❑	❑	❑	❑	❑
What a GPS is/does; why it can take a while to find satellites (3)	❑	❑	❑	❑	❑
Using the touchscreen (4)	❑	❑	❑	❑	❑
How to use the menus and when to use the menus. (5)	❑	❑	❑	❑	❑
How to save trips or locations (6)	❑	❑	❑	❑	❑
Only specific functions (i.e. don't need training on full functionality) (7)	❑	❑	❑	❑	❑
Updating maps (8)	❑	❑	❑	❑	❑
How to avoid distraction (9)	❑	❑	❑	❑	❑
What to do if you think the GPS is "wrong" (10)	❑	❑	❑	❑	❑
How to change your route (11)	❑	❑	❑	❑	❑
How to cancel your route (12)	❑	❑	❑	❑	❑
Troubleshooting (13)	❑	❑	❑	❑	❑
Other (14)	❑	❑	❑	❑	❑

Appendix J: Gift Card Received Form

East Carolina University

Title of Research Study: Comparing the Effectiveness of Video Training Alone Versus Hands-on Training for Older Adults Using GPS Technology
Principal Investigator: M. Chandler Coleman
Institution/Department or Division: Occupational Therapy
Address: ECU Health Sciences Building, Greenville, NC 27858
Telephone #: (828) 606-5446

As volunteer in this study, I received a $30.00 gift card.

____

Participant's Name (PRINT) **Signature** **Date**

I certify that the above signed has agreed to the conditions of this study indicated above. I approve the disbursement of a gift card numbered __________________ in the amount of $ 30.00 to the participant for this step of the study on this date__________________.

_________________________________ _____________

Signature of Principal Investigator **Date received**