TAI CHI AND DRIVING CESSATION TRANSITION

Examining the Effect of a Tai Chi Intervention on Psychosocial Consequences of Driving Cessation among Older Adults

Dissertation submitted to the Kent State University College of Nursing in partial fulfillment of the requirements for the degree of Doctor of Philosophy

by

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Abstract

EXAMINING THE EFFECT OF A TAI CHI INTERVENTION ON PSYCHOSOCIAL CONSEQUENCES OF DRIVING CESSATION AMONG OLDER ADULTS

Dissertation Committee Chair: Barbara L. Drew, PhD, PMHCNS-BC

Advanced age is associated with age- and illness-related changes that often limit driving ability. Driving cessation is a major life transition that can lead to negative psychosocial consequences including worsening of depressive symptoms, social isolation, loneliness, and poorer quality of life in older adults. This study was conducted to determine the effectiveness of a 6-week Tai Chi intervention on managing those consequences of driving cessation among older adults. A theoretical model was developed based on integrating the concepts of a conceptual model developed by Choi et al. (2012) and the Transitions Model (Meleis et al., 2000). A two-group, repeated measures, quasi-experimental design was used. Older adults who have either quit driving or were making plans to quit driving \( n = 20; 19 \text{ women, 1 man, } M_{\text{age}} = 73.6 \text{ years, } SD = 5.9 \text{ years} \) were recruited from senior housing centers. Ten participants were non-randomly assigned to the intervention group and practiced Tai Chi for six weeks with two one-hour sessions...
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per week; the other 10 were assigned to the wait-list control group. Demographic data and data regarding driving history were collected at baseline. Depressive symptoms, social isolation, loneliness, and quality of life were measured at baseline, three weeks, and six weeks. Data were analyzed using SPSS (version 22). Descriptive and correlational analyses were completed and groups were compared on all measures at baseline. MANOVA and follow-up ANOVA, when needed, were conducted to answer the research questions. The results indicate that the intervention group had a significant decrease in depressive symptoms and social isolation and increase in their quality of life compared to the control group. This study provides preliminary knowledge about the effectiveness of implementing a Tai Chi intervention to manage the negative psychosocial consequences of driving cessation in older adults. Nurses are encouraged to consider Tai Chi as a facilitator of driving cessation. The findings are, however, limited by the sample size and characteristics of participants. Further theory-generating and testing research is needed to advance nursing knowledge in this area.
Chapter 1

Introduction

One of the remarkable demographic changes in the U.S population is the dramatic growth of the older adult population. According to the U.S. Census Bureau (2011), the older adult population increased between 2000 and 2010 at a faster growth rate of 15.1% than the total U.S population which increased by 9.7%. This age group, 65 years and older, is projected to grow at an even faster rate over the next few decades. In 2010, there were approximately 40.2 million people who were 65 years of age and older. This number is projected to double and reach 88.5 million by 2050 (U.S. Census Bureau, 2010). This dramatic increase in the older population is associated with a similar increase in the number of older drivers. Among the current older adult population, there are approximately 30 million older people who are licensed drivers in the U.S (National Highway Traffic Safety Administration [NHTSA], n.d).

Driving an automobile is the most preferred and common form of transportation in the U.S. (Choi, Adams, & Mezuk, 2012; Gardezi et al., 2006; O'Neill, 2000). Furthermore, use of transportation, including driving, is reported as the second most important instrumental activity of daily living (IADL) among community-dwelling older adults (Fricke & Unsworth, 2001). Results from the Second Injury Control and Risk Survey, conducted at the national level, showed that 73% of people ranging in age from
75 to 84 years and 60% of people 85 years of age and older are still active drivers (Betz & Lowenstein, 2010). Another report indicated that 85% of people 75 years of age and older, who voluntarily participated in a retrospective study, were drivers despite their advanced age and chronic health problems (Carr, Flood, Steger-May, Schechtman, & Binder, 2006). Therefore, it is reasonable to expect that the number of older drivers will increase as the proportion of older adults in the population increases.

As an IADL, driving requires a state of physical, functional, sensory, and cognitive well-being (Haltiwanger & Underwood, 2011). Unfortunately, older adults experience declines in one or more of those health domains as a result of age-related changes and/or changes secondary to chronic illnesses such as cognitive impairments and heart diseases. Such changes predispose older drivers to be at higher risk for motor vehicle crashes and subsequent disability and mortality. Compared to other age groups, Betz and Lowenstein (2010) reported that older drivers had a higher incidence of involvement in motor vehicle accidents (MVAs) per mile driven and they had higher mortality rate per MVA. On average, 15 older adults are killed and 586 others are injured every day as a result of involvement in MVA in the U.S. (NHTSA, 2014). As a result, many older adults tend to either self-limit their driving or stop driving altogether. Examples of self-limitation behaviors include reducing driving at night, in unfamiliar areas, on high-speed roads, during long trips, and in poor weather conditions (Betz & Lowenstein, 2010). On the other hand, older adults may stop driving only when advised to or pressured by family members, friends, and/or physicians.

Statement of the Problem
Liddle and colleagues argued that driving is a role and that driving cessation results in a loss of that role (Liddle, Gustafsson, Bartlett, & McKenna, 2012). Older adults often link driving privileges to maintaining independence and avoiding being a burden on relatives and friends. People rely on driving the automobile to access community resources, shopping centers, and health care settings. In rural areas, driving the automobile seems to be even more necessary as a result of the limited public and community transportation alternatives (Liddle, Turpin, Carlson, & McKenna, 2008). Despite the felt need to continue driving, approximately one million older adults in the U.S. transition into non-driving each year (Dickerson et al., 2007). Such transition has unique predictors, attributes, and consequences. The following discussion will shed light on these aspects of the driving cessation transition.

**Predictors of Driving Cessation**

Driving cessation is a major life transition, among other transitions, that many older adults experience. This transition and various related aspects, including driving cessation predictors, have been investigated extensively over the past few decades. Health-related and other issues have been investigated as predictors of driving cessation. The following discussion focuses on the main predictors of the driving cessation transition in older adults.

**Age.** Results from multiple studies have shown that advanced age is a significant predictor of driving cessation (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008; Anstey, Windsor, Luszcz, & Andrews, 2006; Dellinger, Sehgal, Sleet, & Barrett-Connor, 2001; Edwards et al., 2008; Edwards, Bart, O’Connor, & Cissell, 2010; Emerson et al., 2012; Sims, Ahmed, Sawyer, & Allman, 2007). Advanced age is reported as an
independent risk factor for driving cessation. Drivers start experiencing functional declines at approximately 55 years of age and they are at risk for dramatic decrease in driving functional abilities after 75 years of age (Johnson, 2002). In addition, aging is often associated with having a higher risk for debilitating illnesses and age-related physical, sensory, and cognitive declines. However, a recent report, based on the results from the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) clinical trial, a randomized controlled trial (RCT) conducted at six different sites in the U.S., showed that age is a predictor, but not a significant one, of driving cessation among older adults (Choi, Mezuk, Lohman, Edwards, & Rebok, 2012). Such variations in research findings can be attributed to using different methodological approaches and statistical analyses. For example, Edwards and colleagues (2010) reported findings from a longitudinal study that lasted 10 years, whereas Choi et al. (2012) included findings from a five-year longitudinal study in their report. In addition, Choi and colleagues’ findings are not congruent with other reports based on the findings from the ACTIVE clinical trial (e.g. Ackerman et al., 2008; Edwards et al., 2008) and this might be attributed to using different statistical analyses.

**Gender.** Another demographic predictor of driving cessation or limitation is gender; however, the results from the literature are mixed. While female gender was found to be correlated with driving cessation in some studies (Anstey et al., 2006; Choi et al., 2012; Keay et al., 2009), it is not a predictor in others (Dellinger et al., 2001; Edwards et al., 2010). Methodological variations, statistical analyses differences, demographic variations of the different samples, and the sampling method may explain having such variations in the literature. As a predictor of driving cessation, female gender correlation
with driving cessation can be explained by considering the traditional differences between the males and females roles. It is claimed that females tend to enjoy home-oriented activities and hobbies (Davey, 2007), hence, they can be more willing to give up driving than men. In addition, women’s life expectancy is longer than men’s.

**Debilitating illnesses.** Chronic illnesses affecting mainly older adults increase the likelihood of driving cessation. According to the Centers for Disease Control and Prevention (CDC), age is positively associated with chronic diseases such as heart disease, stroke, arthritis, and sensory impairments including hearing and visual problems (Schiller, Lucas, & Pereygo, 2012). Health conditions and illnesses such as cognitive impairments (Edwards et al., 2008; Edwards et al., 2010; Emerson et al., 2012; Keay et al., 2009), congestive heart failure (Ackerman et al., 2008), visual disturbances and glaucoma (Adler, Bauer, Rottunda, & Kuskowski, 2005; Dellinger et al., 2001; Edwards et al., 2008; Emerson et al., 2012), poor physical and functional ability (Edwards et al., 2008), stroke (Ackerman et al., 2008), and poor self-rated health (Ackerman et al., 2008; Anstey et al., 2006; Sims et al., 2007) were reported as significant predictors of driving cessation in older adults. Such conditions are highly prevalent in the older adult population and they frequently lead to significant life transitions including driving cessation.

**Other demographic predictors.** Interactions between the previously discussed predictors of age, gender, and chronic illnesses seem to be likely and this interaction may result in a more rapid, or even an unplanned, involuntary transition to driving cessation. In addition, other sociodemographic factors may expedite or delay this transition. For example, marital status of men, i.e. being married, predicts delaying driving cessation.
In regard to racial differences, the majority of studies involved mainly white Caucasian participants with few exceptions. Given that, non-whites were found to be more likely to give up driving than whites (Choi et al., 2012). In a study involving White and African American participants, the latter were more likely to report their health as poor to fair and to have more chronic illnesses than the former group (Sims et al., 2007). Poor to fair self-reported health, in turn, was significantly associated with higher risk for the driving cessation transition.

**Alternative transportation.** Availability of alternative transportation from relatives, friends, and public transportations is another predictor of driving cessation (Choi, Adams, & Kahana, 2012). Specifically, the support provided by friends is more predictive of driving cessation than family members’ support (Choi et al.). However, many older adults are often hesitant to ask for rides from their relatives and friends. Relying on friends is thought to provide more social context than asking relatives for rides (Bauer, Rottunda, & Adler, 2003). Older adults receiving rides from either family members or friends were found to be relatively satisfied with life after stopping driving (Musselwhite & Shergold, 2013).

Rural areas are known to have limited access to formal, public and/or community transportation systems (Davey, 2007; Liddle et al., 2008), and there may be less informal transportation support from family and friends (Johnson, 2002). Residence in rural areas, therefore, may delay driving cessation and, consequently, endanger public safety and increase the older driver risk for MVA’s as well as injuries and death. Even when public transportation is available, many older adults seem reluctant to use this alternative (Buys, Snow, van Megen, & Miller, 2012; Liddle & McKenna, 2003). The limited utilization of
public transportation is related to many factors including lack of knowledge about availability, cost, schedule, and locations and destinations of public transportation (Bauer et al., 2003; Musselwhite & Shergold, 2013). Issues related to safety of public transportation alternatives can limit utilization of such alternatives by older adults (Kim & Richardson, 2006). In addition, Buys and colleagues (2012) reported that the convenience of using a private vehicle and health and mobility issues are two main barriers of using public transportation by older adults. Consequently, limited use of public transportation can delay driving cessation.

Driving Cessation Attributes

The driving cessation transition has some unique attributes that will be discussed in this section.

Driving cessation decision-making process. The driving cessation decision-making process is often a complicated phenomenon. While some older adults make their own decision to quit driving, others find themselves obligated to quit driving. Based on the extensive literature review, voluntary driving cessation decision can be defined as the autonomous decision made by the older adult to quit driving mainly as a result of changes in health condition. This type of decision can be facilitated by guidance and advice provided by informed family members and/or health care providers (Betz, Schwartz, Valley, & Lowenstein, 2012). There is no doubt that making an autonomous, voluntary decision to quit driving is the preferred option by older adults (Adler, 2010; Ralston et al., 2001). That is because making such a decision is essential to give older adults freedom and control over crucial life events. It also enhances the sense of independence among older adults.
Other older adults may experience an involuntary driving cessation decision-making process. An involuntary decision to quit driving is the decision made by family members, health care providers, or the department of motor vehicles (DMV) personnel with minimal consideration of the older driver’s opinion. Family members often times play a key role in this form of the driving cessation decision-making process. When they notice unsafe driving behaviors, family members feel obligated to support their loved ones (Ralston et al., 2001) and they may start exerting pressure on older drivers to quit driving. According to a survey conducted by Betz and colleagues (2012), the majority of respondents agreed that advice provided by family members of unsafe older drivers is more important than the DMV or police authority in the driving cessation decision-making process. Likewise, health care providers can advise older adults to quit driving based on their clinical assessment and findings. However, family members and health care providers are challenged by the difficulty of discussing the topic of driving cessation with older adults (D’Ambrosio et al, 2009; Friedland, Rudman, Chipman, & Steen, 2006). A common fear is the creation of family- and health care providers-older driver conflicts (D’Ambrosio et al, 2009; Friedland et al., 2006). In addition, lack of knowledge and resources can be challenging to both family members and health care providers. Of note, women are more willing to accept their health care providers’ advice to stop driving (Betz et al.).

Driving cessation planning. Similar to any other major life transition, the driving cessation transition can be facilitated by appropriate planning. Planning for driving cessation can take different forms. For example, some older adults start by self-limiting their driving. Others may start preparing by talking to members of their social networks
(i.e. family members and friends) or health care providers, considering alternative transportation, and selling their vehicles. Finding a convenient transportation alternative is reported as a factor that enhances safety and mobility of older adults (Choi et al., 2012) which can facilitate the driving cessation transition. Seeking transportation alternatives and discussing with and learning from the experiences of retired drivers seems helpful to retiring older drivers (Gustafsson et al., 2011).

However, not all older drivers are willing to discuss their driving situation with others. In addition, some health problems mandate that older adults quit driving without prior planning. For example, experiencing a stroke often leads to sudden, unplanned driving cessation transition. License revocation by the DMV may also result in a similar kind of transition.

Consequences of Driving Cessation

The driving cessation transition is associated with consequences at the individual, community, social, and policy levels. In this section, the main consequences of the driving cessation transition will be presented.

Psychological consequences. The driving cessation transition was described as a “painful, awkward, difficult, embarrassing, sad, frustrating, tearful, ugly experience” (Freund, 2003, p. 68). Fonda, Wallace, and Herzog (2001) conducted a longitudinal study to examine the effect of driving restriction and cessation on mood. The study involved three waves of measurements between the years 1993 and 1998. The results showed that older adults who stopped driving, compared to those who retained driving privileges, were at higher risk for experiencing depressive symptoms. Furthermore, the authors
reported that having a driving spouse did not mitigate the effect of driving cessation on depressive symptoms. Ragland, Satariano, and MacLeod (2005) reported similar findings from another longitudinal study.

Transition into non-driving affects the psychological well-being of individuals differently. Driving cessation has been correlated with worry about losing mobility (Corn & Rosenblum, 2002; Davey, 2007), the feeling of being a burden on others (Bryanton, Weeks, & Lees, 2010; Corn & Rosenblum, 2002), and loss of independence and spontaneity (Bauer et al., 2003; Corn & Rosenblum, 2002). In addition, the intensity of such psychological disturbances vary depending on the sociodemographic characteristics of people. For example, Corn and Rosenblum (2002) found that men and younger drivers had more worries than women and older drivers.

**Social consequences.** Social status of older adults, including social networks and support, can be affected by the transition into non-driving. Driving cessation often results in loss of mobility and fewer interactions within social networks. Mezuk and Rebok (2008) examined the effect of driving cessation among older adults on social integration and perceived social support. They found that driving cessation led to a significant decrease in social integration, as indicated by the decrease in the size of social networks of friends. Similarly, results from a five-year follow up study showed that driving cessation resulted in a decline in social function and increased interference in social activities (Edwards, Lunsman, Perkins, Rebok, & Roth, 2009).

Social well-being during the post-cessation era is moderated by the availability and use of alternative transportation as well as by the demographics of older adults. The availability of a stable mobility option, provided by a family member for example, has
been reported as a factor that helps older women adapt to driving cessation (Bryanton et al., 2010). However, older adults who stop driving while not having a family member who is currently a driver and lives close by are at higher risk for social isolation (Bryanton et al., 2010). In addition, older adults with a limited social network, overall, are at higher risk for social isolation (Johnson, 2008).

Both the nature of the decision to quit driving, i.e. voluntary versus involuntary, and the type of transition, i.e. planned versus unplanned, moderate the effect of driving cessation on the social life of older adults. Bauer et al. (2003) reported that adaptation after driving cessation was facilitated by making the decision to stop driving by the older driver without intervention by others. The driving cessation transition is often unplanned and this makes the transition more difficult (Liddle, Carlson, & McKenna, 2004). However, older adults who plan ahead and make the voluntary decision to quit driving have better outcomes as indicated by the possibility of maintaining social contacts that facilitate transition and adaptation (Bauer et al.).

**Loneliness.** Loneliness is a subjective state that results from perceived deficiencies in one’s social contacts and is usually described as a distressing and emotionally unpleasant experience (Bekhet, Zauszniewski, & Nakhla, 2008). Loneliness risk increases as older adults experience a decrease in their social contacts. However, there is evidence that older former drivers may experience loneliness regardless of the amount of social support they receive from friends and family members (Johnson, 1998). In turn, loneliness increases the risk for decline in motor functioning (Buchman et al., 2010), worsening of depressive symptoms, and a greater risk for dementia (Wilson et al., 2007).
Physical and general health consequences. Driving cessation is a transitional process that can contribute to decline in the overall health status of older adults. Part of the ACTIVE clinical trial examined the effects of driving cessation on health trajectories in older adults (Edwards et al., 2009). A total of 698 participants, out of 2,832 participants in the principal ACTIVE study, 65 years of age and older were included in the analyses. The authors examined health trajectories both at the time of driving cessation and post-cessation. The results revealed that driving cessation was accompanied by declines in physical functioning and performance in daily activities after adjusting for age, gender, and education. After driving cessation, general health and physical performance of older adults showed a steep decline. In addition, older adults who quit driving did not have recovery from declines in physical functioning, experienced at the time of cessation, throughout the course of the study. The authors claimed that the decline in physical performance was subsequent to the driving cessation transition.

Living arrangements. Another potential consequence of the transition to non-driving is physical relocation. Choi et al. (2012) addressed the importance of establishing accessible and affordable transportation alternatives for older adults in age-friendly cities. In some situations, residential relocation to areas with well-developed alternative transportation is a strategy used to manage the psychosocial consequences of driving cessation (Windsor & Anstey, 2006). Yet, relocation to unfavorable, and potentially more stressful, places such as nursing homes is not uncommon following driving cessation. Former and never drivers were found to be at a significantly higher risk for entry into a long-term care facility than current drivers (Freeman, Gange, Munoz, & West, 2006). Such relocation into a long-term care facility is another transition and it usually requires a
period of time in order for an individual to adapt to the different environment and establish social networks in the new setting. Lee, Lee, and Woo (2010) maintained that living in nursing homes can impact psychosocial well-being and health-related quality of life (QOL) of older adults as well as their social support.

In summary, the transition into the non-driving state is associated with various physical, functional, psychological/emotional, and social consequences that can be stressful and devastating to older adults. Former drivers have a greater risk for mortality than other older adults who maintain driving privileges (Edwards, Perkins, Ross, & Reynolds, 2009). In addition, former and never drivers were found to be at higher risk to enter long-term care, for example nursing homes, than current drivers after controlling for sociodemographic and health variables (Freeman et al., 2006). The cascade of events and the seriousness of driving cessation trajectories vary depending on the sociodemographic characteristics and adaptability of individuals and the availability of a convenient, stable mobility option, however. In addition, both the nature of the decision and planning for driving cessation can facilitate the transition and enhance the former driver’s ability to quickly adapt and adjust his or her life.

**Positive consequences of driving cessation.** The driving cessation transition can lead to positive outcomes. While many older adults may feel isolated after quitting driving, others may feel more supported and assisted by family members and friends (Mezuk & Rebok, 2008). Informal social support provided by family members and friends can help older adults make the decision to stop driving and adapt afterward (Johnson, 1998). Such support was reported as a means of staying socially connected and meeting elders’ transportation needs. Johnson (2008) conducted a study to describe how
informal social support impacts maintaining voluntary driving cessation in older rural women. The results showed that older women who maintained voluntary driving cessation had more support from family and friends than those who resumed driving within six to nine months of quitting driving. Moreover, older women who maintained driving cessation reported feeling loved and supported by family members and friends. On the other hand, all women who resumed driving felt alone and 69% of them had less than monthly contact with family or friends. Johnson (2008) found that living alone or with an individual is not a significant predictor of maintaining voluntary driving cessation. These findings highlight the importance of informal social support in maintaining the QOL and the sense of independence of older women after driving cessation. In addition, email and telephone are suggested methods of communication to meet the needs and enhance the sense of security of older women (Johnson, 2008).

Another positive outcome of driving cessation among the elderly is the reduction in spending. Kim and Richardson (2006) examined the association between non-driving and spending for basic and recreational needs among a group of older adults. The researchers combined data collected in both the 1998-2002 Health and Retirement Study (HRS) and the 2003 Consumption and Activities Mail Survey (CAMS) and conducted data analysis on a total of 1,287 older people. Eighty-five percent of the participants were current drivers. Analyses showed that spending on basic needs such as food and clothing was not different between current and non-drivers. However, spending on trips, tickets, and dining out declined significantly after driving cessation.

**Specific Aims of the Current Study**
As discussed earlier, the negative consequences of the driving cessation transition can impact the psychological and social well-being of older adults. Such consequences can negatively impact the QOL of older adults and this requires immediate nursing interventions aimed at facilitating the driving cessation transition. Therefore, the main objective of conducting this feasibility study was to determine the effectiveness of a Tai Chi intervention on improving the psychosocial status and QOL of older adults going through the driving cessation transition. Secondary aims of this study were to:

1) Compare the psychosocial status and QOL of older adults who have either quit driving (retired) or were making plans to quit driving (retiring)

2) Examine the relationship between the nature of the driving cessation decision, either voluntary or involuntary, and psychosocial status and QOL of older adults going through the driving cessation transition.

3) Investigate the relationship between the type of the driving cessation transition, either planned or unplanned, and psychosocial status and QOL of retired and retiring older adult drivers.

**Significance of the Current Study**

In 2001, an Institute of Medicine’s (IOM) report emphasized the importance of improving the quality of health care services by focusing on the concept of integrative health care (IOM, 2001). This report, entitled *Crossing The Quality Chasm: A New Health System for The 21st Century*, identified patient-centered care as one of six aims to improve the quality of health care and patient safety. As a result, the emphasis on patient-centered care has gained popularity in health care systems and is often integrated into the
mission statements of health care organizations and settings (Frampton et al., 2008). Basically, a patient-centered approach can be described as one that addresses the cooperation between the health care provider and the patient, and sometimes family members, in order to meet the patient’s various needs.

Nurses strive to provide holistic, patient-centered care and their contribution is crucial to establishing innovative patient-centered, integrative care models (American Nurses Association [ANA], 2010). Central to the concept of patient-centered care is the focus on empowering individuals and supporting them while the patient takes the primary responsibility for his/her own health (Richard & Shea, 2011). This can be achieved through encouraging patients to become more involved in self-care activities. Despite the absence of consensus on its definition, self-care can be defined as “individual responsibilities for healthy lifestyle behaviors required for human development and functioning, as well as those activities required to manage acute and chronic healthcare conditions” (Richard & Shea, 2011, p. 256). Self-care implies that one is knowledgeable about his or her health status and methods for engaging in health promoting activities.

There is a growing body of evidence-based knowledge regarding the usefulness of complementary and alternative therapies as a patient-centered approach into health promotion endeavors. The National Center for Complementary and Integrative Health (NCCIH), one of the National Institutes of Health (NIH) centers, is the governmental lead agency specialized in developing the evidence regarding the effectiveness and usefulness of complementary and alternative medicine including mind-body practices. Advancing the science of symptom management and developing effective, practical strategies for promoting individuals’ health and well-being are two main goals of the NCCIH research
activities (NCCIH, 2012). The top objective of the NCCIH third strategic plan for 2011-2015 is to advance research on mind-body interventions (NCCIH, 2011).

Results from the National Health Interview Survey indicated that 16.6% of adult Americans used at least one form of mind-body therapy (Bertisch, Wee, Phillips, & McCarthy, 2009). According to Bertisch et al., 30% of mind-body therapy users reported using it to treat medical conditions, such as depression and pain, with an overall range of perceived helpfulness of 68-90% among users. Even though its use is not as common as mindful breathing and yoga, Tai Chi is one example of mind-body practices. Tai Chi originated in China as a martial art and can be described as “moving meditation;” an individual moves his/her body slowly and combines that with deep breathing and awareness (Chi, Jordan-Marsh, Guo, Xie, & Bai, 2013). Tai Chi is a suitable exercise for older adults simply because it does not involve extraneous body movements (Chi et al., 2013; Lee et al., 2010). Over the past a few years, Tai Chi effectiveness on promoting physiological and social well-being has been evaluated in different groups of older adults. Tai Chi is a group-based mind-body therapy that can enhance social support among participants (Waite-Jones, Hale, & Lee, 2013). Therefore, Tai Chi is proposed as an intervention that can enhance the psychosocial status of older adults going through the driving cessation transition in this study.

Tai Chi was utilized in this study to establish foundational knowledge about implementing a patient-centered approach to facilitate the driving cessation transition at advanced age. As far as can be determined, this is the first study that investigates the usefulness of a Tai Chi intervention in ameliorating the psychosocial consequences of driving cessation among older adults. In addition to expanding scientific knowledge, this
study was conducted to evaluate older adults’ willingness and readiness to adopt innovative, integrative modalities of patient-centered care—that is, to evaluate the social need and applicability of Tai Chi among older adults going through the driving cessation transition.

Summary of Chapter One

In summary, the physical, psychological, and social consequences of driving cessation affect overall health and QOL of older adults. Utilizing a mixed methods approach, Musselwhite and Shergold (2013) studied the process of driving cessation in older adults. The authors employed driving diaries, interviews, and focus groups to collect data on driving history, motivations for driving cessation, alternative transportation availability, and perceived potential barriers to and benefits of giving up driving. They found that older adults who make sudden decisions to quit driving are more likely to experience poorer QOL post-cessation. The results of this study highlight the importance of discussing driving issues with older adults earlier in life. Furthermore, clinicians need to be knowledgeable and aware of health conditions and age-related changes that can affect driving performance. The consequences of the driving cessation transition can be detrimental to older adults and this requires immediate intervention by nurses to help older adults adapt to and achieve a healthy driving cessation transition. There is evidence that mind-body interventions, Tai Chi for example, can help improve the psychosocial well-being of various populations. Therefore, the current study is intended to evaluate the effectiveness of implementing a Tai Chi program on improving the psychosocial status of older adults going through the driving cessation transition. This
study is innovative in that it is the first study to investigate a Tai Chi intervention on the psychosocial consequences of driving cessation among older adults.
Chapter 2

Literature Review

A variety of programs have been developed to help older drivers before and after making the decision to quit driving. In this chapter, these programs are described beginning with programs directed toward current drivers and then moving to other programs directed to help former older drivers. In addition, programs and resources developed to provide supports for caregivers and health care providers will be discussed. Theoretical perspectives and a literature review on Tai Chi are presented, as well. A presentation regarding the literature review methods as well as strategies used to critically analyze and synthesize the literature will be introduced first followed by the findings of the literature research.

**Literature Research and Review**

**Key Terms**

The researcher used the term driving cessation to retrieve articles about the driving cessation transition. The search was limited only by the age group, 65 years and older. In addition, the following terms were used and combined in different ways to retrieve articles about Tai Chi and psychosocial well-being: Tai Chi, depression, psychosocial, social support/network, loneliness, and QOL. The literature research about Tai Chi was not narrowed by any of the available limits.
Databases

The Cumulative Index of Nursing and Allied Health Literature (CINAHL) plus with full text, MEDLINE, AgeLine, and PsychINFO databases were searched for relevant articles using the keywords identified in the previous section. The researcher also used a snowball approach to expand the literature review through exploring the references lists of select articles. This helped with identification of more relevant resources.

Results of the Literature Research

The literature search resulted in the retrieval of a total of 446 articles about the driving cessation transition as well as Tai Chi and psychosocial well-being. The researcher started by reading the abstracts and, accordingly, identifying the most relevant articles. Full-text versions of all relevant articles were obtained. The majority of the full-text articles was found on EBSCOhost, while others were accessed from Google Scholar and a few ordered through Interlibrary Loan.

Critical Analysis and Synthesis

The start point of this step was to develop a matrix on an Excel document. This matrix helped the researcher organize his thoughts and systematically summarize the results of the literature search. Inside the Excel document, the researcher categorized the works into different sheets including: statistics, predictors (i.e. driving cessation predictors), consequences, theory, intervention programs, and decision. In addition, color-coding was used to sort the articles located within each category according to their importance and relevance. For example, articles with the red color code were most important and relevant to the specific category. These two methods of categorizing and
sorting the articles within the matrix helped the researcher better understand the body of knowledge regarding the driving cessation transition.

The following sections describe the findings of the literature review and the synthesis process. The presentation is organized based on the type of programs developed to facilitate the driving cessation transition starting with programs focused on the pre-cessation period on to post-cessation. An examination of theoretical perspectives and a review of the literature regarding Tai Chi are then presented.

**Pre-cessation Programs**

Early research on programs about driving cessation was focused mainly on assessing older adults’ driving ability and performance. Interested researchers tried to assess and identify older drivers at risk for impaired driving performance. The *Physician’s Guide to Assessing and Counseling Older Drivers* (Carr, Schwartzberg, Manning, & Sempek, 2010) provides detailed guidelines for physicians regarding how to approach an older driver and discuss driving performance, methods of assessing functional abilities of older drivers, the most common medical problems and medications that may impair driving, and the legal and ethical responsibilities of physicians dealing with older adults going through the driving cessation transition. Assessment of Driving-Related Skills (ADReS) is a tool that is included that provides guidelines about assessment of the visual, cognitive, and motor/somatosensory function of older drivers. However, ADReS involves only physical assessment in the clinic and is not a comprehensive tool to assess driving ability and on-road performance of older adults.
Other assessment batteries have been created and tested including in-clinic, on-road, and simulation-based assessments. For example, the DriveABLE is a tool which was developed to help clinicians better assess cognitive abilities relative to driving (DriveABLE, 2012). The DriveABLE involves two assessment tools, one is in-office, software-based, and the other is an on-road test. They are called the DriveABLE Cognitive Assessment Tool (DCAT) and the DriveABLE On-Road Evaluation (DORE), respectively. Administered by a certified health care professional, the in-office DriveABLE assessment predicts on-road driving ability. A recent study showed that test-retest reliability of the DriveABLE tool is adequate (Korner-Bitensky et al., 2011). However, the DriveABLE provides a means to assess only an individual’s cognitive abilities relevant to driving and its use is limited to people who have cognitive impairments secondary to health problems and/or use of medications that affect cognition. The DORE, on the other hand, is intended to assess older drivers’ cognitive ability pertinent to driving, but not understanding of the rules of roads.

Reliable assessment tools for health care providers are necessary to help them guide their clients to make accurate driving-related decisions (Korner-Bitensky et al., 2011). Despite the outstanding endeavors of researchers, there is still lack of consensus regarding the establishment of a comprehensive assessment battery to assess older adults’ driving performance (Subzwari et al., 2009). Individual variations in terms of the physical, functional, sensory, and cognitive capabilities of older drivers hinder establishing a comprehensive driving assessment battery. In addition, primary healthcare providers’ knowledge and preparation as well as the availability and cost of assessment tools may impact the development and utilization of a comprehensive assessment battery.
The issue gets more complicated because of the variations of policies and regulations of each state’s DMV’s across the U.S.

The felt need by many older adults to retain their driving privileges compelled researchers to develop and evaluate programs that delay driving cessation. For example, Edwards, Delahunt, and Mahncke (2009) examined whether a cognitive speed of processing program delays driving cessation in older adults. The speed of processing intervention involved computerized exercises of visual attention to enhance speed and accuracy of visual performance. Participants from the intervention group underwent a total of 10 speed of processing sessions over a period of five weeks with each session followed by an immediate assessment of cognition. The intervention group participants were 40% less likely to cease driving over a three-year period.

Motor function is key to maintain competent driving skills and performance. Therefore, an exercise-based program was developed and tested for effectiveness in delaying driving cessation in older adults (Marottoli et al., 2007). This program was administered to enhance flexibility, coordination, and speed of movement. This physical conditioning program was reported as a safe and effective approach that enhances driving performance. The authors maintained that enhancing driving performance contributes to clinician-patient communication through adoption of a more positive tone by shifting the focus on driving performance instead of cessation.

These two studies, by Edwards et al. (2009) and Marottoli et al. (2007), have limitations and drawbacks. A common issue between these two studies is that each one of them targeted a specific aspect of driving; cognitive abilities and physical conditions, respectively. Once again, driving requires a state of cognitive, physical, functional, and
sensory well-being. With that in mind, the presented programs are not holistic and applying only one of them may not be helpful for those older drivers who often have a combination of both cognitive and physical deficits secondary to illness and/or age-related changes.

Another type of program during the pre-cessation period is directed toward enhancing older drivers’ safety and decision-making processes. These programs are mainly educational in nature and can be directed to help older adults, their relatives and/or friends, and their health care providers. For example, the American Association of Retired Persons (AARP) offers specialized classes and webinars for older drivers and their family members. The AARP Smart Driver Course is offered for drivers 50 years old and older and it is intended to refresh those drivers’ knowledge and skills (AARP, n.d. a). The goal of this course is to improve older drivers’ safety as well as reduce their risk for traffic violations and traffic-related injuries. It is reported, on the AARP website, that 97% of older drivers who took this course changed at least one driving behavior; however, there is no clear scientific evidence regarding the effectiveness of this online course.

The AARP also offers resources to ease communication between older drivers and their family members in order to facilitate transitioning into non-driving. An online seminar, entitled We Need to Talk, was developed by the AARP in collaboration with the Hartford Foundation and the Massachusetts Institute of Technology (MIT) AgeLab (AARP, n.d. b). This seminar introduces the topic of driving importance and driving cessation to family members. It includes three modules and provides tips and resources for family members regarding observation of older drivers’ driving skills, initiation of the
conversation with older drivers, and discussion regarding alternative transportation options. This seminar may facilitate the transition into non-driving through help in planning ahead and making voluntary decisions to quit driving. However, there is no clear scientific evidence regarding the effectiveness of this seminar.

Enhancing older drivers’ safety is a major concern for both researchers and clinicians. Advanced technology has led to the development of driving simulators which can be used for either driving assessment or driving rehabilitation. There is growing evidence regarding the effectiveness of utilizing a driving simulator. For example, a study comparing the effectiveness of a driving simulator with a cognitive training program in stroke survivors showed that the simulator-based program was more effective in regard to improving the overall driving performance (Devos et al., 2009). However, driving assessment tools, including driving simulators, lack standardization and their reliability is questioned in the literature (Subzwari et al., 2009). In addition, driving simulators are associated with a syndrome known as “simulation sickness” which includes experiencing symptoms like headache, sweating, dry mouth, nausea, vomiting, drowsiness, vertigo, and dizziness. Older adults are especially at higher risk for experiencing this syndrome (Brooks et al., 2010) and this may limit utilizing driving simulators.

Post-cessation Programs

As noted in chapter one, driving cessation may lead to negative psychosocial consequences that can impair older adults’ functioning and increase their mortality risk. There are some studies of programs designed to help older drivers after they stop driving. Usually, the focus of such programs is on maintaining mobility and alleviating the negative consequences of driving cessation, such as depressive symptoms.
Targeting driving cessation in dementia patients, Dobbs, Harper, and Wood (2009) examined the effectiveness of a theory-based, support group intervention to help both older drivers who have dementia and their caregivers cope with driving cessation. The authors developed the intervention program based on Lazarus and Folkman’s Stress and Coping Model (Lazarus & Folkman, 1984) and the Coping Effectiveness Training (CET) Program (Folkman et al., 1991). The intervention involved participation in support groups consisting of former drivers with dementia and their family caregivers. Each group was assigned a trained leader who identified the participants’ stressors and guided the participants to use theory-based, emotion-focused or problem-focused coping strategies. Participants in the intervention group had better outcomes than individuals in the control group. Participants in the intervention group had significantly lower depressive symptoms, better QOL, and more enjoyment of life events by the completion of the program. Most of the participants in the intervention group reported that the program helped them cope with their transition into non-driving. This is one of the very few theory-based programs developed to decrease the negative consequences of driving cessation.

Recently, there has been a shift in research toward developing and evaluating the effectiveness of person-centered programs to help older drivers throughout the driving cessation transition. The University of Queensland Driver Retirement Initiative (UQDRIVE) is a program that was developed following extensive research on older people, their family members, and health care providers (Gustafsson et al., 2012). Three major premises guided the development of the UQDRIVE: empowerment of older drivers, phases of driving cessation, and the individuality of the driving cessation
experience (Liddle, McKenna, & Bartlett, 2006). One of the ultimate goals of the UQDRIVE was to overcome the negative consequences of driving cessation. This group-based program is held once a week for a total of six weeks and it involves discussions between retired and retiring older drivers and health care providers. During the group interviews, older adults are given the opportunity to identify and share their issues and concerns (Gustafsson et al., 2012). In addition, group members plan for practical exercises that include exploring and using alternative transportation.

A total of 55 people 60 years of age and older participated in the UQDRIVE and completed a survey to report their satisfaction with the program (Gustafsson et al., 2011). The participants were highly satisfied with the UQDRIVE program as evidenced by a range of mean satisfaction scores between 9.4 and 9.7 out of 10 in the areas of content, presentation, outings, and venues of the program. Content analysis resulted in the emergence of the following themes: (a) finding alternative means: transport and service options, (b) planning with more wisdom: thinking about driving cessation, and (c) being with people: sharing experiences with peers. Overall, the participants benefited from participating in the UQDRIVE program by receiving psychological support and practical, i.e. transportation, assistance as well as learning from each other.

Further analysis by Gustafsson and colleagues (2012) investigated how the UQDRIVE program can help identify and improve transportation and lifestyle issues of older adults including retired and retiring drivers. Participants were asked to complete the Canadian Occupational Performance Measure (COPM), a person-centered tool used to collect data regarding individuals’ self-identified problems as well as their perception of and satisfaction with daily functioning (Law et al., 1990). The results showed that the
participants had significant improvement over time in performance and satisfaction with a total of 160 self-identified issues such as attending medical appointments and remaining connected with friends. The qualitative data analysis showed that the UQDRIVE program was beneficial in terms of learning ways to stay involved and socially active, feeling more independent and trying alternative forms of transportation, being prepared to make informed decision regarding when to quit driving (reported by retiring drivers), and learning from the experiences of others.

Both studies by Gustafsson and her team (2012) highlight the necessity for developing a client-centered approach to help older adults achieve a more successful transition into non-driving. The findings should be interpreted considering the limitations both studies share including the small sample size and the sampling method; convenience and snowball sampling. Moreover, the authors focused on the positive aspect of implementing the UQDRIVE and no data were collected about potential negative aspects of the program. In addition, the potential effect of the UQDRIVE program on ameliorating the negative psychosocial consequences of driving cessation, like depression and social isolation, was not investigated. Of note, retired and retiring older drivers showed interest in participating in the UQDRIVE program which indicates that this population is aware of the need for easing the driving cessation transition. This suggests the social importance of the UQDRIVE program and, possibly, similar person-centered programs.

**Literature Review on Tai Chi**

Tai Chi was selected as the intervention in the current study based on the evidence of its effectiveness in empowering older adults and improving their psychosocial status.
Tai Chi involves practicing organized, slow movements combined with deep breathing. This type of exercise is suitable for older adults who may not be able to practice more challenging exercises. Compared to other relaxation techniques such as guided imagery and biofeedback, Tai Chi can improve physical activity of older adults. Consequently, it can help managing such chronic diseases as cardiovascular diseases and diabetes mellitus. In addition, Tai Chi is a group-based exercise that is proposed as a means to help older adults going through the driving cessation transition establish social networks and improve social support among each other. Therefore, practicing Tai Chi seems to be a promising approach to improve psychosocial status of older adults. The following is a review of the literature about Tai Chi practice and its effect on various health aspects.

An overview of complementary and alternative therapies and a delineation of other related terms will be provided first. Complementary, alternative, and integrative are three terms often cited to describe methods of nonconventional medicine. According to the NCCIH website (April, 2016), complementary refers to the use of non-mainstream approaches together with conventional medicine. When non-mainstream methods are used to replace conventional medicine, alternative is the accurate term to be used. Integrative indicates that both conventional and complementary approaches are integrated with each other and used in a coordinated way. The NCCIH (April, 2016) categorizes complementary therapies into two main categories: mind-body practices and use of natural products. Tai Chi is a form of mind-body practices.

Mind-body practices are considered a type of complementary and alternative therapy and they include different interventions that can be administered or taught by a trained practitioner (NCCIH, April, 2016). As healing strategies, mind-body practices are
used “to enhance the mind’s capacity to affect bodily function and symptoms” (NCCIH, 2007, p. 2). One of the fundamental principles of mind-body practices is the unity between cognition and action that are considered the two key components of functioning (Dechamps, Onifade, Decamps, & Bourdel-Marchasson, 2009). Approximately 40% of Americans used at least one form of complementary and alternative therapies (Barnes, Bloom, & Nahin, 2007) with approximately one in five Americans reported use of at least one form of mind-body therapies (Bertisch et al., 2009). In the older adult population, 27.7% of noninstitutionalized older adults were found to use complementary and alternative therapies (Arcury et al., 2006). Among those, 11.7% of those older adults used mind-body therapies. Arcury and colleagues reported that practicing mind-body is more common among older adults who: (a) are Asian, (b) are female, (c) completed high school or college, and (d) have more medical conditions.

Mind-body practices are attractive to both well and ill individuals. Such practices are relatively safe, can be learned relatively easily, and are generally cost-effective (D’Silva, Poscablo, Habousha, Kogan, & Kligler, 2012). They can also help individuals achieve self-empowerment (D’Silva et al.) and promote health or treat various illnesses (Arcury et al., 2006) through meeting different needs. Tai Chi is an example of those practices and it involves slow, gentle, and organized movements of the body accompanied by deep breathing (Waite-Jones et al., 2013). According to Waite-Jones and colleagues, utilizing Tai Chi can promote mind and body interaction through enhancing the integration between the physical, psychosocial, emotional, spiritual, and behavioral elements of the individual. Moreover, practicing Tai Chi does not require using any
special equipment and it can be practiced in different settings including both indoors and outdoors (Chan, Lee, Suen, & Tam, 2010).

There is a growing body of evidence regarding the effect of Tai Chi on the physiological, physical, and psychosocial well-being and overall QOL of individuals. Tai Chi has been reported as an effective measure in improving balance, preventing falls, enhancing cardiovascular status, improving rehabilitation of rheumatoid arthritis, and reducing pain and stress (Chen, Snyder, & Krichbaum, 2002). As for depression in the elderly, a recent RCT investigated the effect of Tai Chi as a supplementary intervention to improve pharmacological depression treatment (Lavretsky et al., 2011). Compared to health education, Tai Chi was found to be a more effective adjunct intervention to improve clinical outcomes of depressed older adults in that RCT. Clinical outcomes reported in this study included decrease in depression severity, improvement in health-related QOL and memory, and reduction in inflammatory markers. As well, a number of systematic reviews, meta-analyses, and other research showed that Tai Chi is effective in managing depression in different populations (Chi et al., 2013; D’Silva et al., 2012; Redwine et al., 2012; Waite-Jones et al., 2013; Wang et al., 2010a; Wang et al., 2010b; Wang et al., 2009).

As previously noted, Tai Chi is a group-based mind-body intervention and its effect on social well-being is also reported in the literature. Lee et al. (2010) conducted an experimental study to examine the effects of Tai Chi on psychosocial well-being of older adults who live in nursing homes. The intervention lasted 26 weeks with three one-hour sessions administered to the intervention group per week. Based on their analysis, Lee et al. found that the effect of Tai Chi intervention on social support was not
statistically significant. However, they addressed the need for further investigation of Tai Chi effect on social support. Another study investigated the perceived psychosocial effects of Tai Chi among people with rheumatoid arthritis (Waite-Jones et al., 2013). Using a qualitative methodology, the authors conducted individual, semi-structured interviews with 19 participants who already participated in a 12-week Tai Chi program. “Social cohesion” was one of the identified themes based on the thematic analysis utilized in this study. All participants reported on the importance of Tai Chi in regard to the social aspect and, consequently, the authors concluded that participating in a Tai Chi intervention provides social support to rheumatoid arthritis patients. It is worth mentioning that practicing Tai Chi by older adults has been found to be facilitated by encouragement from family members, friends, and healthcare providers (Chen, Snyder, & Krichbaum, 2001).

The effect of Tai Chi practices on QOL is another research area that has been studied in different populations with different health conditions. For example, the effect of Tai Chi on health-related QOL among institutionalized elders was examined and compared to a cognition-action intervention that involved 30-40 minutes of exercises twice weekly (Dechamps et al., 2009). A total of 52 participants took part in either intervention for a total of 24 weeks. The results revealed that both interventions are effective in improving the QOL in a group of frail older adults. Similarly, the Tai Chi effect on health-related QOL of patients with Chronic Obstructive Pulmonary Disease (COPD) was explored in an RCT (Chan et al., 2010). The authors included a total of 206 COPD patients and then randomly assigned them to the Tai Chi intervention, exercise, or control group. The Tai Chi program lasted 3 months with two one-hour sessions per
week. The exercise group participants were taught breathing techniques and walking as the physical exercise; whereas, the control group maintained their routine activities. Based on the findings, Tai Chi was reported as a safe intervention that can improve health outcomes in COPD patients. In addition, the Tai Chi intervention group participants reported an overall satisfaction rate of 4.57 (out of five). Other studies reported the effectiveness of Tai Chi on improving the QOL (Lee et al., 2010; Wang et al., 2010a; Wang et al., 2010b).

**Theoretical Perspectives and Framework**

A common issue with many of the research studies on driving cessation is the focus on applied research and the lack of theoretical basis. This observation was supported by this review of the literature of nursing and related fields which yielded a limited number of theory-generating or theory-testing articles. Liddle et al. (2004) utilized an inductive approach to conceptually organize and understand the driving cessation transition in later life. They created a matrix that integrated both the thematic categories of their analysis and time phases of the driving cessation transition. In that matrix, the timeline included four distinct phases: driving in the past, pre-decision, decision, and post-decision. The authors recommended using the developed matrix as a framework for programs that will support older adults while they are transitioning to driving cessation. The matrix includes changes over time from the perspective of older adults, family members, and health care providers. However, this matrix is not extensive and lacks details about the integration of other factors such as community resources and social support on the driving cessation transition.
Driving as an Everyday Competence (DEC) (Lindstrom-Forneri, Tuokko, Garrett, & Molnar, 2010) is a recently developed theoretical model by a group of interdisciplinary researchers based on a review of the literature and experts’ revisions. This model was developed to explain older adults’ driving competency and performance. On the one hand, driving competence is described as a latent, non-measurable construct that refers to the driving capability of an older adult, and it results from the interaction between individual and environmental factors. On the other hand, driving performance is a measurable concept and it refers to the actual driving behaviors of an older driver (Lindstrom-Forneri et al.). The DEC is a comprehensive model of driving in the older adult population; however, it does not explain the transitional process, the predictors and consequences of driving cessation, and the outcomes of the transition. Rather instead, it is focused on the performance and driving behaviors of older adults. In addition, recent advances in technology have led to manufacturing vehicles equipped with various safety measures that can improve driving performance of older drivers who can afford to buy those vehicles. However, the DEC model does not address this issue as a determinant of driving performance in the older adult population.

The driving cessation transition is complex and is usually stressful. Based on the principles of the stress and coping paradigm, Choi et al. (2012) developed a comprehensive model that explains the transition of driving cessation and how that relates to the aging process. The authors started by discussing the primary/internal (health-related) and secondary stressors that can predict driving cessation. They identified three main types of internal stressors: cognitive, visual, and functional impairments that can lead to the emergence of secondary stressors. Secondary stressors are further
categorized into: (a) internal stressors including the difficulty with driving and subsequent self-perceived discomfort and anxiety, and (b) secondary stressors including pressures by social networks and health care providers as well as the authority of the DMV personnel and state driving regulations.

As discussed earlier, a variety of consequences can take place after driving cessation. Driving cessation can limit older adults’ mobility and their social interactions resulting in loss of independence, social isolation, loneliness, worsening of depressive symptoms, feeling burdensome on family and friends, and decreased overall QOL. Such physical and psychosocial consequences are identified and discussed in the model developed by Choi and colleagues (2012). In addition, the authors identified the voluntariness of the driving cessation decision as a possible covariate that has not yet been investigated.

Based on Choi and colleagues’ (2012) conceptual model, transition into non-driving requires certain types of coping mechanisms and buffers. Effective emotion-focused coping involves such reactions that alleviate the stress as the acceptance of the need to stop driving. Coping can be achieved through problem-focused strategies such as avoiding driving in cumbersome environments and the use of alternative transportation, as well. In regard to buffers, Choi et al. (2012) discussed the importance of personal, social, and environmental factors that may promote the physical and psychosocial well-being of older former drivers. Meanwhile, they maintained that identification and evaluation of social resources, that decrease the negative consequences of driving cessation, is still a crucial topic that requires further investigation.
Finally, Choi et al (2012) discussed a number of spatial, temporal, and sociodemographic factors that can be integrated into their conceptual model. Spatial factors include variations in residential environments, e.g. residence in an urban versus rural community, and such living arrangements as availability of a competent driver in the household. State driving policies and regulations are classified as temporal factors that can affect driving cessation, with less-developed policies leading to sudden, unplanned driving cessation without a transitional period of driving restriction (Koulikov, 2005). Lastly, transitioning into non-driving is often affected by sociodemographic factors such as age, gender, marital status, and income level.

The conceptual model developed by Choi and colleagues (2012) is the first comprehensive model that explains the driving cessation transition in the older adult population. It incorporates the potential predictors of driving cessation and how driving cessation can affect individual health and well-being in later life. At the same time, it provides guidelines that can be used by researchers to develop and evaluate programs directed towards alleviating the negative consequences of driving cessation. Application of this model in nursing research seems to be promising since it is capable of integrating the various aspects of the transition into non-driving.

**Theoretical Framework of the Current Study**

The current study was guided by incorporating the concepts, principles, and assumptions of two theoretical models: the conceptual model by Choi et al. (2012), discussed earlier, and the Transitions Model (Meleis, Sawyer, Im, Messias, & Schumacher, 2000). The fundamental elements of both theories will be integrated to formulate the theoretical framework of the current study. The following is a discussion
of the Transitions Model (Meleis et al.) and how it will be integrated with the model by Choi et al. (2012) and then utilized in the current study.

The Transitions Model (Meleis et al., 2000) is a middle-range nursing theory that was developed based on an integrative concept analysis strategy and extensive research of various types of transitions among different populations. After over 30 years of inductive and deductive work, Meleis, along with other researchers, have expanded the nursing body of knowledge about transitions and other related concepts such as role, role insufficiency/loss, and role supplementation. Such expansion has helped nurses develop strategies to ease transitions at both the individual and organizational levels.

A transition is defined as “a passage from one fairly stable state to another fairly stable state” (Meleis, 2010, p. 11). Meleis et al. (2000) described their theoretical framework starting with the types and patterns of transitions. According to the Transitions Model, individuals may experience developmental, situational, health- or illness-related, or organizational transitions that can take place as a single, multiple, sequential, simultaneous, related or unrelated pattern. Relevant to driving cessation, older adults are expected to experience mainly developmental/age-related and/or illness-related events that impact their driving abilities leading to driving cessation that can happen as a single transition or take another pattern. For example, a healthy older adult may decide to quit driving voluntarily and experience a single transition, whereas another may experience multiple transitions after having a stroke that results in unplanned, involuntary driving cessation.

According to Meleis et al. (2000), transitions share common properties including awareness, engagement, change and difference, time span, and critical points and events.
Based on the review of the literature, impaired older drivers, their family members, and/or friends often become aware of the need to initiate the transition into non-driving after experiencing or witnessing driving problems, such as a traffic violation or an accident committed by an older driver. Family members can initiate discussion with health care providers regarding the driving ability of older adults. In addition, abnormal health assessment findings such as cognitive and visual impairments can make health care providers aware of the need to initiate discussions with the older driver and/or family members about future plans for driving and mobility. Linked to the model developed by Choi et al. (2012), family members’ and health care providers’ roles can be described as secondary external stressors. As a result of their awareness, many older adults engage into the transitional process through restricting their driving or even stopping driving altogether. As discussed previously, the driving cessation transition can also lead to substantial changes in the psychological, social and overall QOL of older adults.

Personal factors as well as community and social resources can act as facilitators or inhibitors of transitions. Driving is highly valued by many older adults and people usually link driving to enhanced-QOL and maintaining independence and autonomy (Davey, 2007; Johnson, 2002). Consequently, the meaning of driving can inhibit the decision to stop driving and this can delay the driving cessation transition. Moreover, different sociodemographic variables have been reported as facilitators or inhibitors of driving cessation. For example, compared to older women, older men tend to drive for a longer time and have a higher risk for experiencing depression following driving cessation (Morgan, Winter, Classen, McCarthy, & Awadzi, 2009). In some cases, driving cessation is preceded by a period of preparation that can facilitate the transition. Sudden,
unplanned loss of driving privileges is likely, though. As for the social and community resources, availability of formal and informal transportation alternatives is a well-documented facilitator of the driving cessation transition since such alternatives can meet the older adults’ needs and keep them mobile after giving up driving.

Healthy transitions are usually indicated by the presence of certain process and outcome indicators such as feeling connected and developing coping strategies (Meleis et al., 2000). These match with the concepts of emotion-focused and problem-focused coping strategies described by Choi and colleagues (2012). In the current study, the Tai Chi program will be tested for effectiveness as a means of achieving healthy transition into non-driving as indicated by improvement of QOL and reduction in depressive symptoms, loneliness, and social isolation. The ultimate goal of the mind-body program is to teach older former drivers an innovative way of mastering new skills to manage their psychosocial disturbances. Applying the principles of both models, the proposed Tai Chi intervention can be claimed as a problem-focused, role supplementation, complementary nursing therapy to manage the loss of driving role. Role supplementation is defined as the implementation of preventive or therapeutic interventions to identify and ameliorate role insufficiency (Meleis, 2010); giving up the car keys in this case.

It is proposed, in this study, that the importance of combining these two models lies in the ability to synthesize a theoretical model that explains the driving cessation transition and enables testing a complementary nursing therapy as a facilitator of this transition. Therefore, the proposed theoretical framework could help the researcher follow a holistic approach to better understand the transition into non-driving and how to manage its potential negative consequences. Moreover, the proposed combination will
help establish a theoretical framework for conducting a rigorous research study. In addition, integration of both models is expected to help with examination of the effect of a theory-based, person-centered intervention on the consequences of the driving cessation transition. Another benefit of this combination is that Choi et al. (2012) explain the process of driving cessation transition in general and the Transitions Model (Meleis et al., 2000) provides guidelines for nurses about how to achieve healthy transitions. While Choi and colleagues explain the driving cessation transition, Meleis and colleagues link transitions and their consequences to nursing knowledge and practice. Meleis (2010) maintained that transition is a central concept in nursing and one reason for that, among others, is that the aging population in the U.S. and worldwide is growing. Such a dramatic increase in the aging population brings about the need for exploring innovative nursing interventions for helping individuals who are experiencing different transitions. Integrating the models allows for a comprehensive image about how personal, social, and community factors interact with each other and affect transitions, such as the one that occurs with driving cessation.

Figure 2.1 shows the schematic conceptual model of the current study and the expected relationship between the study concepts. In this model, driving cessation is presented, especially unplanned and involuntary cessation, as a transition that increases depressive symptoms, social isolation, and loneliness among older adults and decreases the overall QOL. On the other hand, the Tai Chi intervention is suggested as a complementary nursing therapy that has an opposite effect. Wang et al. (2009) maintained that psychosocial well-being is essential to QOL. Psychosocial well-being, as indicated by fewer depressive symptoms, less loneliness and social isolation, and higher
QOL are inter-related and overlap. Despite this overlap and inter-relatedness, there are certain domains that make those concepts distinct and different. While psychosocial well-being involves absence of mood disturbances and maintenance of social networks and support, QOL extends to involve other domains. Ferrans and Powers (1992) maintained that QOL involves a person’s sense of well-being and satisfaction or dissatisfaction with such areas of life as health and functioning, self-esteem, and socioeconomic status. In addition, QOL reflects the level of satisfaction with those aspects of life that may or may not be related to the existence of psychosocial disruptions such as depressive symptoms, loneliness, and social isolation. Finally, sociodemographic variables are depicted in the model and presented as factors that may influence driving cessation transition, psychosocial well-being, and the QOL of older former drivers.
In summary, driving cessation is a significant transition that older adults may experience as a result of age-related and/or health-related changes in later life. Like other transitions, driving cessation can be either planned or unplanned and, sometimes, it can be associated with other transitions such as retirement and loss of relatives and family members. Developing assessment tools and programs to delay driving cessation and to enhance older drivers’ and the public safety can be helpful in certain situations. However, giving up the car keys is likely to be inevitable in many cases when an older adult fails to maintain an intact state of physical, functional, sensory, and cognitive functioning.

Annually, approximately one million older adults experience the transition into non-driving secondary to poor health (Dickerson et al., 2007). This represents 2.5% of the total older adult population in the U.S. Thus, every year, 2.5% of the older adult population is at risk for experiencing depressive symptoms, social isolation, loneliness, decreased QOL, and increased likelihood for entering a long-term care facility as a result of driving cessation. In regard to maintaining mobility through alternative transportation, there is evidence that public and community transportation can help meet older adults’ mobility needs. However, public transportation is not often convenient or is perceived to be inconvenient and that is a key barrier to the use of such alternative (Buys et al., 2012).

**Current Study**

**Objective and Aims of the Current Study**

This is a reminder to the reader of the specific aims of the current study. The primary objective of this feasibility study was to determine the effectiveness of a Tai Chi...
intervention on improving the psychosocial status and QOL of older adults going through the driving cessation transition. Secondary aims of this study were to:

1) Compare the psychosocial status and QOL of older adults who have either quit driving (retired) or were making plans to quit driving (retiring)

2) Examine the relationship between the nature of the driving cessation decision, either voluntary or involuntary, and psychosocial status and QOL of older adults going through the driving cessation transition.

3) Investigate the relationship between the type of the driving cessation transition, either planned or unplanned, and psychosocial status and QOL of retired and retiring older adult drivers.

**Research Questions**

The current study was designed to answer the following research questions:

1) Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from baseline to three weeks compared to older adults in the wait-list control group?

2) Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from three weeks to six weeks compared to older adults in the wait-list control group?

3) Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from baseline to six weeks compared to older adults in the wait-list control group?
4) Are there statistically significant differences in depressive symptoms, loneliness, social isolation, and quality of life between retiring and retired drivers?

5) Does the nature of the driving cessation decision (voluntary or involuntary) and the type of transition (planned or unplanned) affect depressive symptoms, loneliness, social isolation, and quality of life of older adults during the driving cessation transition?

Research Hypotheses

The following research hypotheses were formulated to provide data to answer the previously stated research questions: (the numbers following each research hypothesis indicate the relevant research question)

1) Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to three weeks. (1)

2) Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from three weeks to six weeks. (2)

3) Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to six weeks. (3)
4) Compared to retiring drivers, retired drivers have a higher risk of experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life. (4)

5) Older adults who make involuntary decision to quit driving or experience unplanned driving cessation transition are at higher risk for experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life compared to those who make voluntary decision to and plan ahead to quit driving. (5)

**Definitions of key terms**

While the previous presentation and discussion provided definitions of the key terms of the current study, this section is intended to address these terms in more detail and facilitate the reader’s ability to better understand the current study.

**The older adult population.** This study is focused on examining the effectiveness of a Tai Chi intervention on the psychosocial consequences of driving cessation among older adults. For the purpose of this study, the cutoff point of 65 year of age or older is used to classify individuals as older adults. Both retired and retiring older drivers were invited to participate in this study. Retiring older drivers are those who were in the planning phase of quitting driving but have not made the decision yet, whereas retired drivers are those who have already made the decision to quit driving.

**Driving cessation.** Driving cessation is a transition in which the older adult moves from the state of being able to drive an automobile to becoming a non-driver.

**Type of decision to quit driving.** Voluntary decision to quit driving is defined as the autonomous decision made by the older adult to quit driving mainly as a result of
changes in health condition. On the other hand, the involuntary decision to quit driving is defined as the decision made by family members, health care providers, or the DMV personnel with minimal consideration of the older driver’s opinion.

**Type of the driving cessation transition.** The driving cessation transition can be either planned or unplanned. Planned driving cessation is the transition that is preceded by a period of time when the older person can make plans for life without an automobile. Examples of planning include finding alternative transportation and discussing the driving issue with family members. The unplanned driving cessation is the sudden transition that starts before the older adult begins to make plans for life without an automobile.

**Psychosocial consequences of driving cessation.** The driving cessation transition can result in such psychosocial consequences as worsening of depressive symptoms, fewer social networks and contacts, loneliness, and poor QOL. Operational definitions of these four variables are presented in the third chapter of this dissertation.

**Tai Chi intervention.** Tai Chi is a mind-body complementary therapy that involves practicing slow movements with deep breathing. The intervention group participants will be offered the opportunity to participate in a six-week Tai Chi program with two one-hour sessions per week.

**Summary of Chapter Two**

Different dimensions of the driving cessation transition have been widely investigated in the literature. This chapter was focused on the programs that were examined for effectiveness to facilitate driving cessation transition in older adults. In
addition, review of the literature regarding theory-generating and theory-testing articles and potential Tai Chi implications were discussed. Generally speaking, there is a limited number of programs that have been tested for effectiveness in facilitating the driving cessation transition in older adults. More specifically, this extensive review of the literature showed that there is a practical gap regarding the examination of complementary therapies for effectiveness to facilitate this in older adults. In addition, a number of theory-generating articles focused on the driving cessation transition in older adults. These articles were discussed and critiqued in this chapter. The researcher decided to develop a conceptual model based on integrating the theoretical model developed by Choi and colleagues (2012) with the Transition Model (Meleis et al., 2000). These models were combined to help understand the process of the driving cessation transition among older adults and to determine the effectiveness of a complementary intervention, specifically Tai Chi, as a facilitator of this transition.
Chapter 3
Methodology

In this chapter, the researcher presents details regarding the design and other methodological aspects of the current study. Rationale regarding decisions related to the design and methodology of this study are integrated into the discussion.

Study Design

This study was conducted using a quasi-experimental, two-group, repeated measures design. Quantitative data were collected from all research participants at three time points; baseline, mid-point (three weeks of starting the intervention), and after completing the intervention (six weeks). Randomization of participants to either the intervention or control group was not feasible and the PI decided to use a quasi-experimental design with random assignment of the senior housing centers. A major advantage of this design lies in its relatively easy implementation compared to experimental research (Trochim & Donnelly, 2008). Lack of randomization often results in non-equivalent groups, i.e. groups that are not comparable at baseline. To ensure recruiting two comparable groups of participants in this study, the principal investigator (PI) recruited older adults from similar communities (senior housing centers). Figure 3.1 illustrates the design followed to conduct this study.
Figure 3.1. Design of the current study. Involves nonrandom assignment of participants (N), pre-, post-test & mid-point data collection (O), and the intervention (X).

The senior housing centers were randomized to either the control or the intervention group. A draw was performed to assign the centers to either group.

The control group participants were on the waiting list to receive the same intervention program upon completion of the program by the intervention group participants. Utilizing a waiting list protocol seems ethical and feasible in research studies aimed at examining the effectiveness of mind-body interventions (Kinser & Robins, 2013). Kinser and Robins argued that having no treatment for the control group in research of mind-body interventions is unethical. Moreover, finding an intervention that is comparable to Tai Chi to be offered to the control group participants was challenging. Comparing Tai Chi to other complementary and alternative therapies was difficult in this study as a result of the challenging recruitment process and lack of sufficient fund. Therefore, the researcher decided to use a waiting list protocol to ensure fairness of treatment to all research participants. The control group participants were invited to practice Tai Chi only after finishing all rounds of data collection.

Sample, Sampling Method, and Recruitment Procedure
Target and Accessible Populations

The target population in this study comprises older adults going through the driving cessation transition. This includes retired, people who have already made the decision to quit driving, and retiring drivers, those who were in the planning phase of quitting driving but have not made the decision yet. The accessible population, on the other hand, consists of independently living older adults in senior centers going through the driving cessation transition in the greater Cleveland, Ohio area. The PI chose this accessible population for practical reasons including lack of sufficient funding to reach out and recruit older adults who do not live in centralized settings.

Inclusion and Exclusion Criteria

Community-dwelling, that is non-institutionalized, older adults were recruited to participate in this study. Older adults who met the following inclusion criteria were invited to participate in the study: (a) 65 years of age and older, (b) have already made the decision to quit driving or are currently thinking about giving up driving, and (c) physically able to participate in the Tai Chi intervention program.

In spite of the low risk associated with practicing Tai Chi, it is recommended that people who have musculoskeletal illnesses should consult their primary care providers before engaging in such physical activity (Mayo Clinic, 2012). Therefore, individual participant’s ability to practice Tai Chi was assessed using the Stopping Elderly Accidents, Deaths, and Injuries (STEADI) algorithm and tool kit (CDC, 2015). The STEADI (Appendix A) materials are evidence-based tools specifically designed to be used for older adults at risk for falls and injury. The STEADI tool kit categorizes older
adults into three categories: low, moderate, and high risk for falls or injury. Low risk older adults are encouraged to engage in regular, low risk physical exercise programs to enhance balance and prevent falls. The researcher started by completing the required online training to obtain the certificate to use the STEADI tool kit. In addition, the researcher created a medical clearance form (Appendix B) to be used if an older adult was determined to be at moderate or high risk for falls or injury.

The researcher administered the STEADI tool kit to the participants and evaluated their readiness to practice Tai Chi as well as their risk for injury and falls. Participants who were identified as low risk, based on the results of administering the STEADI tool kit, were invited to practice Tai Chi without further assessment by their primary care physicians. None of the participants were identified as moderate or high risk for falls or injury, consequently, no one was referred to his/her primary care physician for further assessment using the medical clearance form. Utilizing this protocol enhanced the researcher’s confidence regarding older adults’ readiness and physical ability to practice Tai Chi.

Older adults who were currently institutionalized, for example those who live in long-term care facilities and nursing homes, were excluded. Those older adults were excluded because they live in settings that are more stressful and that may have a negative impact on their psychosocial status.

Sample Size

A total of 20 participants were recruited to participate in the current study. The decision on the number of participants was made based on the literature review of similar
intervention studies as well as the challenging experience of the researcher to find and recruit older adults who met the inclusion criteria. The literature regarding determining the sample size required to conduct feasibility studies provides limited guidance. More specifically, there are no clear calculation guidelines to estimate the sample size in feasibility studies. However, there is a great deal of emphasis that the sample size should always be justified (Billingham, Whitehead, & Julious 2013; Hertzog, 2008). Hertzog maintained that 10-15 participants per group can be sufficient to conduct feasibility studies. An example of a similar research study is presented by Redwine and colleagues (2012) who implemented a Tai Chi program to conduct a two-group pilot study with a sample size of 24 subjects.

**Sampling Method**

All participants were recruited using a purposive sampling approach, namely, the researcher used the total population sampling technique. This sampling method was selected because of the very limited number of people in the accessible population and the challenging recruitment process of older adults experiencing the driving cessation transition. Despite the subjective nature of selecting participants in purposive sampling, this approach is convenient and allows researchers to get deep insights about the phenomenon being studied (Knapp, 1998). More details about the disadvantages of this sampling method will be presented in the limitations section in chapter 5.

**Recruitment of Participants**

Following Institutional Review Board approval from Kent State University, various methods were used to announce the study and recruit older adults going through
the driving cessation transition. The PI talked directly to the administrative staff at these senior housing centers in order to facilitate communication with older adults who live in those settings. Additionally, flyers and posters (see Appendix C) were posted in different senior housing centers. Potential participants who live in the senior housing centers were introduced to the study through the posters and flyers as well as by having direct discussion with the PI. Contact information was included in all advertisement methods so that interested older adults could contact the researcher. Additionally, the PI attended a total of four general tenants’ meetings at the senior housing centers. During those meetings, the PI introduced the study, including its purpose and overall procedure, to older adults. In addition, the PI demonstrated some Tai Chi moves during those meetings and invited the audience to practice simple Tai Chi moves. Potential participants were invited to practice Tai Chi while sitting down to ensure safety and prevent injuries/falls. For example, potential participants were invited to practice the commencement form; starting by moving the hands up to shoulder height with palms facing each other, followed by bringing the hands closer to the body in front of the hips, then moving the hands along the chest and gently pushing them forward, and ending with lowering the hands and moving them to the sides of the body. During and after the meetings, the PI answered questions about the research study and gathered contact information of interested older adults who met the inclusion criteria. The following chart (Figure 3.2) shows the recruitment process and the number of older adults contacted, surveyed (for eligibility), recruited, and assigned to the two groups. People who were excluded did not meet the inclusion criteria as they were current drivers with no intention to quit driving in the near future.
Figure 3.2. Actual numbers of contacted and surveyed potential participants as well as those who met the inclusion criteria and agreed to participate in the study.

**Setting**

The original plan was to conduct this study in three senior housing centers in Northeast Ohio. One senior housing center was excluded from further consideration due to the collective lack of interest in Tai Chi by the residents who lived there. The recruitment process, data collection, and implementation of the Tai Chi intervention program proceeded at the remaining two senior housing centers.

**Procedure**

The researcher introduced and described the study to those older adults who responded to the recruitment methods. Interested older adults were introduced to the
study and asked questions to determine their eligibility to participate in the study. Contact information of interested older former drivers was obtained and an arrangement was made to obtain informed consent and assess the individual participant’s ability to practice Tai Chi using the STEADI protocol. The results of utilizing the STEADI tool kit showed that all participants were categorized as low risk for falls or injury. Therefore, there was no need to use the medical clearance form and to ask any participant to undergo further assessment to evaluate his/her ability to practice Tai Chi.

The first round of data collection took place prior to starting the Tai Chi program. Demographic data and data about driving history and the transition to driving cessation as well as measurement of the four dependent variables: depressive symptoms, loneliness, social isolation, and QOL were collected during this phase from all participants. After randomizing the senior housing centers using a draw, the intervention group participants engaged in the Tai Chi intervention program for a total of six weeks. Each participant received a $10 gift certificate during the second week of starting the Tai Chi intervention. Then, participants were given another $10 gift certificate during week four. Data on the four dependent variables were collected from participants in both groups at mid-point of the Tai Chi intervention and then upon its completion. In addition, all participants were asked to self-report any health conditions they have experienced or medications that have been prescribed during their participation in the course of the study. The last gift certificate ($10) was given during the last week of the Tai Chi intervention. The control group participants did not receive any treatment and were on the waiting list to start Tai Chi training after completing the post-intervention data collection from all participants.

**Data Collection**
Variables and Potential Covariates

**Independent variables (IV’s).** There are three IV’s in the current study: (a) assignment to the group: participation in the Tai Chi intervention or the control group, (b) the nature of driving cessation decision; voluntary or involuntary, and (c) the type of driving cessation transition; planned or unplanned. For the purpose of conducting this study, voluntary decision to quit driving is defined as the autonomous decision made by an older adult to cease driving without pressure by family members, friends, DMV authority, or health care providers. As for the type of the transition, planned transition is defined as planning ahead for driving cessation by an older adult such as searching for alternative transportation and selling his/her vehicle.

**Dependent variables (DV’s).** There are four main DV’s in this study: depressive symptoms, loneliness, social isolation, and QOL. These variables have been selected based on the integrative review of the literature and theoretical evaluation of the driving cessation transition. Theoretical analysis of the model by Choi et al (2012) supports the inclusion of three DV’s: depressive symptoms, social isolation, and QOL. The researcher integrated loneliness as one of the DV’s considering the empirical evidence in the literature that the driving cessation transition can lead to loneliness.

**Potential covariates.** There are many covariates that have been identified based on the literature review and the theoretical underpinnings of both the Transitions Model (Meleis et al., 2000) and the conceptual model developed by Choi and colleagues (2012). The experience of the driving cessation transition can be influenced by one or more of the following covariates: (a) age, (b) gender, (c) race, (d) education, (e) level of income, (f) marital status, (g) living arrangements, (h) time elapsed since driving cessation, (i)
availability of formal or informal transportation alternatives, and (j) medical history including comorbidity(ies) and use of medications that affect cognition, nervous system, or mobility. All these covariates were assessed at baseline using the demographic questionnaire as shown in Appendix D. Throughout the course of this study, participants were reminded to report changes in their income, marital status, living arrangements, medical history, or medications use because such changes can affect the driving cessation transition and, potentially, the severity of its consequences.

Data Collection and Research Tools (Appendix D)

A description of the measures used in the current study as well as evidence regarding their reliability and validity is presented in this section.

Depressive symptoms. The shorter version of the Geriatric Depression Scale (GDS) (Yesavage & Sheikh, 1986) was used to measure depressive symptoms. The original version of the GDS (Yesavage et al., 1983) consists of 30 items. The GDS was developed to uniquely measure depressive symptoms among the elderly and there is evidence that it is more predictive than other tools, the Center for Epidemiological Studies Depression Scale (CES-D) for example, in detecting depression among older adults (Yesavage & Sheikh, 1986). The shorter version of the GDS was developed to make its administration to the elderly population easier through minimizing the risk of fatigue and poor concentration associated with using longer scales (Yesavage & Sheikh, 1986). It takes about five to seven minutes to complete and it is highly recommended for use with physically and cognitively ill elderly. Therefore, it is appropriate for older adults experiencing driving cessation and other illness-related transitions. Based on the results of item correlation with depressive symptoms and validation studies, Yesavage
and Sheikh (1986) selected 15 yes/no items out of the 30 in the original GDS and included them in the shorter version. Ten items indicate depressive symptoms if answered positively and the other five indicate depressive symptoms when answered negatively. Based on the guidelines of scoring the GDS, a score of more than five on the short version of the GDS is suggestive of depression and requires further investigation and interviewing.

A validation study (Yesavage & Sheikh, 1986) compared the short- and long-form GDS scales and the results indicated that both forms are useful to differentiate depressed from non-depressed with a high correlation (r = .84, p < .001). Specificity and sensitivity of both forms were compared in a systematic review and demonstrated that both forms have similar criterion validity (Wancata, Alexandrowicz, Marquart, Weiss, & Friedrich, 2006). The authors found that the pooled sensitivity, and specificity of the GDS (short form) were .81 and .75, respectively. On the other hand, sensitivity of the long version of the GDS was .75 and specificity was .77. Cronbach’s α of the GDS-Short Form in the current study was .71.

**Social isolation.** Social isolation was measured in terms of the social networks and support as perceived by the participants. Lack of agreement about the definition of social networks makes measuring social networks and support challenging to researchers (Lubben & Gironda, 2003a). On the one hand, social support is focused on the subjective traits of social ties such as the quality and nature of social interactions (Lubben & Gironda, 2003b). On the one hand, social networks provide information about such objective characteristics of the structure of social ties as their source, density and size as well as geographic proximity and frequency of contacts. In this study, the 18-item
Lubben Social Network Scale (LSNS-18) (Lubben & Gironda, 2003b) was used to measure the social networks and perceived social support among the participants. One of the main advantages of using LSNS is its ability to assess social support provided by different social networks including family members, neighbors, and friends. The LSNS was first developed in 1998 and then revised three times with the LSNS-18 being the expanded version specifically designed for research purposes.

There is evidence that older people usually become more neighborhood-bound and they can rely on neighbors’ support to meet transportation needs (Lubben & Gironda, 2003a). While the other versions of the LSNS can measure family members’ and friends’ social support and networks, the LSNS-18 is an 18 item scale that distinguishes between social support provided by family, friends, or neighbors (Lubben & Gironda, 2003b). A factor analysis approach was followed to develop the expanded LSNS-18. It is an easy to administer research tool and it usually takes about five to 10 minutes to be completed.

The items of the LSNS-18 are categorized based on the source of support (family, neighbors, and friends) with each item having a rating of zero to five. The total score of the LSNS-18 is between 0 and 90 with higher scores indicating more social support and larger social networks. The LSNS-18 has the highest internal consistency reliability (Cronbach’s α = 0.82) among all other versions of the LSNS (Lubben & Gironda, 2003b). Similarly, the family, friends, and neighbors subscales of the LSNS-18 showed high internal consistency of 0.82, 0.87, and 0.80, respectively. In this study, Cronbach’s α of the LSNS-18 was .92. The values of Cronbach’s α of the LSNS-18 subscales were as follows: (a) family = .89, (b) neighbors = .81, and (c) friends = .92. As far as the construct validity, factor analysis of the LSNS-18 revealed that items from the three
subscales loaded sufficiently to the scale without having excessive redundancy (Lubben & Gironda, 2003b).

**Loneliness.** The UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978) is the most commonly used scale to measure loneliness. This scale has been revised multiple times, and the third version (Russell, 1996) was used in this study. The main drawback of both the first version of the UCLA Loneliness Scale (Russell et al., 1978) and the revised version (Russell, Peplau, & Cutrona, 1980) is the wording of the items and the responses. Items containing negatively/lonely worded statements that were specifically problematic to the elderly (Russel, 1996). On the other hand, the third version does not have such problematic wording. The UCLA Loneliness Scale (Version three) is a 20-item instrument that has been used and evaluated among different populations including the older adult population (Russell, 1996). Its internal consistency reliability, test-retest reliability, convergent validity, and construct validity were all established and supported (Russell, 1996). Cronbach’s α value of the UCLA Loneliness Scale-Version 3 in the current study was .67. Respondents are asked to rate their responses to the 20 items using a 4-item rating scale: 1 = never, 2 = rarely, 3 = sometimes, and 4 = always. After reversing the scores of nine items, the scores for all items are summed. The total score ranges from 20 to 80 with higher scores on the UCLA Loneliness Scale (Version 3) indicate a greater degree of loneliness (Russell, 1996).

**Quality of life.** The Quality of Life Index (QLI) (Ferrans & Powers, 1985) was used to measure the QOL among participants in this study. The QLI is a well-established research instrument that has various forms that can be used among a wide range of healthy people and those with various health conditions such as arthritis and liver
transplantation. In the current study, the generic version of the QLI was used to measure QOL of community-dwelling older adults. The QLI consists of two parts that measure overall QOL as well as QOL of the following domains: health and functioning, social and economic, psychological/spiritual, and family. The first part consists of 33 items and it is used to assess satisfaction with various aspects of life. The second part assesses the importance of those 33 items to the individual. To complete the QLI, individuals are asked to rate their satisfaction with and the importance of those 33 items on a six-item scale; with a score of one means very dissatisfied and very unimportant. The QLI can be completed in approximately 10 minutes. Following specific scoring guidelines and steps, the QLI produces a score ranging from zero to 30 with a higher score indicating better QOL.

One of the primary reasons for selecting the QLI in the current study was the reported reliability, content validity, and construct validity. Internal consistency reliability is supported by the analysis of more than 40 studies. Cronbach’s $\alpha$ of the overall QLI ranged from 0.73 to 0.99 (Ferrans & Powers, n.d. a). Cronbach’s $\alpha$ values of the four domains of the QLI ranged from 0.63 to 0.96. In this study, internal consistency reliability revealed the following Cronbach’s $\alpha$ values: (a) QLI (total) = .94, (b) health and functioning subscale = .84, (c) social and economic subscale = .80, (d) psychological/spiritual subscale = .92, and (e) family subscale = .73. Content validity is supported by the extensive literature review that preceded the development of the QLI. On the other hand, construct validity is supported by the results of factor analysis (Ferrans & Powers, 1992). Other reasons for choosing the QLI include the relatively easy administration and the reading level, i.e. fourth grade level, of the tool. More importantly,
the QLI was developed based on the premise that QOL is a subjective phenomenon that varies depending on the varying experiences of different people. Such conceptualization is consistent with the uniqueness of the driving cessation transitions and the resulting different consequences among older people.

**Measuring the IV’s.** The nature of the driving cessation decision and the type of transition were measured by asking questions about these two IV’s. During the pre-intervention interview, participants were asked about who primarily made the decision to quit driving and whether they planned to quitting driving or not. See Appendix D.

**Tai Chi Intervention**

The Tai Chi intervention program consisted of two 1-hour sessions per week of Tai Chi for six weeks. Tai Chi was selected based on the empirical evidence of its effectiveness as a relaxation technique. In addition, it is considered a gentle exercise that is particularly useful in the older adult population (Lee et al., 2010). Tai Chi is a mind-body intervention that has been found to be effective in improving the psychological status of different populations. Moreover, because it is a group-based exercise, the author proposed Tai Chi as a means of improving social interaction among a group of older adults who may have limited social networks and interaction. Tai Chi effectiveness in managing depression, enhancing physical mobility, improving social interaction, and improving QOL has been reported in many studies and systematic reviews (Chan et al., 2010; Chi et al., 2013; Lee et al., 2010; Waite-Jones et al., 2013; C. Wang et al., 2010a). The length, frequency, and duration of the Tai Chi intervention program were decided based on thorough literature review. There is a variation in the frequency of implementing Tai Chi interventions; however, two systematic reviews reported that the
The majority of such mind-body therapies lasted 12 weeks with one-hour session per week (Wang et al., 2010a; Wang et al., 2009). The original plan was to utilize a Tai Chi program that lasts for 12 weeks with weekly one-hour sessions. However, potential participants sounded concerns about making a long-term commitment due to the other responsibilities they have, such as doctor’s appointment and family responsibilities. Consequently, the PI decided to implement a six-week Tai Chi intervention with two one-hour sessions per week to enhance commitment. Of note, the PI consulted a Tai Chi expert prior to making the final decision about shortening the duration of the Tai Chi program without changing the total number of Tai Chi hours; 12 hours.

The specific type of Tai Chi utilized in the current study is called the Tai Chi for Arthritis program (Tai Chi for Health Institute, n.d), a Sun-style Tai Chi program. This program was developed by Dr. Paul Lam in 1997. The program involves practicing 12 relatively simple moves. In addition, Tai Chi classes started by practicing simple warm-up moves and ended with a short cool-down period. These warm-up and cool-down exercises are suggested by Dr. Lam as an integral part of the Tai Chi for Arthritis program. The decision to use this form of Tai Chi was based on consulting experts in designing and training Tai Chi. This type of Tai Chi is flexible and can be modified to match the physical ability of individual older adults. For example, an individual with a high risk for falls can practice Tai Chi while sitting on a chair. Therefore, the risk for falls and injury associated with practicing Tai Chi for Arthritis is minimal. In fact, Tai Chi for Arthritis helps improve balance and reduce the risk for falls (Voukelatos, Cumming, Lord, & Rissel, 2007) as well as improve physical functioning (Song, Lee, Lam, & Bae, 2003).
An expert Tai Chi instructor was hired to deliver the Tai Chi program. This instructor holds certificates to train Tai Chi for Arthritis, Kidz, Diabetes, Energy, Falls Prevention, and Rehabilitation. All of her certificates are awarded through the Tai Chi for Health Institute. She has been practicing Tai Chi for 23 years. In 2012, she became a Senior Trainer for the Tai Chi for Health Institute. Holding a Senior Trainer certificate authorizes an instructor to conduct Tai Chi instructor classes. Of note, the majority of the hired Tai Chi instructor’s trainees in other workshops and classes are usually older adults.

The Tai Chi sessions were held in a convenient environment that is private, comfortable, spacious, and accessible to the participants. All sessions were held during the same time of the day to enhance memorization of the class schedule and commitment to attend the largest number of Tai Chi classes. The PI received professional Tai Chi training prior to starting the intervention and obtained a certificate through the Tai Chi for Health Institute. He attended and participated in all the Tai Chi classes.

**Intention-to-Treat Protocol**

Before discussing the specific statistical plans for answering the research questions, the intention-to-treat protocol used in this study will be described. According to the Consolidated Standards of Reporting Trials (CONSORT) (2010), intention-to-treat analysis involves analyzing the groups exactly as assigned. A fundamental criterion to fully adhere to intention-to-treat analysis is to obtain a complete dataset about the main variables from all participants (Hollins & Campbell, 1999). However, this seems to be unlikely as a result of possible noncompliance with the intervention and dropout (Armijo-Olivo, Warren, & Magee, 2009; Wertz, 1995). Yet, intention-to-treat is a strategy that should be followed to minimize the risk of overestimating the clinical effectiveness of a
specific intervention (Hollins & Campbell, 1999). According to the *Cochrane Handbook* (Higgins & Green, 2011), there are three basic principles of intention-to-treat analysis: (a) keeping participants in the groups to which they were randomized regardless of the intervention they will receive, (b) measuring outcome data in all participants, and (c) including all participants in the analysis.

Based on those principles and recommendation provided by Alshurafa et al. (2012) Armijo-Olivo et al. (2009), and Hollins and Campbell (1999), the following protocol was created and followed in this study:

1. Randomization: senior housing centers were randomized and participants were kept in the group to which they were assigned.

2. Outcome data were collected from all participants regardless of their compliance with the designed intervention.

3. Compliance: participants’ compliance with the Tai Chi intervention was assessed by keeping records of attendance. Data were used and analyzed regardless of attendance. During data analysis, potential compliance effect on the effectiveness of the intervention was examined.

4. Withdrawal: participants who decided not to continue with the study would be interviewed and asked to participate in the remaining data collection rounds. None of the participants withdrew from the current study.

5. Dropout: participants who develop an adverse effect of the intervention and/or a health condition that prevented them from participating in the study, would also be interviewed and asked to participate in the post-intervention data collection.
One participant developed pneumonia and chose not to attend the last two Tai Chi classes. She participated in all rounds of data collection, though.

6. Follow-up would be established as needed. If a participant forgot or intentionally ignored completing a specific instrument (e.g. the GDS), he/she would be contacted and asked whether it would be possible to complete that instrument. Some participants did not fill out a number of questions. Upon contacting them, the PI found out that those participants experienced trouble understanding the questions. The PI then met with the participants and helped them complete all instruments.

7. Missing data: data entry and accuracy were double checked by the researcher. Missing data were replaced using the expectation maximization (EM) method. More details will be provided later in this chapter.

8. Data analysis and reporting: the intention-to-treat analysis protocol was the main plan to analyze and report the findings. This included analyzing and reporting the aggregate data of all participants in this study based on participants’ original assignment to either the intervention or control group. None of the participants decided to switch groups during the study and there was no need to apply this item of the intent-to-treat protocol.

**Analysis Plan**

Quantitative data were double entered into the Statistical Package for Social Sciences (SPSS) version 22. Then, data screening was done to assess any missing data, check for outliers, and to assess the fulfillment of statistical analyses assumptions. More
details about data entry checking, and replacement of missing values are discussed in the following section of this chapter.

**Plans for Testing the Research Hypotheses**

The researcher started the data analysis process by examining the correlations between the main sociodemographic variables and the DV’s. This step was performed to make the decisions regarding the most appropriate method of replacing missing values and the statistical analyses to be used to answer the research questions. In addition, possible correlations were examined to determine whether the effect of Tai Chi is linked to the implementation of the intervention or the effect of covariates.

The second step in the data analysis was to make a comparison between the intervention and control group in terms of depressive symptoms, social isolation, loneliness, and QOL at baseline. A multivariate analysis of variance (MANOVA) test was used to answer this research question. The results of the MANOVA results were then compared with the results obtained from analysis of the third research question. This comparison will help with the interpretation whether or not the results are related to the Tai Chi intervention program.

**Research hypothesis # 1: Compared to the wait-list control group**

Participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to three weeks. **Research hypothesis # 2:** Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms,
social isolation, and loneliness, and increase in quality of life from three weeks to six weeks. Research hypothesis # 3: Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to six weeks. These research hypotheses were formulated to compare the means of depressive symptoms, social isolation, loneliness, and QOL between the intervention and control groups at the three times of data collection. A repeated measure MANOVA was conducted to test the stated hypotheses. The decision to perform a MANOVA test, rather than MANCOVA, was based on the result of answering the first research question- that is, there was no significant correlation between the sociodemographic variables and the DVs.

Research hypothesis #4: Compared to retiring drivers, retired drivers have a higher risk of experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life. A MANOVA test was done to test the research hypothesis.

Research hypothesis # 5: Older adults who make involuntary decision to quit driving or experience unplanned driving cessation transition are at higher risk for experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life compared to those who make voluntary decision to and plan ahead to quit driving. This hypothesis is focused on examining the differences in depressive symptoms, loneliness, social isolation and QOL based on the nature of the driving cessation decision and the type of transition. A factorial MANOVA was performed to answer this question and test the hypothesis.

Procedures after Data Collection
**Data Entry**

All quantitative data were double-entered into SPSS. The PI started this process by creating a comprehensive code book. The code book included all items of the collected data at the three time points. Some items of the GDS and UCLA Loneliness Scale are negatively worded and required reversing the individual item scores. After that, the PI checked for any errors that might have happened during the data entry process. To do so, the PI compared the entered data with the original research measures used in this study. The small sample size helped the PI performing this step over a relatively short period of time.

**Data Screening**

Once the data were entered and checked, the PI moved forward with data screening. Data screening was performed mainly to check for any missing values, any outliers, and to evaluate the normality of the collected data. Checking for normality will be discussed under the MANOVA assumptions section. A number of steps were carried out to screen the data:

1) The QLI required using a special syntax for converting the scores and calculating the total QLI score as well as the scores of the subscales of the QLI: health and functioning, social and economic, psychological/spiritual, and family subscales. The PI used the syntax available on the website of the authors of the QLI scale (Ferrans & Powers, n.d. b) to perform this imputation for the QLI scores at times one, two, and three of data collection. See Appendix E.
2) The “Descriptives” and “Frequencies” functions were used to check for any missing values. Results showed that the demographic variables had no missing values. However, missing values were found after checking the data regarding the four DVs. The percentage of missing values at the variable level for the four DVs was 3.7%. Figure 3.3 shows the pattern of missing values, for the four DVs, and the completeness of demographic variables.

Overall Summary of Missing Values: All DVs, Times 1, 2, & 3

(A)

Overall Summary of Missing Values: Demographic Variables

(B)
Figure 3.3. Missing values all cases, all time points. Dependent variables (A), Demographic variables (B).

3) The PI was interested in knowing exactly where the missing values are coming from. Careful investigation of the data revealed that the majority of missing values are due to not answering selective items of the QLI. Namely, the majority of participants did not respond to the following items: how satisfied are you with your sex life? How satisfied are you with your spouse, lover, or partner? How satisfied are you with your job (if employed? How satisfied are you with not having a job (if unemployed, retired, or disabled)? How important to you is your sex life? How important to you is your spouse, lover, or partner? How important to you is your job (if employed? how important to you is having a job (if unemployed, retired, or disabled)?

4) Checking for outliers was performed. Boxplots were created for each variable and examined for the existence of any outliers. Only three mild outliers were found and those are shown in Figure 3.4. The PI decided to keep these three mild outliers in the data set and go forward with the rest of the analysis without further imputation.
Replacing Missing Values

The PI started the process of replacing missing values by checking whether or not the missing pattern is random. Little’s MCAR test was carried out and the results were not significant ($p = 1.0$) indicating that missing data were random. The PI decided to use Expectation-Maximization (EM) to replace missing values for the following reasons:

1) The missing values represent only a small percentage, 3.7%, of the collected data.

2) The PI did not consider using a regression-based, single imputation based on the results of correlations. Prior to replacing any missing values, examination of the correlations between the demographic variables and the four DVs was performed. No significant correlations were found between any of the demographic variable and the four DVs. In order to utilize a regression-based imputation method, finding significant correlations between the demographic variables and the four DVs seemed necessary to predict the missing values. Therefore, using a regression model could have introduced bias to the process of replacing missing values.

3) The likelihood of introducing bias using mean substitution and other traditional methods of dealing with missing values is higher compared to using EM (Graham, 2009). All in all, EM is superior to other methods of replacing missing values including group mean substitution, case mean substitution, regression imputation, and last observation carried forward (Polit, 2010).
To maintain the homogeneity of variables, the PI replaced the missing items for each scale separately. In other words, replacing the missing values in the GDS- short form was carried out separately from replacing the missing values in all other scales (LSNS-18, UCLA Loneliness Scale, & QLI). The same procedure was completed to replace the missing values in the LSNS-18, UCLA Loneliness Scale, and the QLI. The merge function was then used to combine the resulting four SPSS files into one file that contains replaced values of all missing items.

**Calculating the Total Scores**

Calculating the total scores for the GDS, LSNS-18, and UCLA Loneliness Scale was straightforward. The PI made sure that scores of all negatively worded items in the GDS and UCLA Loneliness Scale were reversed. The QLI required further imputation and utilization of a unique SPSS syntax.

**Making the Decision to Use MANOVA or MANCOVA**

The PI excluded using a univariate analysis (i.e. ANOVA or ANCOVA) considering the number of DV’s in the current study. There are four DV’s in this study which means that using a univariate analysis would have required conducting four different analyses; one for each DV. Following such statistical analysis approach results in inflation of type I error (Field, 2013; Mertler & Vannatta, 2013) and, hence, putting the conclusion validity of findings at risk (Trochim & Donnelly, 2008). Conducting four separate, univariate analyses means that the possibility of not having type I error, in case of having a $p$ value of $.05 = .95 \times .95 \times .95 \times .95 = .81$. The resulting probability of making type I error would be $1 - .81 = .19$. Conducting a multivariate analysis, on the
other hand would avoid inflation of type I error and improve conclusion validity of the results.

Mayers (2013) maintained that MANOVA requires some existing correlation between the DV’s to have a multivariate effect. Univariate statistical tests are more appropriate when there is no correlation between the DV’s. In the current study, correlation analysis revealed the following significant correlations between: (a) depressive symptoms and social isolation, $r = -.52, p < .05$; and (b) loneliness and QOL, $r = -.60, p < .001$. See Table 4.3. Therefore, performing MANOVA was more appropriate in this study.

MANOVA and MANCOVA are very similar and they both are used to test for group mean differences. In MANCOVA, covariates can be incorporated into the analysis (Mertler & Vannatta, 2013). To determine which test is appropriate to answer the research questions, the PI examined any correlations between the demographic variables and the four DVs after replacing the missing values. No significant correlations were detected between any demographic variables and any of the four DVs. Therefore, the PI decided to use MANOVA in an attempt to answer the research questions and test the hypotheses.

**MANOVA Assumptions**

The last step prior to carrying out the statistical analyses was to test the assumptions of MANOVA. Mertler and Vannatta (2013) stated that MANOVA has four main assumptions: (a) the observations are randomly sampled and independent of each other, (b) multivariate normality, (c) homogeneity of covariance matrices, and (d) linear
relationships among all pairs of DVs. The first assumption is related to the design of the study. The senior housing centers were randomly assigned to either the intervention or control group and all observations were independent of each other. Therefore, it is logical to argue that this assumption was met. The following is a discussion regarding methods of testing the remaining three assumptions.

**Multivariate normality.** Multivariate normality can be evaluated through examining both univariate normality and the bivariate scatterplots. The histograms and Q-Q plots of the four DVs are presented in Appendix F. The histograms show that some DVs were close to the shape of normal distribution, for example GDS time 2 and QLI time 3. However, many others show skewness and they are not as close to the normal distribution shape. The Q-Q plots show that the majority of observations of all DVs are arranged around the x-axis. The values of skewness and kurtosis as well as the results of Kolmogorov-Smirnov statistic indicate that some DVs are not normally distributed.

Kolmogorov-Smirnov statistic results show that the following DVs are not normally distributed: GDS1, GDS2, GDS3, UCLA2, and QLI2. The following table (Table 3.1) summarizes these results.

<table>
<thead>
<tr>
<th>DV</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Statistic</th>
<th>df</th>
<th>P Value</th>
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</thead>
<tbody>
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<td>GDS1</td>
<td>.71</td>
<td>.25</td>
<td>.25</td>
<td>20</td>
<td>.003</td>
</tr>
<tr>
<td>GDS2</td>
<td>0</td>
<td>-.26</td>
<td>.23</td>
<td>20</td>
<td>.008</td>
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<td>-1.6</td>
<td>.24</td>
<td>20</td>
<td>.003</td>
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<td>LSNS1</td>
<td>.28</td>
<td>.63</td>
<td>.12</td>
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<td>.17</td>
<td>.11</td>
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<td>-.52</td>
<td>-.01</td>
<td>.15</td>
<td>20</td>
<td>.20</td>
</tr>
</tbody>
</table>
The PI tried to enhance the normality of the DVs by transforming the variables using both the logarithm and square root methods. Upon examination of the histograms and the values of skewness and kurtosis as well as the Kolmogorov-Smirnov test, transformation of the DVs did not improve the normality of these variables. Therefore, the PI decided to use the original non-transformed DVs to be included in the statistical analyses. Of note, MANOVA is robust to violations of the normality assumption (Mertler & Vannatta, 2013).

**Linearity.** Linearity was evaluated through examination of the scatterplots. The scatterplots (Figure 3.5) show that the majority of scatterplots are elliptical. Therefore, this assumption was met and linear relationships among pairs of DVs was assumed. The scatterplots of all DVs at all times of data collection are presented. Because of the relatively small size of the scatterplots of all DVs at all times, the scatterplots of the DVs at the pre-intervention are also presented to make it easier for the reader to examine these scatterplots.
Figure 3.5. The scatterplots of all DVs at baseline (A) and all time points (B). GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index. The numbers next to these abbreviations indicate the time of data collection; 1: pre-intervention, 2: mid-point, 3: post-intervention.
Homogeneity of covariance matrices. Box’s test was used to test the assumption of homogeneity of covariance matrices. The results showed that the homogeneity of covariance matrices can be assumed with p values of .14, .16, .27, and .21 for the GDS-Short Form, LSNS-18, UCLA Loneliness Scale (Version 3), and the QLI respectively. Figure 3.6 depicts the Box’s test results. By assuming homogeneity of covariance matrices, results of the Wilks’ Lambda test will be interpreted during the interpretation of the MANOVA analyses in chapter four. The PI obtained the Box’s test by separately entering each of the four DVs to the repeated measures MANOVA analysis.

<table>
<thead>
<tr>
<th>Box's Test of Equality of Covariance Matricesa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box's M</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>df1</td>
</tr>
<tr>
<td>df2</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
</tbody>
</table>

(A)

<table>
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</thead>
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<td>Box's M</td>
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<tr>
<td>F</td>
</tr>
<tr>
<td>df1</td>
</tr>
<tr>
<td>df2</td>
</tr>
<tr>
<td>Sig.</td>
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</table>

(B)

<table>
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</thead>
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<td>Box's M</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>df1</td>
</tr>
<tr>
<td>df2</td>
</tr>
</tbody>
</table>

(C)
Figure 3.6. Box’s test results: Homogeneity of covariance matrices. (A): Geriatric Depression Scale-Short Form, (B): Lubben Social Network Scale-18, (C): UCLA Loneliness Scale-Version 3, (D): Quality of Life Index.

Homogeneity of variance between groups was evaluated by examining the results of Levene’s Test. The results (Table 3.2) indicate that homogeneity of variance between groups is assumed, except for the LSNS-18 at the pre-intervention round of data collection.

Table 3.2

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS total Time 1</td>
<td>.722</td>
<td>1</td>
<td>18</td>
<td>.407</td>
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<tr>
<td>GDS total Time 2</td>
<td>.000</td>
<td>1</td>
<td>18</td>
<td>1.000</td>
</tr>
<tr>
<td>GDS total Time 3</td>
<td>.048</td>
<td>1</td>
<td>18</td>
<td>.829</td>
</tr>
<tr>
<td>LSNS total time 1</td>
<td>4.680</td>
<td>1</td>
<td>18</td>
<td>.044</td>
</tr>
<tr>
<td>LSNS total time 2</td>
<td>1.243</td>
<td>1</td>
<td>18</td>
<td>.280</td>
</tr>
<tr>
<td>LSNS total time 3</td>
<td>.063</td>
<td>1</td>
<td>18</td>
<td>.805</td>
</tr>
<tr>
<td>UCLA total time 1</td>
<td>.238</td>
<td>1</td>
<td>18</td>
<td>.632</td>
</tr>
<tr>
<td>UCLA total time 2</td>
<td>.667</td>
<td>1</td>
<td>18</td>
<td>.425</td>
</tr>
<tr>
<td>UCLA total time 3</td>
<td>4.144</td>
<td>1</td>
<td>18</td>
<td>.057</td>
</tr>
</tbody>
</table>
Sphericity. A repeated measure MANOVA analysis was carried out in an attempt to test research hypotheses number one, two, and three. Therefore, the assumption of sphericity was evaluated through examining the results of Mauchly’s test. The results indicated that sphericity has not been violated for the LSNS-18, UCLA Loneliness Scale-Version 3, and QLI with p values of .07, .94, and .47 respectively. However, the assumption of sphericity was not met for the GDS-Short Form (p < .05) (see Table 3.3). Therefore, Greenhouse-Geisser results was used to interpret the univariate results relevant to the GDS-Short Form, whereas the results of sphericity-assumed were utilized to interpret the remaining of the univariate results pertinent to the LSNS-18, UCLA Loneliness Scale-Version 3, and QLI.

Table 3.3

Mauchly’s Test of Sphericity

<table>
<thead>
<tr>
<th>Within Subjects Effect</th>
<th>Measure</th>
<th>Mauchly's W</th>
<th>Approx. Chi-Square</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>GDS</td>
<td>.576</td>
<td>9.366</td>
<td>2</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td>LSNS</td>
<td>.732</td>
<td>5.297</td>
<td>2</td>
<td>.071</td>
</tr>
<tr>
<td></td>
<td>UCLA</td>
<td>.992</td>
<td>.132</td>
<td>2</td>
<td>.936</td>
</tr>
<tr>
<td></td>
<td>QLI</td>
<td>.916</td>
<td>1.498</td>
<td>2</td>
<td>.473</td>
</tr>
</tbody>
</table>

GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index.
Ethical Considerations

Protection of Human Subjects Rights

The decision to participate in this study was voluntary and all potential participants were assured that they have the right to accept or refuse to be a part of this study. Informed consents were obtained prior to collecting the first round of data and included all the essential elements of informed consent: (a) a description of the study, its purpose and procedure, (b) a statement of confidentiality, (c) a description of the benefits of participating in the study, (d) the researcher’s contact information, and (e) a statement that participation is voluntary. The project and the informed consent document were reviewed and approved by the Institutional Review Board at Kent State University. Withdrawal from the study at any time was the choice of the participants, as well. However, if a participant decided to withdraw from the study, he/she would be interviewed to find out the reason of making that decision and he/she would have been interviewed to find out the reason for making that decision and asked to participate in the remaining rounds of data collection. Privacy of the participants was maintained by not sharing such information that might identify any participant. All information obtained from the participants was not used in any way to harm them and participants were identified only by the ID numbers assigned to them by the PI. In addition, signed consent forms were separately stored from the collected data. All data were securely stored in a locked cabinet and digital data were stored in an encrypted external storage drive. Finally, only aggregate data will be presented in this dissertation and any future publications to maintain privacy of participants.

Anticipated Risks and benefits
Tai Chi was implemented as an intervention that could enhance the psychosocial status of older adults. The main potential benefit of conducting this study was the possible facilitation of the driving cessation transition in older adults. It was hypothesized in this study that Tai Chi would be a cost-effective, efficient intervention to decrease the major psychosocial consequences of driving cessation including depression, limited social support, and loneliness. In addition, improving the psychosocial status of older adults was expected to enhance their QOL.

Practicing Tai Chi is associated with no anticipated physical risks beyond those encountered in everyday life. As previously noted, the STEADI tool kit was administered prior to implementing the Tai Chi intervention to assess individual participants’ risk for falls and/or injuries. None of the participants were classified as moderate or high risk. The Tai Chi for Arthritis program is characterized by performing slow, organized movements. The program is adaptable in that an individual can perform the movements while sitting if he/she can not tolerate standing for a long time. The Tai Chi instructor and the PI made sure that all participants were comfortable while practicing Tai Chi. Throughout the intervention program, only one participant developed a pneumonia that prevented her from attending the last two Tai Chi classes.

Discussing issues related to the driving cessation transition may result in discomfort and uneasiness. The researcher followed the guidelines of the distress protocol designed by Draucker, Martsolf, and Poole (2009) to handle such events during the interviews. If a participant showed signs of mild distress that is not accompanied by safety concerns, the interviewer would have immediately stopped the interview and provided emotional support. In addition, the interviewer would have given the participant...
enough time to regroup or continue with the interview. If a participant showed more extreme distress and/or safety concerns to self or others, the interviewer would have stopped the interview and contacted local law authorities unless a family member could transport the participant to the emergency department. The participants talked openly about their driving cessation transition and there was no need to implement the mentioned protocol.

**Monetary Compensation**

Each participant was compensated a total of $30. This monetary compensation was in the form of three separate gift cards ($10 each) to a local grocery store. The first gift card was given during the third Tai Chi class, the second during week four, and the last one during the last Tai Chi class.

**Summary of Chapter Three**

This study was conducted using a quasi-experimental, two-group, repeated measures design. The PI recruited 20 participants from two senior housing centers in Northeast Ohio. The senior housing centers were randomly assigned to either the intervention or wait-list control group. Data were collected at three time points: pre- and post-intervention and at mid-point. This included data regarding sociodemographic variables, collected at baseline only, as well as data about depressive symptoms, social isolation, loneliness, and QOL collected at the three time points. The intervention group participated in a six-week Tai Chi intervention with two one-hour sessions per week. The same program was offered to the waiting list control group upon completion of all rounds of data collection. Data were double-entered to SPSS and screened for missing values.
Data screening revealed a total of 3.7% missing values of all data and EM was used to replace these values. The chapter also covered statistical methods to test MANOVA assumptions including multivariate normality, linearity, homogeneity of covariance matrices, and sphericity. Lastly, ethical consideration to ensure protection of participants’ human rights were summarized.
Chapter 4

Findings

This chapter is organized in the following way. Participants’ characteristics are summarized in the first section. Then, the main findings from the statistical tests are presented. The general format of this chapter is to present the research question/hypothesis, followed by the specific statistical test that was used, and then, the results. Tables and graphs are also presented to summarize and facilitate understanding of the results.

Characteristics of Participants

Twenty participants (19 women, 1 man, $M_{age} = 73.6$ years, $SD = 5.9$) were recruited in this study with 10 participants assigned to the intervention group, and 10 participants to the control group. In the study there were nine retiring drivers (those who were in the planning phase of quitting driving but have not made the decision yet) and 11 retired drivers (those who have already made the decision to quit driving). Table 4.1 summarizes the characteristics, in terms of the continuous variables, of the intervention and control group participants at baseline. Table 4.2 shows a comparison between the intervention and control group participants, at baseline, in terms of the categorical/ordinal variables. Careful examination of both tables reveals that both groups were comparable in regards to the basic demographic variables. For example, participants’ mean average of age is 73.9 and 73.2 years for the intervention and control groups, respectively. The
gender, marital status, race, and education were all very similar between the intervention and control group participants, as well. In addition, data regarding the driving history were comparable between the intervention and control group participants. None of the participants reported any changes in their driving status, or any other demographic variable throughout the course of this study. Only one participant reported a change in health condition, developed a pneumonia.

Table 4.1

Participants’ Characteristics at Baseline: Continuous Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention Group</th>
<th>Control Group</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (n)</td>
<td>SD</td>
<td>Mean (n)</td>
<td>SD</td>
</tr>
<tr>
<td>Age</td>
<td>73.9 (10)</td>
<td>6.26</td>
<td>73.2 (10)</td>
<td>5.88</td>
</tr>
<tr>
<td>Health problems*</td>
<td>1.7 (10)</td>
<td>1.42</td>
<td>2.1 (10)</td>
<td>.88</td>
</tr>
<tr>
<td>Driving**</td>
<td>35.9 (10)</td>
<td>7.23</td>
<td>37.8 (10)</td>
<td>11.53</td>
</tr>
<tr>
<td>Decision***</td>
<td>4.33 (6)</td>
<td>.82</td>
<td>4.9 (5)</td>
<td>4.25</td>
</tr>
</tbody>
</table>

* The number of health problems reported by the participants at baseline.
** Driving experience (years) as reported by the participants at baseline.
*** Time (years) since the decision to quit driving was made.

Table 4.2

Participants’ Characteristics at Baseline: Categorical/Ordinal Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention Group (n = 10)</th>
<th>Control Group (n = 10)</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percentage</td>
<td>N</td>
<td>Percentage</td>
</tr>
<tr>
<td>Gender:</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
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<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>90</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Marital Status:</td>
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<tr>
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<td>1</td>
<td>10</td>
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<tr>
<td>In-relationship, not married</td>
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<td>2</td>
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<tr>
<td>Married</td>
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<td>0</td>
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<td>Divorced/separated</td>
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<td>50</td>
<td>4</td>
<td>40</td>
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<tr>
<td></td>
<td>2</td>
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<td>3</td>
<td>30</td>
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<td>-----------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Widow/widower</strong></td>
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<td><strong>Race:</strong></td>
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<tr>
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<td>50</td>
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<td>60</td>
<td>5</td>
<td>50</td>
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<tr>
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<tr>
<td>Unplanned</td>
<td>4</td>
<td>40</td>
<td>6</td>
<td>60</td>
</tr>
</tbody>
</table>

**Testing Correlations**

Prior to starting data analyses to answer the research questions and test the hypotheses, the PI examined the correlations between the DV’s and sociodemographic variables. This step was implemented to determine which statistical test should be used; MANOVA or MANCOVA.

**Results**
The researcher used Pearson’s r correlation \((r)\) to test for associations between continuous variables, and the point-biserial correlation \((r_{pb})\) to test for associations between dichotomous and continuous variables. Point-biserial is a special type of Pearson’s r correlation which can be computed in SPSS in the same way as Pearson’s r. None of the four DVs was significantly correlated with any of the sociodemographic variables (Table 4.3). However, the table shows that some significant correlations were found between pairs of sociodemographic variables. Marital status had a moderate, positive correlation with both age \((r = .51, p < .05)\) and gender \((r = .49, p < .05)\). The results also showed that income and education had a moderate, negative correlation \((r = -.50, p < .05)\). In regards to the correlations between the pairs of the four DVs, depression was negatively correlated with the social status \((r = -.52, p < .05)\), and loneliness was negatively correlated with the QOL \((r = -.60, p < .001)\).

Table 4.3

**Correlations between study Variables**

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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Age</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>2- Gender</td>
<td>.34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>3- Marital Status</td>
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<td>.49*</td>
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<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>4- Race</td>
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<td>.12</td>
<td>-.41</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>5- Education</td>
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<td>-.34</td>
<td>.24</td>
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<td>6- Income</td>
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<td>-.19</td>
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<tr>
<td>8- Driving Status</td>
<td>.33</td>
<td>.25</td>
<td>.39</td>
<td>-.44</td>
<td>-.04</td>
<td>.09</td>
<td>.27</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>9- GDS</td>
<td>-.07</td>
<td>.09</td>
<td>.22</td>
<td>.01</td>
<td>-.43</td>
<td>.24</td>
<td>.32</td>
<td>.06</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>10- LSNS</td>
<td>-.04</td>
<td>.20</td>
<td>-.10</td>
<td>-.18</td>
<td>.09</td>
<td>-.03</td>
<td>.23</td>
<td>-.12</td>
<td>-.52*</td>
<td>-</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>11- UCLA</td>
<td>-.03</td>
<td>-.03</td>
<td>.16</td>
<td>-.09</td>
<td>-.01</td>
<td>-.13</td>
<td>-.23</td>
<td>-.14</td>
<td>-.21</td>
<td>-.25</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>12- QLI</td>
<td>.23</td>
<td>.20</td>
<td>-.27</td>
<td>.17</td>
<td>.26</td>
<td>-.32</td>
<td>.18</td>
<td>.22</td>
<td>-.28</td>
<td>.36</td>
<td>-.6**</td>
<td>20</td>
</tr>
</tbody>
</table>

* P < .05, ** P < .01
Note: GDS: Geriatric Depression Scale-Short Form, LSNS: Lubben Social Network Scale-18, UCLA: UCLA Loneliness Scale-Version 3, QLI: Quality of Life Index, Health Problems: The number of health problems reported by the participants at baseline.
Based on these findings MANOVA, not MANCOVA, was used to answer the remaining research questions and test the research hypotheses.

**Baseline Comparison**

A baseline comparison between the intervention and control group participants was conducted. Making such comparison would help determine whether any resulting differences, after implementing the Tai Chi intervention, are attributed to the intervention.

**Results**

A one-way MANOVA test was conducted to determine the differences in the four DVs between the intervention and control groups at baseline. The PI entered only the pre-intervention scores of the GDS, LSNS, UCLA Loneliness Scale, and QLI to the MANOVA analysis. The results revealed no statistically significant difference in the four DVs between the intervention and control groups prior to implementing the six-week Tai Chi intervention program, Wilks’ $\Lambda = .95$, $F(4, 15) = .19$, $p = .94$, multivariate $\eta^2 = .05$. Wilks’ $\Lambda$ is reported here because the Box’s test was not statistically significant. Since the multivariate results are not statistically significant, results of univariate analysis will not be presented. Table 4.4 summarizes the multivariate results at baseline.

Table 4.4

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Pillai’s Trace</td>
<td>.047</td>
<td>.186</td>
<td>4.000</td>
<td>15.000</td>
<td>.942</td>
</tr>
</tbody>
</table>
Research Hypotheses # 1, 2, and 3

Narratives

Research hypothesis # 1. Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to three weeks.

Research hypothesis # 2. Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from three weeks to six weeks.

Research hypothesis # 3. Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to six weeks.

Results

Multivariate results. A repeated measures MANOVA analysis was carried out to compare the four DVs (depressive symptoms, social support and networks, loneliness,
and QOL) between the intervention and control groups at the three rounds of quantitative data collection, i.e. pre- and post-intervention and mid-point. The results of the repeated measures MANOVA showed a significant group difference between the intervention and control groups in at least one of the four DVs, Wilks’ Λ = .50, $F(4, 15) = 3.70, p = .03$, multivariate $\eta^2 = .50$. In addition, time had a statistically significant effect on at least one of the four DV’s, Wilks’ Λ = .15, $F(8, 11) = 7.81, p = .001$, multivariate $\eta^2 = .85$; and a statistically significant interaction between time and group was found, Wilks’ Λ = .21, $F(8, 11) = 5.06, p = .008$, multivariate $\eta^2 = .79$ (Table 4.5). The Wilks’ Lambda statistic is reported here because of the nonsignificant Box’s test. The repeated measures MANOVA outputs revealed the following values of observed power for group, time, and group by time interaction .76, .99, and .94; respectively.

Table 4.5

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
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<td>Between Subjects</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>.504</td>
<td>3.695</td>
<td>4.000</td>
<td>15.000</td>
<td>.028</td>
<td>.496</td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Subjects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>.150</td>
<td>7.805</td>
<td>8.000</td>
<td>11.000</td>
<td>.001</td>
<td>.850</td>
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<tr>
<td>Wilks' Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time * Group</td>
<td>.214</td>
<td>5.056</td>
<td>8.000</td>
<td>11.000</td>
<td>.008</td>
<td>.786</td>
</tr>
<tr>
<td>Wilks' Lambda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Between-group main effect.** The significance of the presented multivariate statistics required further investigation of the univariate outputs. Therefore, multiple univariate analyses were then conducted as follow-up on the multivariate results. Analyses of variance (ANOVA) were conducted on each dependent variable to determine
which dependent variable(s) was/were responsible for the significance of the multivariate analysis. The results revealed that the depression was significantly lower for the intervention group compared to the control group, $F(1, 18) = 10.96, p = .004, \eta^2 = .38$.

The group factor did not have significant effect on social support, loneliness, or QOL (Table 4.6).

Table 4.6

*Between-group Main Effects on the Dependent Variables*

<table>
<thead>
<tr>
<th>Source</th>
<th>Measure</th>
<th>df</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>GDS</td>
<td>1a</td>
<td>10.960</td>
<td>.004</td>
<td>.378</td>
</tr>
<tr>
<td></td>
<td>LSNS</td>
<td>1a</td>
<td>.000</td>
<td>.988</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>UCLA</td>
<td>1a</td>
<td>.019</td>
<td>.892</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>QLI</td>
<td>1a</td>
<td>1.069</td>
<td>.315</td>
<td>.056</td>
</tr>
</tbody>
</table>

\(^{a}\) Reported Error df = 18

GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index.

### Within-group main effect

Results of the Mauchly’s test revealed that sphericity can be assumed for all of the DVs except depressive symptoms ($p = .009$). Therefore, the Greenhouse-Geisser statistic was used to report the univariate results relevant to the depressive symptoms and the sphericity assumed statistic was used for all other DVs. ANOVA analyses revealed three significant findings: (a) depressive symptoms were significantly lower at post-intervention than at baseline, $F(1.41, 25.29) = 33.81, p < .001, \eta^2 = .65$; (b) social support and networks were significantly higher at post-intervention than baseline, $F(2, 36) = 3.90, p = .03, \eta^2 = .18$; and (c) QOL was significantly higher after implementing the Tai Chi intervention than baseline, $F(2, 36) = 16.65, p < .001, \eta^2$.
= .48. No statistically significant change on loneliness was noticed, $F(2, 36) = 2.11, p = .14$. The within-group main effects are summarized in Table 4.7.

Table 4.7

**Within-group Main Effects on the Dependent Variables**

<table>
<thead>
<tr>
<th>Source</th>
<th>Measure</th>
<th>Statistic</th>
<th>df</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>GDS</td>
<td>Greenhouse-Geisser</td>
<td>1.41$^a$</td>
<td>33.813</td>
<td>&lt;.001</td>
<td>.653</td>
</tr>
<tr>
<td></td>
<td>LSNS</td>
<td>Sphericity Assumed</td>
<td>2$^b$</td>
<td>3.880</td>
<td>.030</td>
<td>.177</td>
</tr>
<tr>
<td></td>
<td>UCLA</td>
<td>Sphericity Assumed</td>
<td>2$^b$</td>
<td>2.109</td>
<td>.136</td>
<td>.105</td>
</tr>
<tr>
<td></td>
<td>QLI</td>
<td>Sphericity Assumed</td>
<td>2$^b$</td>
<td>16.649</td>
<td>&lt;.001</td>
<td>.481</td>
</tr>
</tbody>
</table>

$^a$ Reported Error df value = 25.288  
$^b$ Reported Error df value = 36  
GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index.

**Time by group interactions.** Results of the ANOVA analysis showed results similar to the ones reported in the previous sub-section. Results revealed significant interaction between time and group for (Table 4.8): (a) depressive symptoms, $F(1.41, 25.29) = 13.46, p < .001, \eta^2 = .43$; (b) social networks and support, $F(2, 36) = 6.65, p = .003, \eta^2 = .27$; and (c) QOL, $F(2, 36) = 5.49, p = .008, \eta^2 = .23$. Time by group interaction did not result in statistically significant change of loneliness, $F(2, 36) = .03, p = .97$.

Table 4.8

**Time * Group Interaction Effects on the Dependent Variables**

<table>
<thead>
<tr>
<th>Source</th>
<th>Measure</th>
<th>Statistic</th>
<th>df</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
</table>
**Finding the source of interaction.** Further investigation was conducted to determine the exact source of statistically significant interaction. To do so, the PI explored the resulting pairwise comparisons and estimates tables generated by the repeated measures MANOVA analysis. Then, the PI integrated the results and created a summary table of the interactions (Table 4.9). The mean scores of the four DVs at the three time points of quantitative data collection are presented in this table. This step of analysis revealed that the mean differences in the depressive symptoms and QOL were statistically significant between the intervention and control groups, both at the post-intervention data collection. Across time points, the following intervention group mean differences were found to be significant: (a) depressive symptoms at mid-point and post-intervention, (b) social support and networks at post-intervention, and (c) QOL at mid-point and post-intervention. Differences in the loneliness are also evident; however, this change is not statistically significant. As for the control group, the mean differences for the depression and QOL were statistically significant at mid-point only, but not at the post-intervention point.

Table 4.9

<table>
<thead>
<tr>
<th>Time * Group</th>
<th>GDS</th>
<th>Greenhouse-Geisser</th>
<th>1.41&lt;sup&gt;a&lt;/sup&gt;</th>
<th>13.459</th>
<th>&lt;.001</th>
<th>.428</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSNS</td>
<td></td>
<td>Sphericity Assumed</td>
<td>2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.651</td>
<td>.003</td>
<td>.270</td>
</tr>
<tr>
<td>UCLA</td>
<td></td>
<td>Sphericity Assumed</td>
<td>2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.034</td>
<td>.967</td>
<td>.002</td>
</tr>
<tr>
<td>QLI</td>
<td></td>
<td>Sphericity Assumed</td>
<td>2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.490</td>
<td>.008</td>
<td>.234</td>
</tr>
</tbody>
</table>

<sup>a</sup> Reported Error df value = 25.288  
<sup>b</sup> Reported Error df value = 36

GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index.
Differences in Means of the Dependent variables between the Intervention and Control Groups at All Time Points

<table>
<thead>
<tr>
<th>Measure</th>
<th>Group</th>
<th>Time</th>
<th>Mean Difference</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>GDS</td>
<td>Intervention</td>
<td>4.30</td>
<td>3.40</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>4.51</td>
<td>3.60</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-.21</td>
<td>-.20</td>
</tr>
<tr>
<td>LSNS</td>
<td>Intervention</td>
<td>41.03</td>
<td>40.30</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>43.53</td>
<td>44.97</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-2.50</td>
<td>-4.67</td>
</tr>
<tr>
<td>UCLA</td>
<td>Intervention</td>
<td>52.43</td>
<td>49.93</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>52.30</td>
<td>50.20</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>.13</td>
<td>-.27</td>
</tr>
<tr>
<td>QLI</td>
<td>Intervention</td>
<td>19.28</td>
<td>22.26</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>19.18</td>
<td>21.37</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>.09</td>
<td>.89</td>
</tr>
</tbody>
</table>

*Mean difference is significant at the p value of < .05, ** Mean difference is significant at the p value < .001.

Note: GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index. The numbers next to these abbreviations indicate the time of data collection; 1: pre-intervention, 2: mid-point, 3: post-intervention.

Independent samples t-tests were performed to determine the effects of the implemented intervention on the four DVs. The results showed that the intervention group had significantly lower depression symptoms, \( t(18) = -8.05, p < .001, d = -2.4 \); and better QOL, \( t(18) = 2.36, p = .03, d = 3.59 \), at post-intervention. The differences in social support and networks and loneliness from baseline to post-intervention were not significant based on the computed independent samples t-test. In addition, the mean scores of the four DVs were investigated across time for the intervention and control groups separately. Paired t-tests were conducted comparing the baseline mean scores with those at post-intervention. The results revealed statistically significant reduction of the
intervention group depressive symptoms at the post-intervention time compared to baseline, \( t(9) = 8.19, p < .001 \). In addition, significant increases in the social support and networks, \( t(9) = -4.10, p = .003 \); and QOL, \( t(9) = -4.98, p = .001 \) were noted for the intervention group. The differences in loneliness were not significant, \( t(9) = 1.29, p = .228 \). Similarly, no statistically significant differences were revealed in any of the four DVs over time for the control group. The results of the independent-samples and paired t-tests are consistent with the findings presented and summarized in Table 4.9.

**Graphical presentation of main effects.** The estimated means of each one of the four DVs were plotted across points of time. The plots help illustrate the pattern of change for each DV throughout the course of this study. Figure 4.1 depicts the resulting plots. Figure 4.1-A shows that the depressive symptoms decreased, improved, more dramatically for the intervention group than for the control group. This decrease is more dramatic moving from the mid-point to post-intervention times for the intervention group. Social networks and support showed a different type of change for the intervention and control groups (Figure 4.1-B). The control group showed improvement, increase, in social networks and support between baseline and mid-point, followed by a decrease to an even lower level than baseline at the post-intervention point. On the other hand, the intervention group’s social networks and support had a sharp increase between baseline and post-intervention in spite of the slight decline at mid-point. The plot showing the loneliness scores looks similar for both the intervention and control groups. Both groups had a decrease, then improvement, in loneliness. The loneliness scores are depicted in Figure 4.1-C. Finally, the QOL showed a more dramatic improvement for the intervention group compared to the control group (Figure 4.1-D).
Figure 4.1. Graphical presentation of the four DVs at the three time points.

Depression (A), Social support (B), Loneliness (C), and Quality of Life (D).
Research Hypothesis # 4

Narratives

Research hypothesis # 4: Compared to retiring drivers, retired drivers have a higher risk of experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life.

Results

A one-way MANOVA test was conducted to determine whether driving status affects any of the four DVs. The results did not show any statistically significant difference between retiring and retired drivers in any of the four DVs; depressive symptoms, social networks and support, loneliness, and QOL at baseline; Wilks’ Λ = .90, $F(4, 15) = .41, p = .80$. See Table 4.10. Based on the insignificant multivariate results, no further univariate analyses were necessary.

Research Hypothesis # 5

Narratives

Research hypothesis # 5. Older adults who make involuntary decision to quit driving or experience unplanned driving cessation transition are at higher risk for experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life compared to those who make voluntary decision to and plan ahead to quit driving.

Results

The PI postulated that an involuntary decision to quit driving and experiencing an unplanned driving cessation transition lead to worsening of depressive symptoms, social
isolation, and loneliness, and poorer QOL among older adults going through the driving cessation transition. To test this hypothesis, a factorial MANOVA was carried out. The PI failed to support the research hypothesis based on the results. The nature of the driving cessation decision did not have a statistically significant effect on any of the four DVs, Wilks’ $\Lambda = .70, F(4, 14) = 1.50, p = .26$. Likewise, the type of the driving cessation transition had an insignificant effect on the four DVs, Wilks’ $\Lambda = .77, F(4, 14) = 1.04, p = .42$. The interaction between the nature of the driving cessation decision and the type of transition did not have a significant effect on any of the DVs, either, Roy’s Largest Root $= .00, F(4, 13) = .00, p = 1.00$. Therefore, moving forward with interpreting the univariate analyses of this factorial MANOVA was neither helpful nor necessary. Table 4.10 provides a summary of the multivariate analyses used to answer research questions four and five and test the second research hypothesis.

Table 4.10

*Multivariate Statistics: Driving Status, Decision Nature, and Type of Transition Effects on the Dependent Variables*

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving Status</td>
<td>Wilks' Lambda</td>
<td>.90</td>
<td>.41</td>
<td>4.00</td>
<td>15.00</td>
</tr>
<tr>
<td>Decision Nature</td>
<td>Wilks' Lambda</td>
<td>.70</td>
<td>1.50</td>
<td>4.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Type of Transition</td>
<td>Wilks' Lambda</td>
<td>.77</td>
<td>1.04</td>
<td>4.00</td>
<td>14.00</td>
</tr>
<tr>
<td>Decision Nature * Type of Transition</td>
<td>Roy’s Largest Root</td>
<td>.00</td>
<td>.00</td>
<td>4.00</td>
<td>13.00</td>
</tr>
</tbody>
</table>

*Roy’s Largest Root statistic is reported here because the SPSS output did not include the values of $p$, $F$, and hypothesis df for all other MANOVA statistics (Wilk’s Lambda, Pillai’s Trace, and Hotelling’s Trace).*

**Additional Findings**

**Attendance and Program Evaluation**
Fifty seven percent of the people who were invited agreed to participate in the current study. Records of attendance were kept by the PI as a quantitative indicator of evaluating the effectiveness of the implemented Tai Chi intervention. The PI examined the correlation between attendance, measured by the number of classes a participant attended, and the DVs at post-intervention. Pearson’s r correlation was conducted and the results revealed no significant correlations between attendance and any of the four DVs (Table 4.11).

Table 4.11

*Evaluating Program Effectiveness: Correlations between Attendance and Dependent Variables*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Attendance</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>2- GDS</td>
<td>-.43</td>
<td>-.63</td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>3- LSNS</td>
<td>.61</td>
<td>.16</td>
<td>-.38</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>4- UCLA</td>
<td>-.09</td>
<td>.09</td>
<td>-.38</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>5- QLI</td>
<td>.47</td>
<td>-.58</td>
<td>.33</td>
<td>-.48</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale- version 3, QLI: Quality of Life Index.

None of the current study participants developed any adverse effects throughout the course of the study. The flexibility of the implemented Tai Chi intervention made practicing Tai Chi more enjoyable for the participants. The Tai Chi instructor made sure that all participants were comfortable during every class. The previously described procedure of Tai Chi practice was followed during all classes. Chairs were readily available to enhance safety of participants who chose to practice Tai Chi sitting down.
One participant developed a pneumonia during the study, and could not attend two Tai Chi classes.

**Subscales**

**LSNS-18 subscales.** The LSNS-18 has three subscales: family, neighbors, and friends. A repeated measures MANOVA analysis was conducted to determine which LSNS-18 subscale(s) had the most significant improvement. The multivariate results revealed a significant time by group interaction; Wilks’ $\Lambda = .40$, $F(6, 13) = 3.21$, $p = .037$, multivariate $\eta^2 = .60$. The observed power for the time by group interaction was .75. Neither group; Wilks’ $\Lambda = .97$, $F(3, 16) = .17$, $p = .92$; nor time; Wilks’ $\Lambda = .62$, $F(6, 13) = 1.33$, $p = .31$; had a significant effect on the LSNS-18 subscales (Table 4.12).

Table 4.12

*Multivariate Statistics: Group, Time, and Time by Group Effects on the LSNS-18*

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Wilks' Lambda</td>
<td>.969</td>
<td>.169</td>
<td>3.00</td>
<td>16.00</td>
<td>.916</td>
</tr>
<tr>
<td>Time</td>
<td>Wilks' Lambda</td>
<td>.620</td>
<td>1.328</td>
<td>6.00</td>
<td>13.00</td>
<td>.313</td>
</tr>
<tr>
<td>Time by Group</td>
<td>Wilks' Lambda</td>
<td>.403</td>
<td>3.206</td>
<td>6.00</td>
<td>13.00</td>
<td>.037</td>
</tr>
</tbody>
</table>

The resulting ANOVA output revealed a statistically significant time by group effect on the neighborhood subscale only; $F(2, 36) = 8.61$, $p = .001$, $\eta^2 = .32$. The output revealed insignificant results for the remaining two subscales: family $F(2, 36) = 2.21$, $p =$
.12, \( \eta^2 = .11 \); and friends; \( F(2, 36) = 1.07, p = .36, \eta^2 = .06 \). The following figure (4.2) shows the graphic presentations of the changes in the three subscales of the LSNS-18 between the intervention and control groups at the three time points. The intervention group participants had an improvement, in the three subscales; however, the neighborhood subscale was the only significant change based on the presented ANOVA results.
Figure 4.2. Graphical presentation of the LSNS-18 subscales mean differences at the three time points. Family (A), Neighborhood (B), Friends (C).

An independent samples t-test was performed to compare the means of the neighborhood subscales between the intervention and control groups prior to and after implementing the Tai Chi intervention. The results showed an insignificant difference at baseline between the two groups, \( t(18) = -0.38, p = .71, d = -0.8 \). The post-intervention difference between the intervention and control groups neighborhood subscales was significant, \( t(18) = 2.51, p = .02, d = 4.4 \). A paired t-test was also conducted to compare the mean scores of the neighborhood across time points. The results revealed a significant improvement for the intervention group participants, \( t(9) = 4.35, p < .002 \); and an insignificant mean difference across time points for the control group, \( t(9) = .44, p = .67 \).

QLI Subscales. The QLI encompasses four subscales: health and functioning, social and economic, psychological/spiritual, and family subscales. Another repeated measures MANOVA was conducted to compare the mean scores of these subscales between the intervention and control groups at the three time points. The multivariate results showed a statistically significant time effect on at least one of the QLI subscales,
Wilks’ \( \Lambda = .25, F(8, 11) = 4.23, p = .02 \), multivariate \( \eta^2 = .76 \); and a similar significant time by group effect, Wilks’ \( \Lambda = .27, F(8, 11) = 3.81, p = .02 \), multivariate \( \eta^2 = .74 \). The observed power values for the time and time by group effects were .88 and .84, respectively. The group effect, on the other hand, was not significant, Wilks’ \( \Lambda = .68, F(4, 15) = 1.79, p = .18 \), multivariate \( \eta^2 = .32 \). Table 4.13 summarizes these multivariate results.

Table 4.13

Multivariate Statistics: Group, Time, and Time by Group Effects on the QLI Subscales

<table>
<thead>
<tr>
<th>Effect</th>
<th>Value</th>
<th>F</th>
<th>Hypothesis df</th>
<th>Error df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Wilks’ Lambda</td>
<td>.68</td>
<td>1.79</td>
<td>4.00</td>
<td>15.00</td>
<td>.183</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.323</td>
</tr>
<tr>
<td>Time</td>
<td>Wilks’ Lambda</td>
<td>.245</td>
<td>4.231</td>
<td>8.00</td>
<td>11.00</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.755</td>
</tr>
<tr>
<td>Time by Group</td>
<td>Wilks’ Lambda</td>
<td>.265</td>
<td>3.813</td>
<td>8.00</td>
<td>11.00</td>
<td>.022</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.735</td>
</tr>
</tbody>
</table>

Follow up ANOVA analyses showed significant time effect on three QLI subscales: (a) health and functioning, \( F(2, 36) = 15.98, p < .001, \eta^2 = .47 \); (b) Social and economic, \( F(2, 36) = 9.75, p < .001, \eta^2 = .35 \); and (c) family, \( F(2, 36) = 13.86, p < .001, \eta^2 = .44 \). The time by group interaction had a significant effect on both health and functioning, \( F(2, 36) = 5.85, p = .006, \eta^2 = .25 \); and family, \( F(2, 36) = 5.98, p = .006, \eta^2 = .25 \). The following table (Table 4.14) presents all the ANOVA analyses results.

Table 4.14

ANOVA Results: Time and Time by Group Effects on the QLI Subscales
<table>
<thead>
<tr>
<th>Source</th>
<th>Subscale</th>
<th>Statistic</th>
<th>df&lt;sup&gt;a&lt;/sup&gt;</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Health &amp; Functioning</td>
<td>Sphericity</td>
<td>2</td>
<td>15.978</td>
<td>&lt;.001</td>
<td>.470</td>
</tr>
<tr>
<td></td>
<td>Social &amp; Economic</td>
<td>Sphericity</td>
<td>2</td>
<td>9.748</td>
<td>&lt;.001</td>
<td>.351</td>
</tr>
<tr>
<td></td>
<td>Psychological /Spiritual</td>
<td>Sphericity</td>
<td>2</td>
<td>1.496</td>
<td>.238</td>
<td>.077</td>
</tr>
<tr>
<td></td>
<td>Family</td>
<td>Sphericity</td>
<td>2</td>
<td>13.855</td>
<td>&lt;.001</td>
<td>.435</td>
</tr>
<tr>
<td>Time * Group</td>
<td>Health &amp; Functioning</td>
<td>Sphericity</td>
<td>2</td>
<td>5.846</td>
<td>.006</td>
<td>.245</td>
</tr>
<tr>
<td></td>
<td>Social &amp; Economic</td>
<td>Sphericity</td>
<td>2</td>
<td>1.563</td>
<td>.223</td>
<td>.080</td>
</tr>
<tr>
<td></td>
<td>Psychological /Spiritual</td>
<td>Sphericity</td>
<td>2</td>
<td>3.143</td>
<td>.055</td>
<td>.149</td>
</tr>
<tr>
<td></td>
<td>Family</td>
<td>Sphericity</td>
<td>2</td>
<td>5.977</td>
<td>.006</td>
<td>.249</td>
</tr>
</tbody>
</table>

<sup>a</sup> Reported Error df = 36

Examination of the plots showed results that validate the statistical analyses pertinent to the QLI subscales. Figure 4.3 (A-D) depicts the changes in the mean scores of the QLI subscales over time for the intervention and control groups. The intervention group had an increase over time in all of the QLI subscales. The control group had a different pattern over time that showed slight improvement moving from baseline to mid-point in all of the QLI subscales. This was followed by a decrease in all of the QLI subscales at post-intervention to levels that are very close to those at pre-intervention.
Estimated Marginal Means of Health Functioning

Estimated Marginal Means of Socioeconomic

(A)

(B)
Figure 4.3. Patterns of QLI subscales changes over time for the intervention and control groups. (A): Health and functioning subscale, (B): Social and Economic subscale, (C): Psychological/Spiritual Subscale, (D): Family subscale.
Finally, t-tests were conducted to compare the mean differences between the intervention and control groups before and after implementing the intervention program. Results of the independent samples t-tests revealed only one statistically significant mean difference; the health and functioning subscale improved after implementing the Tai Chi intervention, \( t(18) = 2.36, p = .03, d = 4.22 \). No other significant mean differences were found between the intervention and control groups based on the independent samples t-tests. Paired t-tests results showed statistically significant results for the intervention group in three of the QLI subscales: (a) health and functioning, \( t(9) = 6.00, p < .001 \); (b) social and economic, \( t(9) = 3.29, p < .001 \); and (c) family, \( t(9) = 5.39, p < .001 \). All of these results are indicative of improvement in these three QLI subscales after implementing the Tai Chi intervention. No significance was found for the intervention group in the psychological/spiritual subscale. As for the control group, no significant mean differences in any of the QLI subscales were found when comparing the pre- to post-intervention mean scores.

**Conclusion and Summary of Chapter Four**

Both groups were comparable at baseline in terms of the sociodemographic variables. Similarly, driving status and history measures were similar for participants of the intervention and control groups. In addition, statistical analyses revealed that the intervention and control groups did not have a statistically significant difference in any of the four DVs at baseline. There is evidence that the Tai Chi intervention improved certain psychosocial aspects and quality of life of the intervention group participants. After implementing the Tai Chi intervention, the intervention group participants had a decrease
in their depressive symptoms, an increase in social networks and support, and quality of life. Loneliness was also lower, however, this was not a statistically significant difference. Neither the nature of the driving cessation transition nor the type of transition had a significant effect on any of the four DVs measured among older adults going through the driving cessation transition in this study. Similarly, there were no differences in any of the four DVs between retiring and retired older drivers. Further investigation of the LSNS-18 subscales revealed that only the neighborhood subscale had a significant improvement after implementing the Tai Chi intervention in the intervention group. In regards to the QLI subscales, time had a significant effect on the health and functioning, social and economic, and family subscales. Additionally, the time by group interaction resulted in significant differences between the intervention and control groups in two subscales: health and functioning, and family. Finally, the Tai Chi intervention was successful as indicated by lack of adverse effects and participants’ attendance. However, no significant correlation was found between level of attendance of Tai Chi classes and the improvement of psychosocial status and QOL of the intervention group participants.
Chapter 5

Discussion and Implications of the Study

This study was conducted to examine the effectiveness of a six-week Tai Chi intervention on the negative psychosocial consequences of driving cessation among older adults. This chapter is focused on discussing the findings of this study. The research question and/or hypothesis will be presented followed by a summary of findings and detailed discussion. In addition, the limitations of this study are discussed in detail. The implications for nursing practice, research, education, and theory development, and health policy are identified. Finally, recommendations for future research and a concluding statement are presented.

Correlations

Summary of Findings

Based on the Pearson’s and point-biserial correlation results, no significant correlations were found between any of the sociodemographic variables and the four DVs.

Discussion

None of the measured sociodemographic variables (including age, gender, marital status, race, level of education, total household income, self-reported health problems, and driving status of participants) were related to any of the four DVs in this study. That
is why the PI selected MANOVA to perform further analyses regarding the effectiveness of the implemented Tai Chi program.

**Baseline Comparison**

**Summary of Findings**

A one-way MANOVA test was conducted to determine any mean differences in the four DVs between the intervention and control groups at baseline. The results revealed no statistically significant difference in the four DVs between the intervention and control groups prior to implementing the six-week Tai Chi intervention program.

**Discussion**

The PI compared the four DVs between the intervention and control groups at baseline by conducting a one-way MANOVA. This comparison was performed to justify whether any significant differences found between the intervention and control groups after implementing the Tai Chi program are due to the effect of the program rather than preexisting differences. Both groups had comparable levels of depressive symptoms, social networks and support, loneliness, and QOL.

Further investigation of the mean scores of the 4 DVs reported collectively for both the intervention and control groups at baseline revealed important information. The mean score of depressive symptoms for both groups (intervention group = 10, control group = 10) at baseline was 4.41 (SD = 1.1). Scores in the range of 0-5 on the GDS short form are considered normal (Stanford University, n.d.). The social support and networks mean average for the intervention and control groups prior to implanting the Tai Chi intervention was 42.28 (SD = 14.08). The cut-off point for the LSNS-18 is 36 with
participants with a score of 36 or less have very limited social networks and contacts. This cut-off point was inferred based on examination of the cut-off point for the LSNS-6, a shorter form of LSNS-18 (Lubben et al., 2006). In regards to the UCLA Loneliness Scale (Version 3), loneliness mean score for both groups at baseline in this study was 52.36 ($SD = 4.36$). The scores of the UCLA Loneliness Scale (Version 3) range from 20 to 80 with higher scores indicate a greater degree of loneliness. Finally, the mean score of QOL for both groups at baseline was 19.23 ($SD = 4.12$). Scores of 19 or less on the QLI indicate poor QOL. Table 5.1 summarizes the mean scores of the four DVs at baseline in this study and compares these mean scores to the cut-off scores for each measure used in this study. The following cut-off scores: more than five, 36 or lower, 60 or more, and 19 or less are indicative of depression, limited social networks and interaction, high level of loneliness, and poor QOL; respectively.

Table 5.1

*Comparison of the Mean Scores of the Four DVs with the Cut-off Points*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean (Current Study)</th>
<th>Cut-off</th>
<th>Range Actual</th>
<th>Range Current Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDS</td>
<td>4.41</td>
<td>&gt;5</td>
<td>0-15</td>
<td>3-7</td>
</tr>
<tr>
<td>LSNS</td>
<td>42.28</td>
<td>≤36</td>
<td>0-90</td>
<td>16-76</td>
</tr>
<tr>
<td>UCLA</td>
<td>52.36</td>
<td>≥60</td>
<td>20-80</td>
<td>42-60</td>
</tr>
<tr>
<td>QLI</td>
<td>19.23</td>
<td>≤19</td>
<td>0-30</td>
<td>12.3-26.3</td>
</tr>
</tbody>
</table>

Note: GDS: Geriatric Depression Scale-Short Form, LSNS-18: Lubben Social Network Scale, UCLA: UCLA Loneliness Scale-Version 3, QLI: Quality of Life Index.

Compared to the mean scores of general population, the participants in this study had borderline mean scores of the four main DVs. These results are consistent with the notion that driving cessation is often a stressful transition. Fonda et al. (2001) and...
Ragland and colleagues (2005) found that retired older drivers are at higher risk for experiencing depressive symptoms. In the current study, older adults reported mean scores close to the cut-off point suggestive of depression, five or above, on the GDS short form. The QOL level were also alarming. The intervention and control groups participants had a baseline QLI mean score that is a fraction above the defining point of 19 that indicates having poor QOL. This finding is congruent with the findings reported by Musselwhite and Shergold (2013) regarding the effect of the driving cessation transition on the overall QOL of older adults. Musselwhite and Shergold (2013) reported that driving cessation, especially when sudden, leads to experiencing poorer QOL. In the current study, the pre-intervention QOL level, regardless of the driving status, was very close to indicate having a poor QOL.

Participants’ social support and networks level in this study was slightly above the cut-off point suggestive of limited social interaction and networks, 36. This finding suggests that participants in this study were at risk for experiencing social isolation prior to implementing the Tai Chi intervention, possibly secondary to the driving cessation transition. Similar results of the relationship between driving cessation and the limited number of social networks and the decreased social support were reported in other studies (Edwards et al., 2009; Mezuk & Rebok, 2008). Lastly, loneliness mean score was relatively high for the participants from both groups at baseline. The collective mean score for the intervention and control group participants at baseline is indicative of moderately high level of loneliness. Moderately high level of loneliness is described as a score on the UCLA Loneliness Scale (Version 3) that falls within the range of 50-59 (D. Russell, personal communication, March 18, 2016). Johnson (1998) maintained that
TAI CHI AND DRIVING CESSATION TRANSITION

retired older drivers are at risk for experiencing loneliness regardless of the social support they may receive.

**Research Questions # 1, 2, and 3 and Research Hypotheses # 1, 2, and 3**

**Narratives**

**Research question # 1.** Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from baseline to three weeks compared to older adults in the waiting list control group?

**Research question # 2.** Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from three weeks to six weeks compared to older adults in the waiting list control group?

**Research question # 3.** Does a 6-week Tai Chi intervention decrease depressive symptoms, loneliness, and social isolation and increase quality of life in older adults from baseline to six weeks compared to older adults in the waiting list control group?

**Research hypothesis # 1.** Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to three weeks.

**Research hypothesis # 2.** Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from three weeks to six weeks.
Research hypothesis # 3. Compared to the wait-list control group participants, older adults who participated in a six-week Tai Chi intervention would have a decrease in depressive symptoms, social isolation, and loneliness, and increase in quality of life from baseline to six weeks.

Summary of Findings

The multivariate portion of the repeated measures MANOVA analysis revealed statistically significant group, time, and group by time effects on the DV’s. Examination of the ANOVA outputs revealed an existing statistically significant group difference, at mid-point and post-intervention, in the depressive symptoms. In regards to the time and the time by group effects, significant univariate results were linked to the significant differences in the depressive symptoms, social support and networks, and QOL. Across time points, the following intervention group mean differences were significant: (a) depressive symptoms at mid-point and post-intervention, (b) social support and networks at post-intervention, and (c) QOL at mid-point and post-intervention. Independent sample t-tests showed that the intervention group had significantly lower depressive symptoms and higher QOL. However, social support and networks and loneliness were not significant based on the computed independent samples t-test. Results of the paired t-tests revealed statistically significant reduction of the intervention group depressive symptoms at the post-intervention time compared to baseline. In addition, both social support and networks and QOL had a significant increase at post-intervention for the intervention group. No statistically significant results were noted in any of the four DVs over time for the control group.

Discussion
Participants in the Tai Chi intervention evidenced decreased depression and improved both social support and networks and QOL. Loneliness also decreased; however, this effect was not statistically significant. In fact, both groups had lower levels of loneliness at post-intervention compared to baseline. Examination of the graphical presentation of the changes in mean scores of the four DVs validates these findings. In addition, it is clear that the intervention group showed improvement over time especially at the post-intervention round of data collection.

Although worsening of depressive symptoms is one of the reported consequences of driving cessation in older adults, there is a dearth of programs directed at alleviating this outcome and other sequelae of the driving cessation transition. Dobbs et al. (2009) examined the effectiveness of a support group intervention on enhancing the coping strategies of dementia patients and their caregivers to deal with the driving cessation transition. This unique support group intervention decreased the depressive symptoms and increased the QOL of the intervention group participants. The UQDRIVE is another example of programs directed at facilitating the driving cessation transition among older adults. This program was effective and participants reported high satisfaction rates (Gustafsson et al., 2011; Gustafsson et al., 2012). However, there is no report of the effectiveness of the UQDRIVE on improving specific aspects of psychosocial well-being, such as depressive symptoms and social isolation, of older adults going through the driving cessation transition.

The effect of Tai Chi on improving depressive symptoms in the older adult population has also been reported in the study conducted by Lavretsky et al. (2011). The Tai Chi program implemented by Lavretsky and colleagues, called Tai Chi Chih, is very
similar to the Tai Chi program utilized in the current study. Both involved practicing slow, gentle movements of the body and could be modified to meet the physical abilities of individual participants. That is why both programs are considered suitable for older adults. Moreover, findings similar to the ones reported in this study, regarding the effect of Tai Chi on depression, are reported in various studies, systematic reviews, and meta-analyses (Chi et al., 2013; D'Silva et al., 2012; Redwine et al., 2012; Waite-Jones et al., 2013; Wang et al., 2010a; Wang et al., 2010b).

Tai Chi is a group-based, mind-body intervention that is typically practiced in small groups, 10 participants in this study. A rationale for selecting Tai Chi for this study was to help older adults establish social networks. Findings from this study support the inference that Tai Chi helps improve social support and alleviate social isolation among older adults going through the driving cessation transition. The literature regarding the effect of Tai Chi on the social aspect of life contains mixed findings. While a qualitative report concluded that Tai Chi provides social support (Wait-Jones et al., 2013), Lee and colleagues (2010) did not find statistically significant results indicative of Tai Chi effectiveness on improving social support. The significant findings relevant to social support and networks in this study may be attributed to the implementation of Tai Chi. In addition, the use of the LSNS-18 which embraces three subscales: family, neighbors, and friends may explain the improvement of social support. Further exploration is provided under the discussion of additional findings section in this chapter.

Loneliness was the only DV that did not show a significant difference between the intervention and control groups over time. However, there was a slight improvement, a decrease in loneliness, for both the intervention and control group participants by the time
of post-intervention data collection. Limited social contacts can increase the risk for experiencing higher levels of loneliness. Someone might argue that loneliness in this study should have improved, i.e. decreased, considering the change that happened in the social status; improvement in the social networks and support. Establishing social networks and finding social support are essential criteria to decrease the risk for loneliness. However, loneliness is a subjective state that older adults may experience even in the presence of established social networks (Hawkley & Cacioppo, 2010). In the case of older adults going through the driving cessation transition, Johnson (1998) maintained that social support provided by family members and friends of older former drivers does not eliminate the risk for loneliness.

As discussed earlier, psychosocial well-being is essential to maintaining a good QOL (Wang et al., 2009). Findings from the current study support the inference that the Tai Chi intervention effectively improved the QOL of older adults experiencing driving cessation. Compared to the control group, the intervention group participants had a significant improvement in their QOL at post-intervention compared to pre-intervention round of data collection. Similarly, results from previous studies concluded that Tai Chi is an effective practice that improves QOL (Chan et al., 2010; Dechamps et al., 2009; Lavretsky et al., 2011; Lee et al., 2010). In summary, the implemented Tai Chi intervention was found to be effective in facilitating the driving cessation transition in older adults through mitigating the negative psychosocial consequences associated with this transition and improving participants’ QOL.

**Research Question # 4 and Research Hypothesis # 4**

**Narratives**
**Research questions # 4:** Are there statistically significant differences in depressive symptoms, loneliness, social isolation, and quality of life between retiring and retired drivers?

**Research hypothesis # 4:** Compared to retiring drivers, retired drivers have a higher risk of experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life.

**Summary of Findings**

The one-way MANOVA results revealed no significant differences between retiring and retired drivers in any of the four DVs: depressive symptoms, social isolation, loneliness, and QOL.

**Discussion**

In a longitudinal study conducted by Fonda et al. (2001), older adults who stopped driving and those who restricted their driving were found at higher risk for developing worsening of depressive symptoms. Similar findings were reported by Ragland and colleagues (2005). Initiating the thought about giving up driving is, to many older adults, a worrying experience. Among the main concerns to older adults are maintaining independence (Bauer et al., 2003), sustaining mobility through driving (Tuokko, McGee, Gabriel, & Rhodes, 2007), “feeling alone, frightened, and unable to survive” (Johnson, 2008, p. 69), and being a burden on family members (Ralston et al., 2001). The results from the current study, as well as the findings from the studies discussed in this section, suggest that the entire driving cessation transition puts older adults at risk for experiencing a variety of negative psychosocial consequences. This conception, in turn,
provides a possibly plausible justification explaining the insignificant results between retiring and retired drivers in the current study.

**Research Question # 5 and Research Hypothesis # 5**

**Narratives**

**Research question # 5.** Does the nature of the driving cessation decision (voluntary or involuntary) and the type of transition (planned or unplanned) affect depressive symptoms, loneliness, social isolation, and quality of life of older adults during the driving cessation transition?

**Research hypothesis # 5.** Older adults who make involuntary decision to quit driving or experience unplanned driving cessation transition are at higher risk for experiencing depressive symptoms, social isolation, loneliness, and poorer quality of life compared to those who make voluntary decision to and plan ahead to quit driving.

**Summary of Findings**

Based on the results of a factorial MANOVA, the nature of the driving cessation decision-making (voluntary or involuntary), the type of transition (planned or unplanned), and the interaction between these two factors did not result in a statistically significant difference in any of the four DVs.

**Discussion**

It seems logical to assume that planning ahead and making a voluntary decision to quit driving would ease the driving cessation transition among older adults. The findings of the factorial MANOVA in this study failed to support the stated research hypothesis,
though. This contradicts findings reported in previous research (Bauer et al., 2003; Buys et al., 2012; Gustafsson et al., 2011; Gustafsson et al., 2012; Windsor & Anstey, 2006). The small sample size and rather smaller proportions of the subgroups, those who voluntarily gave (will give) up driving and planned (are planning) to quit driving, in the current study may explain the lack of support for the research hypothesis. In addition, some of the cited resources in this section were conducted using qualitative or mixed methods research designs. Therefore, it is possible that the authors of such works were able to detect fine qualitative details, reported by the participants/informants, that could not be identified as significant findings by the quantitative analyses used in the current study.

**Additional Findings**

**Program Evaluation**

Older adults going through the driving cessation transition exhibited interest in participating in the current study. Fifty seven percent of the people who were invited agreed to participate in the current study which indicates that Tai Chi is attractive to older adults. In addition, the retention rate in the current study was 100%. Similar enrollment and retention rates are reported in the literature. In their RCT that involved a 10-week Tai Chi intervention, Lavretsky and colleagues (2011) had a participants’ enrollment rate of 65% and a retention rate of 92%. The enrollment rate of the study by Lavertsky et al. is the percentage of older adults who agreed to practice Tai Chi out of those who started pharmacological treatment for depression. Chan et al. (2010) had an enrollment rate similar to the current study. The retention rate reported by Chan and colleagues was 86%. The slight variations between the current study and the studies discussed in this section
can be attributed to a number of factors. The Tai Chi intervention lasted six weeks in this study compared to 10 and 12 weeks in the studies conducted by Lavertsky et al. and Chan et al., respectively. In addition, both of these studies investigated Tai Chi effects on ill older adults and some participants withdrew from Chan and colleague’s study due to illness.

The correlation between the number of days of attendance and the post-intervention mean scores of the four DVs was not significant. This does not necessarily rule out the dose effect of Tai Chi on these four DVs because of the small sample size. The PI is not aware of any study that investigated the dose effect of Tai Chi in terms of the correlation between days of attendance and post-intervention changes. Sannes, Mansky, and Chesney (2008) conducted a literature review to estimate the effect of this intervention based on the dose (the frequency and duration of Tai Chi programs). Inconsistent reporting of Tai Chi attendance and other details prevented reaching a solid conclusion regarding the dose effect of Tai Chi. Investigating the intervention dose and any dose effect of the implemented Tai Chi program is a topic that requires extensive research. Important considerations include the number of attended Tai Chi classes and exact measurement of the time spent practicing Tai Chi, including out-of-class practice. In addition, the Tai Chi intervention utilized in this study is modifiable to meet participants’ needs and capabilities. Therefore, it would be important to investigate whether doing Tai Chi standing up is different from sitting down on a chair.

**LSNS-18 Subscales**

The repeated measures MANOVA and the follow up univariate analyses revealed that the intervention group participants had a significant increase in the neighborhood
subscale of the LSNS-18. Both the family and friends subscales also had an improvement after participating in the Tai Chi intervention, however, these were not statistically significant changes.

Enhancement of social interaction was one of the philosophical underpinnings of going forward with implementing a Tai Chi program in the current study. All members of the intervention group resided in a single apartment complex and the control group subjects lived in another high-rise apartment building. Based on the findings, Tai Chi helped the intervention group participants expand their social networks and support systems. The majority of this support was attributed to being more socially involved with neighbors. A previous quantitative study did not find a significant effect of Tai Chi on social support (Lee et al., 2010). A possible explanation of this variation is the use of different tools to measure social interaction and support. Lee and colleagues used the Social Support Questionnaire-Short Form (SSQ6) (Sarason, Sarason, Shearin, & Pierce, 1987). Although it has well-established reliability and validity indicators, the SSQ6 does not involve questions directly linked to evaluating social support within the context of neighborhood. The notion that the intervention group participants in this study lived in the same building might also explain the improvement in the social support and networks. That is, the participants shared certain social living conditions and the implemented Tai Chi program might have just facilitated establishing social networks among the neighbors at a faster pace.

**QLI Subscales**

Analyses conducted at the QLI subscales level revealed statistically significant time effect on the health and functioning, social and economic, and family subscales.
Time by group interaction had a significant effect on health and functioning and family subscales. T-tests results showed that the intervention group had significant improvement after implementing the Tai Chi intervention on three subscales: health and functioning, social and economic, and family. The psychological/spiritual subscale is the only one that was not affected by the intervention program.

As reported earlier, the Tai Chi intervention improved social interaction and support. This finding is consistent with the improvements noticed in both the social and economic and family subscales of the QLI. The LSNS-18 family subscale showed improvement, although it was not statistically significant. Finding significant results in the QLI family subscale but non-significant results in the LSNS-18 family subscale might be related to the different dimensions of family interactions and support measured by these two subscales. The psychological/spiritual subscale of the QLI did not have a significant change over time in this study. However, depressive symptoms, as measured by the GDS-Short Form, decreased after implementing the Tai Chi intervention. This discrepancy between the psychological/spiritual subscale and depressive symptoms could be explained by the high levels of specificity and sensitivity of the GDS-Short Form. That is, the GDS detected specific psychological disturbances that affect the mood of older adults going through the driving cessation transition.

As for the health and functioning subscales of the QLI, no other measures of physical/overall health and functioning were used in this study. Previous studies showed that Tai Chi improves health-related QOL (Chan et al., 2010; Wang et al., 2010a; Wang et al., 2010b). The items relevant to health and functioning in the QLI address overall health concerns such as health, health care, pain level. This suggests that the intervention
Limitations of the Current Study

Sampling and Sample Size

One of the main limitations of this study was the sampling method. The decision to utilize a purposive sampling method was based on a practical reason—specifically the challenging nature of reaching a large number of older adults going through the driving cessation transition that would have allowed the PI to randomly select participants who met the inclusion criteria. While purposive sampling can be helpful to recruit participants in a relatively quick way, it is a type of nonprobability sampling that involves a nonrandom selection of research participants. Keeping that in mind, it is hard to tell whether the recruited sample encompassed a group of older people who adequately represent the population of older adults going through the driving cessation transition. Therefore, the ability to generalize the findings is limited by the likelihood of not having a representative sample.

The second major limitation of this study was the sample size. The small sample size, 20 participants, significantly affects the external validity of the current study. However, this was a feasibility study and it was conducted to determine whether a Tai Chi intervention could effectively be implemented among older adults experiencing driving cessation. As discussed previously, having a small sample size seems reasonable for the purpose of conducting such a study. The results showed that the intervention group participants attended, on average, 9.7 classes $SD = 1.58$. This suggests that Tai Chi
is both attractive to and enjoyable for older adults. The majority of participants who missed classed, according to conversations with the PI, had other necessary commitments like doctor’s appointments.

**Characteristics of Participants**

Utilizing a purposive sampling approach and the availability of a limited number of people in the accessible population resulted in recruiting a sample that is not representative of the target population. The resulting sample had unique characteristics that have been described previously. This section presents how some of these characteristics could limit the findings of the current study.

**Gender.** The vast majority, 95%, of participants were women. Gender plays a key role in determining the driving status and the nature of making a decision regarding driving among older adults (Betz et al., 2012). Older women who make voluntary decision to quit driving often tend to feel socially supported (Johnson, 2008). Having such a sample with a majority of women in this study hindered the possibility of making a valid comparison between older men and women going through the driving cessation transition. In addition, it is likely that the recruited participants had larger social networks and were more socially supported compared to the target population. As noted previously, older women who maintained driving cessation reported feeling loved and supported by family members and friends (Johnson, 2008).

**Race.** Seventy five percent of the sample was African American. This means that the findings of this study might not be generalizable to other older adults who are not African Americans. Racial disparities are not extensively studied in the area of driving
cessation transition among older adults and the majority of previous studies were, mainly, conducted with samples of Caucasian participants. In a study conducted by Sims and colleagues (2007), African Americans were more likely to self-report their overall health status as poor to fair. Reporting health as poor to fair was accompanied by a higher risk for giving up driving in the African American population. In addition, poor health status is generally associated with poorer psychosocial status and QOL.

**Living arrangement.** Once again, the PI conducted this study in centralized settings, that is, senior housing centers. Recruiting participants from such settings facilitated the recruitment process as well as other steps of the study such as data collection and implementing the Tai Chi classes. However, those settings are located in areas that are well-supported by public transportation. In addition, transportation was provided to all residents in those settings by the senior housing staff. Even though the public transportation option is not always convenient, the availability of alternative transportation can affect the consequences of the driving cessation transition. Older adults who live in rural areas may not have access to formal and informal alternative transportation options. Therefore, the negative consequences of the driving cessation transition can be more detrimental in older adults who reside in rural areas.

**Driving status.** Retiring and retired drivers were recruited in this study. Comparing older adults experiencing the driving cessation transition with active drivers, who are not currently planning to quit driving, was not possible in this study. The PI did not collect data from the participants prior to starting the planning phase of the driving cessation transition. Therefore, it is not logical to assume that the reported psychosocial disturbances including depressive symptoms, deficient social support, moderately higher
level of loneliness, and poor QOL are purely related to the driving cessation transition. Therefore, excluding active drivers is another limitation of the findings of this study.

**Threats to InternalValidity**

In two-group design research studies, selection bias can be a major threat to internal validity. Using a non-random assignment of participants to either the intervention or control group increases the risk for this threat to internal validity. The PI attempted to minimize this threat through selecting similar senior housing centers to recruit older adults and conduct the study. Earlier discussion showed that the resulting groups were similar in terms of the sociodemographic variables. (See Tables 4.1 and 4.2). In addition, statistical analysis revealed no significant group differences between the intervention and control group participants at baseline. Therefore, it can be argued that the selection bias threat to internal validity was minimal in this study.

Another potential threat to validity in this study is the Hawthorne effect. This phenomenon develops from participants’ awareness of taking part in research studies and can result in consequent change in behavior. In the current study, there is a possibility that participants might have changed their responses to the utilized research instruments. However, the Hawthorne effect usually affects research studies that involve observation of human behaviors. In this study, data about psychosocial status were collected. Thus, the Hawthorne effect may not have a major impact on the findings.

**Implications of Findings**

This study provides foundational knowledge and preliminary evidence regarding the effectiveness of implementing a Tai Chi program on managing the negative
psychosocial consequences of driving cessation among older adults going through the driving cessation transition. Implications of the current study for nursing practice, education, and theory are discussed in this section. In addition, implications for healthcare and public policies are presented.

**Implications for Nursing Practice**

The roles and responsibilities of the professional nurse have expanded over the years. Nursing practice extends beyond the sole focus on providing physical care to embrace other dimensions of the human being’s life. In particular, nurses are expected to identify physiological, functional, psychological/emotional, social, spiritual, and cultural areas of need and then develop holistic plans of care to enhance overall well-being. Nurses’ central, never-ending mission to alleviate suffering has always stimulated investigating different care modalities to improve the health of individuals and groups. One of the main motives that encouraged the PI to choose this particular area of research is his compassion for improving the health and wellness of the growing older adult population, specifically those individuals going through the driving cessation transition.

Findings from the current study are inspiring for practicing nurses to advise their patients to utilize a safe, evidence-base practice (EBP) useful for adaptation to life without a car. Steps of the nursing process, coordination of care, EBP and research, collaboration, and resource utilization are all fundamental standards of professional nursing practice (ANA, 2010b). The Tai Chi intervention in this study is applicable to these standards. The PI started the research process by analyzing the data available in the related literature to assess the impact of the problem on older adults going through the driving cessation transition. In addition, identifying possible areas of improvement and
adopting an innovative patient-centered approach was implemented. Similarly, practicing nurses can make a difference by collecting data from individual older adults experiencing driving cessation to identify the challenges they face throughout the transition. Nurses are encouraged to ask older adults specific questions about their driving status. In addition, nursing assessment should be modified to thoroughly assess the potential impact of the driving cessation transition on the psychosocial life of retiring and retired older drivers. Then, nurses can utilize the evidence from the current study, which suggests that Tai Chi can help improve the psychosocial status and QOL of the target population, to improve health and wellness of the individuals they provide care to. Tai Chi classes can be provided in various settings including hospitals, clinics, extended care facilities, and community centers. Implementation of a Tai Chi intervention, or a similar program, requires collaboration with other parties including physicians, social workers, occupational and physical therapists, and Tai Chi practitioners. In addition, implementing Tai Chi practice implies meeting the professional nursing standard of utilizing a safe, effective resource.

Holistic nursing, an officially recognized nursing specialty, focuses on providing care to the whole person instead of dealing with the individual components of the human being (American Holistic Nurses Association [AHNA], 2016). The interconnectedness of the human being’s body, mind, and spirit is stressed at the core of providing holistic nursing care. The scope and standards of holistic nursing practice are similar to the scope and standards of professional nursing practice (ANA/AHNA, 2013). Complementary therapies, like Tai Chi, are recognized by AHNA as practices that fall within the scope of professional nursing practice. One of the key elements of providing holistic nursing is the
emphasis on preventive services. Therefore, nurses are encouraged to follow a holistic approach of providing nursing care to older adults experiencing driving cessation by early detection of the negative consequences associated with this transition. Accordingly, nurses can advise those older adults to use Tai Chi as a complementary therapy to facilitate healthy transition into non-driving.

**Implications for Nursing Theory**

The statistical findings supported the conceptual framework designed to guide the current study. Tai Chi was associated with decreased depressive symptoms and loneliness (although the decrease in loneliness was not statistically significant) as well as improved social interaction and QOL of participants. Establishing a comprehensive theoretical model that explains the driving cessation transition in older adults is still a major concern in nursing and other health care fields. Incorporating the concepts and assumptions of both the conceptual model developed by Choi et al. (2012) and the Transition Model (Meleis et al., 2000) helped to examine the driving cessation transition from the perspective of professional nursing. However, the utilized conceptual model is not yet comprehensive or final.

The PI suggests considering the conceptual model as a foundation for future theory-generating works. Establishing strong empirical evidence regarding the relationships between the specified concepts is crucial. Both quantitative and qualitative research can help nurse researchers. Using quantitative research, nurses are encouraged to validate the findings discussed in the current study using a theory-testing, deductive approach. Considering other theoretical concepts related to the main nursing domains (person, health, environment, and nursing) is vital. Examples include, but are not limited
to, physical health, balance and coordination, cognitive health, driving performance, and stress. In addition, examining the effectiveness of other interventions, complementary or conventional, as facilitators of a healthy driving cessation transition would be useful.

Qualitative research can be used to uncover fundamental, minute details about the driving cessation transition in older adults. Following an inductive approach, nurse researchers are encouraged to study the process of driving cessation transition among older adults. Conducting in-depth individual interviews or focus groups can help accomplish this. A major area of focus should address how individual older adults facilitate their own driving cessation transition. Qualitative research should be conducted over a significant period of time with multiple data collection rounds to help nurse researchers better understand the entire driving cessation transition process. Finally, integration of findings from both approaches would facilitate the capture of a comprehensive picture of the driving cessation transition in older adults.

**Implications for Nursing Education**

Nurse educators build nursing curricula and design nursing courses that reflect the integration of essential competencies and standards developed by lead nursing organizations. The American Association of Colleges of Nursing (AACN) developed the *Essentials of Baccalaureate Education for Professional Nursing Practice* (AACN, 2008) to guide development and continuous evaluation of comprehensive nursing curricula. In this AACN document, complementary and alternative modalities are suggested as methods of meeting AACN essentials of baccalaureate nursing education. The Quality and Safety Education for Nurses (QSEN) competencies provide a thorough framework that guides nursing education to enhance the quality and safety of health care (QSEN,
2014). QSEN competencies highlight the importance of patient-centered care and EBP to advance nursing education.

Following these essentials and competencies, nurse educators are responsible for modifying nursing courses to reflect integration of complementary and alternative therapies. Nurse educators need to advance their own knowledge regarding the different complementary and alternative therapies and their possible implications for nursing. Faculty development through workshops and webinars on complementary and alternative therapies is a suggested activity for nurse educators. NCCIH and AHNA websites provide a wide range of resources that can be utilized by nurse educators for professional development purposes. In addition, knowledge sharing and engaging in direct discussions with nurse educators who use complementary and alternative therapies is invaluable for nurse educators. Booth-LaForce and colleagues (2010) provide an interesting example of faculty development to encourage the inclusion of complementary and alternative therapies in nursing courses.

The Recommended Baccalaureate Competencies and Curricular Guidelines for the Nursing Care of Older Adults (AACN, 2010) describes the gerontological nursing competencies required to ensure providing quality nursing care for older adults. These competencies emphasize the importance of incorporating complementary and alternative practices into gerontology nursing courses. The findings from the current study can be utilized by nurse educators who teach gerontological nursing as well as nursing research/EBP and wellness-focused nursing courses. The nurse educator can present the findings from the current study as an example of how to improve QOL and psychosocial status of older adults going through the driving cessation transition. In addition, nurse
educators can demonstrate Tai Chi in the classroom or show short videos of professional practice of Tai Chi. Such class activities can help increase nursing students’ awareness about Tai Chi and its possible implications for their practice.

Recently, the National Council of State Boards of Nursing (NCSBN, 2016) released the new National Council Licensure Examination for Registered Nurses (NCLEX-RN) test plan, effective April 1st, 2016. The updated test plan declared that nursing students will be tested on their knowledge of complementary and alternative therapies. Nursing students need to have basic knowledge of the need for utilizing complementary and alternative therapies as well as their potential benefits and risks and/or contraindications. This update requires immediate actions to be taken by nurse educators. In addition, many nursing authors have already realized the need for adding various resources regarding complementary and alternative therapies to nursing textbooks. Discussing such resources in the classroom, nursing skills and simulation laboratories, and the clinical arenas seems imperative to advance nurse educators and students knowledge about this topic.

**Implications for Health Care Policy**

Health delivery takes many forms and levels including primary, secondary, and tertiary care. The findings in this study suggest that nurses can offer Tai Chi as either a primary or secondary care approach to older adults experiencing driving cessation. As a primary care measure, Tai Chi can prevent the experience of the negative psychosocial consequences of the driving cessation transition among older adults in general. On the other hand, Tai Chi can be considered a secondary care measure when it is suggested to older adults who have already started experiencing these negative consequences of the
driving cessation transition. In both cases, Tai Chi may prevent the devastating progress of depression, social isolation, loneliness, and poor QOL.

Lack of potential participants’ interest in the current study at one of the senior housing centers was partially attributed to the busy schedule those older adults had. Those potential participants did not want to replace any of the activities they routinely had with Tai Chi. Examples of activities they had included bingo and Wii bowling. These activities may help enhance socialization among older adults. In addition, they can help improve physical activity and cognitive health. Tai Chi, however, is a mind-body intervention that enhances the integration of the mind, body, and spirit of the human being. Furthermore, Tai Chi is not competitive in nature and it is not expected to create any social conflicts among older adults.

Implementing the Tai Chi intervention at senior housing centers in this study increased the staff and residents’ awareness of its benefits. The participants enjoyed practicing Tai Chi. By completion of the study and the wait-list control group Tai Chi training, all participants discussed with the service coordinators the need to organize more Tai Chi classes in the future. The participants appreciated the efforts of the Tai Chi instructor and the PI. Therefore, offering Tai Chi in place of some other activities at senior housing centers seems desirable and attractive to older adults. The service coordinator at one of the centers where this study was conducted contacted the PI after the study asking for the Tai Chi instructor’s contact information. The service coordinator mentioned that they received a grant and they were interested in holding Tai Chi training based on the positive feedback they received from the residents who participated in this study.
Despite the evidence regarding its preventive effect and older adults’ willingness to practice it, Tai Chi is not covered by leading health insurance plans. Older adults covered by Medicare and other insurance plans are eligible to participate in nationally recognized exercise programs like Healthways Silver Sneakers® Fitness at no additional cost. Silver Sneakers® Fitness program is currently included in more than 65 Medicare health plans and offered in more than 13,000 locations in the U.S (Silver Sneakers, 2014). Although Silver Sneakers® include group-based physical exercise programs, Tai Chi is not one of them. A potential implication of the current study’s findings, at the health care policy level, is to offer Tai Chi classes to older adults at the Silver Sneakers® participating locations as well as senior housing centers and skilled care facilities. Expanding Medicare Part B coverage of preventive services to include Tai Chi would enhance older adults’ utilization of an evidence-based, safe physical activity intervention.

**Recommendations for Research**

Despite the evidence regarding the negative consequences of the driving cessation transition, there is a paucity of studies aimed at examining the effectiveness of programs that potentially reduce the hazards of this transition among older adults. Results from the current study suggest that utilizing a person-centered approach can successfully manage the negative consequences of the driving cessation transition in older adults. More research is needed in this area to expand the knowledge base regarding this phenomenon. The first recommendation is to conduct a comprehensive study with a larger sample size of older adults going through the driving cessation transition. It is recommended that future research includes current, retiring, and retired drivers. Recruiting these groups seems beneficial considering that driving cessation is a transition and its negative
consequences can last for a significant period of time starting before making the decision to quit driving.

Future research should investigate the effectiveness of Tai Chi on the functional health outcomes, specifically the physical health of older adults experiencing the driving cessation transition. For retired drivers, researchers need to determine possible Tai Chi effects on enhancing physical health and preventing debilitation and injury. On the other hand, Tai Chi effects on improving psychomotor skills required to maintain safe driving and delay driving cessation among retiring older drivers could be an interesting topic to investigate. Regarding the different rounds of data collection, collecting data at different points in time is necessary. One suggested change is to schedule a follow up round of data collection conducted within a few weeks/months of completing the Tai Chi intervention to determine any long-term effects of Tai Chi.

A number of potential participants refused to participate in the current study after seeing the pre-intervention data collection packet. One of the reported concerns was the length of questionnaires, but that challenge was minimized through assuring potential participants to have adequate time to work on completing those questionnaires. In addition, the PI made sure he was readily available to help some participants respond to the research instruments. The more challenging aspect was the inclusion of questions about participants’ income, health problems, and current medications. Many older adults have never participated in a research study and inclusion of such questions can make them skeptical about the intentions of the researcher and the rational for collecting data about income and health-related issues.
In regards to the implemented Tai Chi program, the PI does not have any recommendations for any changes at this time. Holding a six-week program with two one-hour sessions per week helped with recruitment and participants’ commitment to attend Tai Chi classes. For future research, it would be helpful to develop a short survey focused on collecting data about participants’ satisfaction with and rating of the Tai Chi program to be used. Such a survey could be either used in place of or integrated with the post-intervention interview to learn about participants’ experience with and evaluation of their Tai Chi classes.

Another important area of investigation is to compare older adults’ experiences with driving cessation based on their residence and living arrangements. Both availability of alternative transportation and social networks can vary based on whether older adults live in rural or urban/suburban areas. In addition, availability of resources, such as shopping centers and recreation facilities, varies between rural and urban localities. Older adults who live in centralized senior housing centers, privately owned homes, and those who live with family members should be considered when planning for future research. Additionally, residents of long-term care and assisted living facilities, should be included as participants in future research.

The recruitment process of the population of older adults going through the driving cessation transition can be lengthy and exhausting. The PI recommends facilitating recruitment of older adults going through the driving cessation transition through conducting interdisciplinary research. Nurse researchers need to collaborate with social workers, physicians, occupational and physical therapists, and Tai Chi practitioners to ensure successful recruitment of the most representative sample of older adults.
experiencing driving cessation. Moreover, the role of nonclinical staff in senior housing centers/long-term care facilities would be invaluable. Examples include collaboration with activity and service coordinators at the facility and/or community levels. Finally, a cornerstone element of facilitating the recruitment and research implementation processes of such interdisciplinary approach is the availability of adequate funding. A significant proportion of funding should be allocated to securing transportation for older adults who do not have transportation options in order to improve the opportunity of taking part of future research and attending Tai Chi classes.

**Summary of Chapter Five**

The findings discussed in this chapter provide preliminary evidence regarding the effectiveness of Tai Chi as a complementary therapy that facilitates the driving cessation transition in older adults. Participants in the Tai Chi intervention experienced decreased depression and improved both social support and quality of life when compared with those in the control group. Generalization of these findings is limited by the small sample size and sampling method used in the current study. In addition, the characteristics of the recruited participants are different from the characteristics of the target population. The findings provide support for nurses to encourage the use of Tai Chi to facilitate the driving cessation transition. Nurse educators are also encouraged to advance quality nursing education by integrating instruction about complementary health practices that meet the contemporary health needs of the growing older adult population. In regard to nursing theory, this study established a foundational theoretical base to understand the driving cessation transition among older adults from the perspective of holistic nursing. Future theory-generating and theory-testing studies are yet to be conducted to formulate a
more comprehensive theoretical model that explains the driving cessation transition among older adults. Finally, replication of this study with a larger, more representative sample is necessary to validate and enhance the generalizability of the current study’s findings.
References


American Association of Colleges of Nursing (2010). *Recommended Baccalaureate Competencies and Curricular Guidelines for the Nursing Care of Older Adults.* Washington, DC.


TAI CHI AND DRIVING CESSATION TRANSITION


Appendix A

STEAD Algorithm
Appendix B

Medical Clearance Form

Dear Doctor_____________________________________________

Your patient _____________________________________________ is invited to participate in a research study that involves practicing Tai Chi. The purpose of conducting this study is to examine the effectiveness of a 12-week Tai Chi program on managing psychosocial consequences of driving cessation. Tai Chi is a type of martial arts and it involves practicing slow, relaxed movements of the body combined with performing deep breathing. It is often referred to as moving meditation. During the classes, participants will be trained to practice such slow movements. There will not be striking or use of weapons. An expert Tai Chi instructor will be training the participants. The specific type of Tai Chi to be used is called the Tai Chi for Arthritis program. The decision to use this type was made based on consulting experts in designing and training Tai Chi. This type of Tai Chi is flexible and can be modified to match the physical ability of individual older adults. For example, an individual with a high risk for falls can practice Tai Chi while sitting on a chair.

Initial assessment of ______________________________________’s ability to practice Tai Chi indicates that further evaluation by his/her care provider is needed before making the decision to practice Tai Chi. By completing this form, you are not assuming any responsibility for our Tai Chi program. Should you have any concerns or questions about the research study, please contact Jehad Rababah, PhD(c), RN via phone (330-389-6097) or email jrababa1@kent.edu

This project has been approved by the Kent State University Institutional Review Board (IRB). If you have any questions about the research study or complaints about the research, you may call the IRB at 330.672.2704.

Client’s Consent and Authorization

I authorize Dr.__________________________________________________________ to release health information to Jehad Rababah regarding my ability to participate in the research study “Examining the Effect of a Tai Chi Intervention on Psychosocial Consequences of Driving Cessation among Older Adults”.

Client’s Name (Print): _________________________________
Client’s Signature: ______________________              Date: _______________
Physician's Recommendations (please select one of the following two options):

_____ I am not aware of any health conditions that may prevent my client, ________________, practicing Tai Chi and, consequently, I recommend that my client can participate in this research study.

_____ I recommend that my client, ________________, not participate in this research study.

_____ I recommend that my client, ________________, can practice Tai Chi only if the Tai Chi program is modified (e.g. having the client sitting while practicing tai Chi). Please provide more details regarding any other necessary modifications:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Physician's signature: _____________________________            Date: ______________
Physician's name (print): __________________________
Phone number: __________________________________
Address: __________________________________________
Appendix C
Flyer to Recruit Participants

DID YOU STOP DRIVING?

We are conducting a research study to examine the effectiveness of physical activity (Tai Chi) on managing the potential consequences of driving cessation in older adults.

Tai Chi is a type of physical activity that involves slow, organized movements combined with deep breathing.

YOU ARE INVITED TO PARTICIPATE IF YOU:
- Are 65 years of age or older.
- Have not driven an automobile for at least six months.
- Are physically able to practice Tai Chi.

PROCEDURE
Participants will practice Tai Chi for 12 weeks with weekly one-hour sessions.

Participants will be asked to complete questionnaires throughout the study and participate in up to two short, one-on-one interviews.

IF YOU ARE INTERESTED OR HAVE QUESTIONS:
Contact Jehad Rababah PhD (c), RN at (330) 389-6097**
Appendix D

Data Collection Tools

Demographic Questionnaire

The aim of this section is to collect your background data. Please respond to the following items.

1. What was your age on your last birthday? _______________years

2. What is your gender?
   - Male
   - Female

3. What is your current marital status?
   - Single, never married
   - Married
   - In a relationship, not married
   - Divorced/separated
   - Widow/widower

4. Please specify your race (you can select more than one):
   - American Indian or Alaska Native
   - Asian
   - African American/Black
5. Please specify your ethnicity

☐ Native Hawaiian or Other Pacific Islander
☐ White
☐ Other
☐ Would rather not say

6. What is your highest level of education?

☐ Less than high school ☐ High school or equivalent
☐ Two-year college ☐ Four-year college
☐ Graduate degree
☐ Other, specify ____________________________

7. What is your current total household income?

☐ Less than $10,000 ☐ $10,001-$20,000
☐ $20,001-$40,000 ☐ $40,001-$60,000
☐ More than $60,001

8. Where do you currently live? Please specify the length of time you have been at your current residence.
TAI CHI AND DRIVING CESSATION TRANSITION

☐ Private home (house, apartment, suite, etc.). _______ year(s), and ______ month(s).

☐ Retirement community. _______ year(s), and ______ month(s).

☐ Senior housing. _______ year(s), and ______ month(s).

☐ Other, specify ______________ _______ year(s), and ______ month(s).

9. Who currently lives with you? Select all that apply.

☐ Spouse/partner ☐ Adult child(ren) ☐ Sibling

☐ Parent(s) ☐ Other relative(s) ☐ Friend

☐ I live alone ☐ Other, specify ______________

10. Please list all the medications you currently use (prescribed and over the counter) and the duration you have been using each medicine. (Note: print on the back of this paper if you take more medications).

Medication ____________________. Time: ______ year(s), and ______ month(s).

Medication ____________________. Time: ______ year(s), and ______ month(s).

Medication ____________________. Time: ______ year(s), and ______ month(s).

Medication ____________________. Time: ______ year(s), and ______ month(s).

Medication ____________________. Time: ______ year(s), and ______ month(s).
Medication ____________________. Time: _____ year(s), and _____ month(s).

Medication ____________________. Time: _____ year(s), and _____ month(s).

Medication ____________________. Time: _____ year(s), and _____ month(s).

Medication ____________________. Time: _____ year(s), and _____ month(s).

Medication ____________________. Time: _____ year(s), and _____ month(s).

Medication ____________________. Time: _____ year(s), and _____ month(s).

11. Which of the following medical conditions have you been diagnosed with?

☐ Heart disease (angina, heart attack, heart failure, valve problems).

☐ Cancer, type/location________

☐ Stroke or Transient Ischemic Attack (TIA).

☐ Chronic lung disease. Specify _____________________

☐ Diabetes mellitus

☐ Hypertension

☐ Kidney disease. Specify _____________________

☐ Bone/joint diseases. Specify _____________________

Other, specify

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Pre-intervention Structured Interview Questions

The following questions were asked during a short interview prior to implementing the Tai Chi program:

1. How long did you drive a motor vehicle before you stopped driving? ________ years

2. Time since you last drove a motor vehicle: _____ years and ______ months

3. Who primarily made the decision to quit driving?

☐ It was my own decision.
☐ My family made the decision.
☐ My driver’s license was revoked/suspended by the BMV.
☐ My health care provider consulted me to stop driving.
☐ Other, specify________

4. In your opinion, do you think that the decision to quit driving was voluntary or involuntary?

________________________

5. What happened that you stopped driving? (select all that apply)

☐ Changes in health conditions.
☐ Inability to afford car expenses.
☐ Availability of alternative transportation.
☐ Inability to renew my driver’s license.
☐ Other, specify______________
6. Prior to making the decision to stop driving, had you discussed concerns regarding your driving with anyone?

☐ No.

☐ Yes. With whom? (Select all that apply)

☐ Family member(s).

☐ Partner/spouse

☐ Health care provider.

☐ Friend(s)

☐ Other, specify________________

7. Making plans prior to stopping driving is common. For example, some people may start looking for transportation alternatives or sell their motor vehicle. Did you plan ahead for quitting driving?

☐ No.

☐ Yes.

8. What kind of transportation do you currently use? Select all that apply

☐ Rides provided by a family member/relative.

☐ Rides provided by friends.

☐ Public transportation.

☐ I rely on transportation provided by volunteers or local community resources (such as church).

☐ Taxi.

☐ A hired assistant.
Geriatric Depression Scale: Short Form

Choose the best answer for how you have felt over the past week:

1. Are you basically satisfied with your life? YES / NO
2. Have you dropped many of your activities and interests? YES / NO
3. Do you feel that your life is empty? YES / NO
4. Do you often get bored? YES / NO
5. Are you in good spirits most of the time? YES / NO
6. Are you afraid that something bad is going to happen to you? YES / NO
7. Do you feel happy most of the time? YES / NO
8. Do you often feel helpless? YES / NO
9. Do you prefer to stay at home, rather than going out and doing new things? YES / NO
10. Do you feel you have more problems with memory than most? YES / NO
11. Do you think it is wonderful to be alive now? YES / NO
12. Do you feel pretty worthless the way you are now? YES / NO
13. Do you feel full of energy? YES / NO
14. Do you feel that your situation is hopeless? YES / NO
15. Do you think that most people are better off than you are? YES / NO
LUBBEN SOCIAL NETWORK SCALE – 18 (LSNS-18)

To complete this questionnaire, please circle the response that best describes/applies to you.

**FAMILY:** Considering the people to whom you are related by birth, marriage, adoption, etc...

1. How many relatives do you see or hear from at least once a month?

   0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

2. How often do you see or hear from relative with whom you have the most contact?

   0 = less than monthly  1 = monthly  2 = few times a month  3 = weekly  4 = few times a week  5 = daily

3. How many relatives do you feel at ease with that you can talk about private matters?

   0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

4. How many relatives do you feel close to such that you could call on them for help?

   0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

5. When one of your relatives has an important decision to make, how often do they talk to you about it?

   0 = never  1 = seldom  2 = sometimes  3 = often  4 = very often  5 = always
6. How often is one of your relatives available for you to talk to when you have an important decision to make?

0 = never  1 = seldom  2 = sometimes  3 = often  4 = very often  5 = always

**NEIGHBORS:** Considering those people who live in your neighborhood...

7. How many of your neighbors do you see or hear from at least once a month?

0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

8. How often do you see or hear from the neighbor with whom you have the most contact?

0 = less than monthly  1 = monthly  2 = few times a month  3 = weekly  4 = few times a week  5 = daily

9. How many neighbors do you feel at ease with that you can talk about private matters?

0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

10. How many neighbors do you feel close to such that you could call on them for help?

0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

11. When one of your neighbors has an important decision to make, how often do they talk to you about it?
0 = never  1 = seldom  2 = sometimes  3 = often  4 = very often  5 = always

12. How often is one of your neighbors available for you to talk to when you have an important decision to make?

0 = never  1 = seldom  2 = sometimes  3 = often  4 = very often  5 = always

FRIENDSHIPS: Considering your friends who do not live in your neighborhood...

13. How many of your friends do you see or hear from at least once a month?

0= none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

14. How often do you see or hear from the friend with whom you have the most contact?

0 = less than monthly  1 = monthly  2 = few times a month  3 = weekly  4 = few times a week  5 = daily

15. How many friends do you feel at ease with that you can talk about private matters?

0= none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more

16. How many friends do you feel close to such that you could call on them for help?

0 = none  1 = one  2 = two  3 = three or four  4 = five thru eight  5 = nine or more
17. When one of your friends has an important decision to make, how often do they talk to you about it?

0 = never   1 = seldom   2 = sometimes   3 = often   4 = very often   5 = always

18. How often is one of your friends available for you to talk to when you have an important decision to make?

0 = never   1 = seldom   2 = sometimes   3 = often   4 = very often   5 = always
### UCLA LONELINESS SCALE VERSION 3

**INSTRUCTIONS:** Indicate how often each of the statements below is descriptive of you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How often do you feel that you are &quot;in tune&quot; with the people around you?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. How often do you feel that you lack companionship?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. How often do you feel that there is no one you can turn to?</td>
<td>1</td>
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<tr>
<td>4. How often do you feel alone?</td>
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<td>5. How often do you feel part of a group of friends?</td>
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<tr>
<td>6. How often do you feel that you have a lot in common with the people around you?</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>7. How often do you feel that you are no longer close to anyone?</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>8. How often do you feel that your interests and ideas are not shared by those around you?</td>
<td>1</td>
<td>2</td>
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<td>9. How often do you feel outgoing and friendly?</td>
<td>1</td>
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<td>10. How often do you feel close to people?</td>
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<td>11. How often do you feel left out?</td>
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<td>12. How often do you feel that your relationships with others are not meaningful?</td>
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<td>13. How often do you feel that no one really knows you well?</td>
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<td>14. How often do you feel isolated from others?</td>
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<td>Question</td>
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<td>15. How often do you feel you can find companionship when you want it?</td>
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<td>16. How often do you feel that there are people who really understand you?</td>
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<td>17. How often do you feel shy?</td>
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<td>18. How often do you feel that people are around you but not with you?</td>
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<td>19. How often do you feel that there are people you can talk to?</td>
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<td>20. How often do you feel that there are people you can turn to?</td>
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QUALITY OF LIFE INDEX®
GENERIC VERSION - III

PART 1. For each of the following, please choose the answer that best describes how satisfied you are with that area of your life. Please mark your answer by circling the number. There are no right or wrong answers.

**HOW SATISFIED ARE YOU WITH:**

<table>
<thead>
<tr>
<th>1. Your health?</th>
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<th>2. Your health Care?</th>
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<th>3. The amount of pain that you have?</th>
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<th>4. The amount of energy you have for everyday activities?</th>
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<th>5. Your ability to take care of yourself without help?</th>
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<th>6. The amount of control you have over your life?</th>
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<th>7. Your chances of living as long as you would like?</th>
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<tr>
<td>HOW SATISFIED ARE YOU WITH:</td>
<td>Very Dissatisfied</td>
<td>Moderately Dissatisfied</td>
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<td>8. Your family’s health?</td>
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<td>9. Your children?</td>
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<td>10. Your family’s happiness?</td>
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<td>11. Your sex life?</td>
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<td>12. Your spouse, lover, or partner?</td>
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<td>13. Your friends?</td>
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<td>14. The emotional support you get from your family?</td>
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<td>15. The emotional support you get from people Other than your family?</td>
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<td>16. Your ability to take care of family responsibilities?</td>
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<td>17. How useful you are to others?</td>
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<td>18. The amount of worries in your life?</td>
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### HOW SATISFIED ARE YOU WITH:

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<th>Question</th>
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<tr>
<td>19. Your neighborhood?</td>
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<td>20. Your home, apartment, or place where you live?</td>
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<td>21. Your job (if employed)?</td>
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<td>22. Not having a job (if unemployed, retired, or disabled)?</td>
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<td>23. Your education?</td>
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<td>24. How well you can take care of your financial needs?</td>
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<td>25. The things you do for fun?</td>
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<td>26. Your chances for a happy future?</td>
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<td>27. Your peace of mind?</td>
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<td>28. Your faith in God?</td>
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<td>29. Your achievement of personal goals?</td>
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<tr>
<td>HOW SATISFIED ARE YOU WITH:</td>
<td>Very Dissatisfied</td>
<td>Moderately Dissatisfied</td>
<td>Slightly Dissatisfied</td>
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<td>30. Your happiness in general?</td>
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<td>31. Your life in general?</td>
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<td>32. Your personal appearance?</td>
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<td>33. Yourself in general?</td>
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</table>
PART 2. For each of the following, please choose the answer that best describes how *important* that area of your life is to you. Please mark your answer by circling the number. There are no right or wrong answers.

<table>
<thead>
<tr>
<th>HOW IMPORTANT TO YOU IS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Your health?</td>
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<tr>
<td>2. Your health care?</td>
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<tr>
<td>3. Having no pain?</td>
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<td>4. Having enough energy for everyday activities?</td>
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<td>5. Taking care of yourself without help?</td>
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<tr>
<td>6. Having control over your life?</td>
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<tr>
<td>7. Living as long as you would like?</td>
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<tr>
<td>8. Your family’s health?</td>
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</table>
## HOW IMPORTANT TO YOU IS:

<table>
<thead>
<tr>
<th></th>
<th>Very Unimportant</th>
<th>Moderately Unimportant</th>
<th>Slightly Unimportant</th>
<th>Slightly Important</th>
<th>Moderately Important</th>
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<tbody>
<tr>
<td>9. Your children?</td>
<td>1</td>
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<td>10. Your family’s happiness?</td>
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<td>11. Your sex life?</td>
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<td>18. Having no worries?</td>
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<tr>
<td>HOW IMPORTANT TO YOU IS:</td>
<td>Very Unimportant</td>
<td>Moderately Unimportant</td>
<td>Slightly Unimportant</td>
<td>Slightly Important</td>
<td>Moderately Important</td>
<td>Very Important</td>
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<td>19. Your neighborhood?</td>
<td>1  2  3  4  5  6</td>
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<td>20. Your home, apartment, or place where you live?</td>
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<td>21. Your job (if employed)?</td>
<td>1  2  3  4  5  6</td>
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<td>22. Having a job (if unemployed, retired, or disabled)?</td>
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<td>23. Your education?</td>
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<td>24. Being able to take care of your financial needs?</td>
<td>1  2  3  4  5  6</td>
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<td>25. Doing things for fun?</td>
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<td>26. Having a happy future?</td>
<td>1  2  3  4  5  6</td>
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<td>27. Peace of mind?</td>
<td>1  2  3  4  5  6</td>
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<td>28. Your faith in God?</td>
<td>1  2  3  4  5  6</td>
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### HOW IMPORTANT TO YOU IS:

<table>
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<tr>
<th>Question</th>
<th>1</th>
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</thead>
<tbody>
<tr>
<td>29. Achieving your personal goals?</td>
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<td>30. Your happiness in general?</td>
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<td>31. Being satisfied with life?</td>
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<td>32. Your personal appearance?</td>
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<td>33. Are you to yourself?</td>
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Appendix E
Quality of Life Index (QLI) Scores Syntax

NOTE: Be sure that the items for each of the five scores listed in this SPSS-PC syntax correspond with the numbered items for the subscales and total scale for the version of the QLI that you are using.

The variable “SAT1” in the syntax below is our name for the first item in the satisfaction section (Part 1 of the instrument). “SAT2” is the second satisfaction item, and so on. The variable “IMP1” in the syntax below is our name for the first item in the importance section (Part 2 of the instrument). “IMP2” is the second importance item, and so on.

“QLI” is the total score, “HFSUB” is the health and functioning subscale score, “SOCSUB” is the social and economic subscale score, “PSPSUB” is the psychological/spiritual subscale score, and “FAMSUB” is the family subscale score.

/***QLI Scoring Syntax for GENERIC III Version***/

COMPUTE AB1= (SAT1-3.5)*IMP1.
COMPUTE AB2= (SAT2-3.5)*IMP2.
COMPUTE AB3= (SAT3-3.5)*IMP3.
COMPUTE AB4= (SAT4-3.5)*IMP4.
COMPUTE AB5= (SAT5-3.5)*IMP5.
COMPUTE AB6= (SAT6-3.5)*IMP6.
COMPUTE AB7= (SAT7-3.5)*IMP7.
COMPUTE AB8= (SAT8-3.5)*IMP8.
COMPUTE AB9= (SAT9-3.5)*IMP9.
COMPUTE AB10= (SAT10-3.5)*IMP10.
TAI CHI AND DRIVING CESSIONATION TRANSITION

\[
\text{COMPUTE AB11} = (\text{SAT11} - 3.5) \times \text{IMP11}.
\]
\[
\text{COMPUTE AB12} = (\text{SAT12} - 3.5) \times \text{IMP12}.
\]
\[
\text{COMPUTE AB13} = (\text{SAT13} - 3.5) \times \text{IMP13}.
\]
\[
\text{COMPUTE AB14} = (\text{SAT14} - 3.5) \times \text{IMP14}.
\]
\[
\text{COMPUTE AB15} = (\text{SAT15} - 3.5) \times \text{IMP15}.
\]
\[
\text{COMPUTE AB16} = (\text{SAT16} - 3.5) \times \text{IMP16}.
\]
\[
\text{COMPUTE AB17} = (\text{SAT17} - 3.5) \times \text{IMP17}.
\]
\[
\text{COMPUTE AB18} = (\text{SAT18} - 3.5) \times \text{IMP18}.
\]
\[
\text{COMPUTE AB19} = (\text{SAT19} - 3.5) \times \text{IMP19}.
\]
\[
\text{COMPUTE AB20} = (\text{SAT20} - 3.5) \times \text{IMP20}.
\]
\[
\text{COMPUTE AB21} = (\text{SAT21} - 3.5) \times \text{IMP21}.
\]
\[
\text{COMPUTE AB22} = (\text{SAT22} - 3.5) \times \text{IMP22}.
\]
\[
\text{COMPUTE AB23} = (\text{SAT23} - 3.5) \times \text{IMP23}.
\]
\[
\text{COMPUTE AB24} = (\text{SAT24} - 3.5) \times \text{IMP24}.
\]
\[
\text{COMPUTE AB25} = (\text{SAT25} - 3.5) \times \text{IMP25}.
\]
\[
\text{COMPUTE AB26} = (\text{SAT26} - 3.5) \times \text{IMP26}.
\]
\[
\text{COMPUTE AB27} = (\text{SAT27} - 3.5) \times \text{IMP27}.
\]
\[
\text{COMPUTE AB28} = (\text{SAT28} - 3.5) \times \text{IMP28}.
\]
\[
\text{COMPUTE AB29} = (\text{SAT29} - 3.5) \times \text{IMP29}.
\]
\[
\text{COMPUTE AB30} = (\text{SAT30} - 3.5) \times \text{IMP30}.
\]
\[
\text{COMPUTE AB31} = (\text{SAT31} - 3.5) \times \text{IMP31}.
\]
\[
\text{COMPUTE AB32} = (\text{SAT32} - 3.5) \times \text{IMP32}.
\]
\[
\text{COMPUTE AB33} = (\text{SAT33} - 3.5) \times \text{IMP33}.
\]
\[
\text{COMPUTE QLI} = \text{MEAN.1(AB1, AB2, AB3, AB4, AB5, AB6, AB7, AB8, AB9, AB10, AB11, AB12, AB13, AB14, AB15, AB16, AB17, AB18, AB19, AB20, AB21, AB22, AB23, AB24, AB25, AB26, AB27, AB28, AB29, AB30, AB31, AB32, AB33}) + 15.
\]
\[
\text{COMPUTE HFSUBa} = \text{MEAN.1(AB1, AB2, AB3, AB4, AB5, AB6, AB7, AB8, AB9, AB10, AB11, AB12, AB13, AB14, AB15, AB16, AB17, AB18, AB19, AB20, AB21, AB22, AB23, AB24, AB25, AB26, AB27, AB28, AB29, AB30, AB31, AB32, AB33}) + 15.
\]
\[
\text{COMPUTE SOCSUBb} = \text{MEAN.1(AB13, AB15, AB19, AB20, AB21, AB22, AB23, AB24}) + 15.
\]
TAI CHI AND DRIVING CESSATION TRANSITION

COMPUTE PSPSUBc = MEAN.1(AB27, AB28, AB29, AB30, AB31, AB32, AB33) + 15.
COMPUTE FAMSUBd = MEAN.1(AB8, AB9, AB10, AB12, AB14) + 15.
Appendix F

Multivariate normality: histograms and Q-Q plots of the four DVs at three time points

(A): Geriatric Depression Scale-Short Form, Baseline.
(B): Geriatric Depression Scale-Short Form, Mid-point.
(C): Geriatric Depression Scale-Short Form, Post-intervention.
(D): Lubben Social Network Scale-18, Baseline.
(E): Lubben Social Network Scale-18, Mid-point.
(F): Lubben Social Network Scale-18, Post-intervention.
(G): UCLA Loneliness Scale-Version 3, Baseline.
(H): UCLA Loneliness Scale-Version 3, Mid-point.
(J): Quality of Life Index, Baseline.
(K): Quality of Life Index, Mid-point.
(L): Quality of Life Index, Post-intervention.