SELF-REGULATORY DRIVING PRACTICES OF

OLD AND YOUNG DRIVERS

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Prof. Dr. Meliha Altunışık
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

Prof. Dr. Tülin Gençöz
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

Assoc. Prof. Dr. Türker Özkan
Supervisor

Examining Committee Members

Assist. Prof. Dr. Mehmet Koyuncu	(EGE, PSY)	
Assoc. Prof. Dr. Türker Özkan	(METU, PSY)	
Assist. Prof. Dr. Bahar Öz	(METU, PSY)	

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Name, Last name : Derya Azık

Signature :

ABSTRACT

SELF-REGULATORY DRIVING PRACTICES OF OLD AND YOUNG DRIVERS

Azık, Derya
M.S., Department of Psychology
Supervisor: Assoc. Prof. Dr. Türker Özkan

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The aim of the current study was to investigate self-regulatory driving practices of old and young drivers by examining underlying factors and possible benefits on drivers' aberrant behaviors. 258 active male drivers (120 older, 138 younger) participated in the study. Older drivers' age range was determined as 60-75 and younger drivers' age range was determined as 21-30. For testing motivator factors of self-regulatory driving practices, Health and Functional Abilities Scale (Molnar et al., 2013), Self-Rated Abilities Scale, Driving Confidence Scale (Parker et al., 2001) were adapted to Turkish Sample and applied to older and younger drivers. After that, for testing self-regulatory, driving behaviors Advanced Decisions and Patterns of Travel Scale (Molnar, et al, 2013) was revised and mini-version of this scale was used. Lastly, for understanding possible safety benefits of self-regulation, Turkish version of Driver Behavior Questionnaire (DBQ) (Lajunen, & Özkan, 2004) was applied. The results show that behavioral mechanism of older, younger drivers were different, and there were no mediation effect of self-regulatory driving practices between possible underlying factors (health and functional abilities, self-rated driving abilities, driving confidence) and aberrant driver behaviors for older drivers. For younger driver groups, the mediation effect of strategical self-regulation was found between situational confidence and lapses. Generally, while tactical self-regulatory strategies were predicted negatively aberrant behaviors of the participants, for strategical self-regulation adverse relations were found which only supports tactical self-regulatory behaviors possible benefits for older and younger drivers. Limitations and contributions of the study were discussed in light of the related literature.

Keywords: older drivers, younger drivers, driving confidence, driving self-regulation, aberrant driver behaviors

ÖZ

YAŞLI VE GENÇ SÜRÜCÜLERİN TRAFİKTEKİ ÖZ DÜZENLEYİCİ DAVRANIŞLARI

Azık, Derya
Yüksek Lisans, Psikoloji Bölümü
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Bu çalışmanın amacı, yaşlı ve genç sürücülerin trafikteki öz-düzenleyici davranışlarını altında yatan muhtemel faktörler ve güvenli sürüş için sağlayacağı muhtemel faydalar araştırılarak incelemektir. Çalışmaya 258 (120 yaşlı, 138 genç) aktif erkek sürücü katılmıştır. Yaşlı sürücülerin yaşları 60-75 arası sınırlandırılırken, genç sürücülerin yaş aralığı 21-30 olarak belirlenmiştir. Öz düzenleyici davranışları etkilemesi muhtemel olan faktörler, Genel Sağlık Durumu Anketi (Molnar et al., 2013), Sürücü Beceri Değerlendirme Anketi ve Sürüş Özgüveni Anketi'nin (Parker et al., 2001) Türkçe 'ye çevrilip, yaşlı ve genç sürücüler üstünde uygulanmasıyla araştırılmıştır. Bunlara ek olarak, Trafikte Öz Düzenleyici Davranışlar Anketi (Molnar et al., 2013) Türkçeye adapte edilmiş ve kısa uyarlaması oluşturulup bu çalışma için kullanılmıştır. Son olarak, trafikteki öz-düzenleyici davranışların, trafik güvenliği için olası yararlarını araştırmak amacıyla Sürücü Davranışları Anketi'nin (SDA) (Lajunen, & Özkan, 2004) Türkçe adaptasyonu katılımcılara uygulanmıştır. Çalışma sonuçlarına göre, yaşlı ve genç sürücülerin davranış işleyişleri birbirinden farklıdır ve genel sağlık durumu, beceri değerlendirmesi, sürüş özgüveni ve sürücü davranışları arasında öz-düzenleyici davranışların aracılık etkisi yaşlı sürücüler için bulunamamıştır. Genç sürücüler için,

duruma bağlı sürüş özgüveni ve ihmaller arasında stratejik öz-düzenleyici davranışların etkisi bulunmuştur. Genel olarak, taktiksel öz-düzenleyici davranışların, sapkın sürücü davranışları üzerinde negatif etkisi bulunurken, stratejik öz-düzenleyici davranışların, sapkın sürücü davranışlarıyla doğru orantılı ilişkisi bulunmuştur. Sonuçlar, yaşlı ve genç sürücüler için sadece taktiksel öz-düzenleyici davranışların, güvenli sürüşü destekliğini göstermektedir. Çalışmayı kısıtlayan olası faktörler ve çalışmanın katkıları ilgili literatür ışığında tartışılmıştır.

Anahtar Kelimeler: yaşlı sürücüler, genç sürücüler, sürüş özgüveni, öz-düzenleyici davranışlar, sürücü davranışları

TO NURSEVIN, MEHMET ALI & EDA…

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INTRODUCTION

1.1 Overview

Road traffic accidents are one of the leading causes of death and it is a global problem. Every year more than one million people die because of the car crashes and it is expected to exceed 2 million by the year 2020 (Evans, 2004). Moreover, while road traffic injuries are listed as the night leading cause of death in 2012, it is expect to be fifth leading causes of death if there is no urgent action taken (WHO, 2013)

According to World Health Organization Global Report on Road Safety, there were approximately 1.24 million people die because of the road traffic accidents in 2010 and this statistic is similar to the number of deaths in 2007. On the other hand, because of the reporting differences between countries the road traffic injuries proportion cannot be reported in detail, globally. While the death numbers seem to be stabilized, still the statistics are so dramatic and economic cost is still too high. In addition to them road traffic accidents are still rising up especially in middle and low income countries (WH0, 2013).

Turkish data trend is similar to the global trend. According to Turkish Statistical Institute statistics of the year, 3, 685 road users death and 274,829 road users injuries were reported. Since 2003, number of persons that killed in traffic accidents is very close and it seems to Turkish Government stabilize the number. However, during the period of 2003 to 2013 there is two times increase in the total accident numbers and the injuries numbers which highlight the need of urgent action (TUIK, 2013).

1.1.1 Main Driver Groups with High Accident Involvement

In order to support urgent action to control crashes, determining specific road users and specific factors that lead crashes may be critical. For example, although, there are some reporting differences about crash data between countries, it is seen that some specific driving groups involved in road traffic accidents more than the other road users and their increased risk is accepted for throughout the world. Therefore, for developing effective countermeasures to decrease accident numbers, understanding risky groups and the factors that are related with their increased risk might be a good point for start.

In the literature with respect to the demographic factors, older drivers and younger drivers might be listed as risky driving populations that their accident involvement rates are more than the other road users (Porter, 2011; Ryan, Legge, & Rosman, 1998). Studies show that crash rates of drivers older than 65 and drivers under the age 25 are higher than the crash rates of other age groups (McGwin, & Brown, 1999). In addition to high rates of crash involvement of these age groups, they have also high rates of responsibility for these crashes. While all age groups are found as affected and killed due to young drivers crashes, for old drivers it is seen that the crashes that older drivers are responsible mostly ended as killing themselves (Williams, & Shabanova, 2003). Due to these age groups, crashes affect all road users' mobility and safe driving environment negatively, understanding these populations' trends and characteristics is critically important for understanding their risk on roads and preventing future crashes on roads.

According to United Nations Statistics, while the proportion of people age 60 and older is 11% in 2009, this rate will reach 22% by 2050 (United Nations, 2009). Due to this world aging trend, public and research attention increasing about this risky group to promote older driver safety since they are listed as second risky driving population in traffic literature (Sivak & Schoettle, 2011; Lourens, Vissers & Jessurum, 1999). It is known that they have higher crash rate per mile driven and they are more likely to die and experience serious injury after a crash due to age related frailty (Hakamies-BlomGvist, Wiklund, & Henrikson, 2005). Their increase risk for crash involvement is attributed to visual, cognitive and physical impairments, which are related to ageing. In addition the effects of ageing, illnesses, the use of medication and their interaction with declines in abilities increase the risk of accident for older drivers and all of these factors and their interactions affect their driving fitness and ability to adapt complex environment in traffic, negatively (Carter, 2006; Shanmugaratnam, Kass & Arruda, 2010; Freund, & Smith, 2011). Although age-related declines make driving more difficult, driving provide active lifestyle with mobility and independence which support well- being and psychological health of the older adults (Nordbake, & Schwanen, 2014; Fonda, Wallace, & Herzog, 2001). Moreover, new cohorts of the elderly more active and less likely to use public transport that is why they want to drive as long as they can (Rosenbloom, 2001). Therefore, understanding their specific crash patterns is critical not only for safety on roads but also for supporting older drivers' mobility and well-being.

According to World Health Organization Youth Road Safety Report, every day approximately 1000 young people under the age of 25 die on the world's roads and road traffic injuries are the leading cause of death between the age of 15-19 while it is the second cause of death for 20-24 ages (2007). When they are compared with the safest group, their injury rate 5-10 times is higher. Moreover, this high rate has not diminished overtime, become a persistent problem for road safety, and makes these age group most risky driver groups in traffic (Elvik, 2010). Their elevated risk for crash is mainly attributed to inexperience and age-related characteristics (OECD, 2006; Wiliams, 2006). Due to they have limited experience and they are not mature yet, higher order perceptual and cognitive skills that are required for safe driving are not totally developed. They detect hazard less quickly, underestimate the risk of accident and overestimate their driving skill (Deery, 1999). In addition to them, the voluntarily risk taking behaviors such as speeding, nighttime driving, distracted driving, alcohol impaired driving and driving with friends are the other important factors that make the young male drivers more prone to experience road traffic accidents are another important cause increased risk of crash (Clarke, Ward, & Truman, 2005; Huang, & Winston, 2011).

Although, older and younger drivers have distinct characteristics that elevate their crash risk, before understanding effects of these specific factors understanding the main contributor factors that lead road crashes may be helpful for interpretation of the specific risk factors of these groups. Therefore, in the next part main casual factors that are related to road crashes are presented.

1.1.2. Main Factors Related with Accident Involvement

Many researches in the area of traffic accidents propose that traffic accidents are not by chance events like the other accidents that people face. Therefore, investigation about the causes of road crashes will be critical to prevent future crashes on roads (Shinar, 2007).

Before investigating the causes of road traffic accidents, understanding that road traffic is a system and it has components. Either the factors or the inappropriate interaction of these factors may lead to road traffic accidents (WHO, 2006). Mainly the factors that are related with the causation of traffic accidents are placed into broad categories named as human, environmental and vehicle and this categorization has remained same over decades (Evans, 2004). Tri-Level Study of Accident Causes was the one of the most detailed and past study, which investigate the causes of the crashes and the components of traffic system. In this report, the most frequent accident cause was reported as human factors that are followed by environmental factors and vehicle factors (Treat et al., 1979). Same years, the study that was conducted in England by a team of U.K.'s Transport Road Research Laboratory in 1975 found remarkably similar results and they reported human factors are far more important than the other factors

(Rumar, 1985; Shinar, 2007). While these studies were conducting, the teams were unaware of each other's activities and obtained the same hierarchy of factors (Evans, 1996). From past to today, the list has not been changed too much and causes that are related to human are still estimated as the dominant contributor of road accidents (Evans, 2004; Shinar, 2007).

Generally, in the area of traffic safety, human factors in driving has been investigated through two main driver acts, they are driving skills and driving style in other words driver performance and driver behaviors (Özkan, Lajunen, & Summala, 2006). Driving performance is related to knowledge, skill, perceptual and cognitive abilities of drivers and it is expected to improve with practice (Evans, 2004; Lajunen, & Özkan, 2011). Use of steering wheel, tracking the road, detecting the hazard on roads and responding to these hazards are the examples of driving performance and these are the elements of driving task (Elander, West, & French, 1993). On the other hand, driving behaviors are related to individuals' driving habits and reflects choices of the drivers. Therefore, attitudes and beliefs about driving and general motives and needs affect driver's behaviors (Elander, West, & French, 1993). Driver behaviors become established over period of years but unlike driver performance, it does not mean getting safer (Elander, West, & French, 1993; Lajunen, & Özkan, 2011). The examples of driver behaviors can be choice of driving speed, threshold for overtaking headway and liability to commit violations in traffic (Elander, West, & French, 1993). Briefly, driver performance is what the driver can do and driver behavior is what the drivers usually do (Özkan, 2006; Evans, 2004).

In the literature, it is seen that both driver performance and driver behaviors are related with accident involvement of drivers. However, good performance alone may not support safe driving or decrease accident risk. This is because of driving is a self-paced task and drivers adapt their task difficulty with respect to their desired level which may lead to higher speed, or secondary task like using cell-phone while driving. After this increased task difficulty, driving demand may be higher and may exceed the capacity of drivers that may increase the risk for accidents. Therefore, after the period of learning how to drive and improve driving, it can be said that driver performance and driving behavior are affected from each other (Evans, 2004; Lajunen, & Özkan, 2011; Özkan, 2006). In addition to them, choices of the drivers become more important for appropriate adaptation of drivers' performance limits. It can be said that, after the learning period of driving, driver behaviors have much greater influence on increased accident risk than driver performance (Lajunen, 1997; Evans, 1996).

In the literature after driver behaviors are seen as the primary causes of accidents, this concept have been gaining importance in the traffic literature over 40 years and it is assumed that specific human behaviors and their components that cause crashes must be investigated and deeply understood to prevent future accidents (Lajunen, 1997, Hendricks, Fell, & Freedman, 2001). With this idea, in these study older and younger drivers' behaviors are investigated deeply and the underlying factors that affect these behaviors that are related with road traffic accidents are screened for promoting their safety.

1.1.3 Contextual Mediated Model- Understanding Factors behind Road Traffic Accidents

In the traffic psychology literature, many studies investigate key problem behaviors of the drivers and possible countermeasures for controlling them. Speeding, non-use of seat belt, drink driving, and driver fatigue is the one of the main specific behaviors that cause accident and increase the severity of the crashes (Fernandes, Hatfield, &Job, 2010). In addition to them, with technological improvement, distracted driving, such as using cell phone while driving, is a growing problem that increases the risk of crashes (Llerena et al., 2015). In reality, these problematic behaviors are short-term direct causes of the accidents and they rely on some of indirect factors. Main indirect factors are listed as physiological failures, conditions or states problems, experiences or exposure levels, conflicting behaviors and risk-taking behaviors. These indirect causes lead to short term direct causes such as falling asleep while driving, drugged, drunk or fatigued driving, road and vehicle unfamiliarity, internal or external distraction and speeding which are the key problematic behaviors that lead to severe crashes on roads (Lee, & Fell, 1988).

More recently, this causality mechanism was studied by Sümer and in his work, the possible paths leading crashes are presented in detail. In this study, he inspired of the study of Bradbury and Fincham's (1988) and investigated the crash causality factors with a contextual mediated model. According to this model, there are two groups of context as proximal and distal. Proximal context includes more direct causal factors increase the risk of crashes. These factors can be both stable and transitory. For example, accidents direct causes can be related to everyday permanent driving behavior such as speed choice, violations and errors or they can be temporary like drinking and driving. Factors under the distal context predict crashes via proximal factors and indirectly contribute to crashes. Cultural factors, socio-demographic factors, stable personality factors, cognitive factors, personal beliefs, and attitudes are given examples of distal factors that are related to driving. In briefly, Sümer proposed that distal factors are related to general tendency of the drivers which in turn specific driver behaviors that lead accidents. Moreover, he suggested that while link between proximal factors and crashes might be less strong, link between distal and proximal factors might be high. Moreover, it is proposed that predictive power of distal factors on crashes might be poor (Sümer, 2003).

Proximal factors of this model are similar to general factors that were studied by Lajunen in 1997. Although, components and paths of theoretical model of Lajunen that is developed for predicting driving behaviors and accidents were more branched, the idea behind these two models is similar (1997). In the Lajunen study, there were driver's self-view factors that mediate the relationship between general factors and

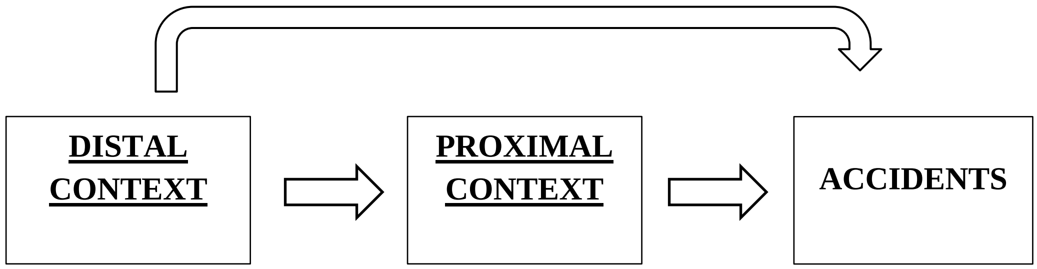

Figure 1. Contextual mediated model (Sümer, 2003).

driving behaviors that is not exist in the Sümer Model. These mediation factors are included either distal or proximal factors in contextual mediated model of Sümer. In addition to them, while Lajunen proposed that there were immediate causes between driving style and accidents, Sümer suggested that proximal factors including driving style are directly related with accident causation.

In the Ph. D thesis, Lajunen states that traffic accidents are not homogenous and there are different causation mechanisms behind different types of accidents, therefore there should be different accidents model for investigating different type of accidents (1997). In this point of view, for understanding safe and unsafe acts and behaviors of older and younger drivers' distal and proximal factors framework will be helpful to study about these risky driver populations systematically. In the next parts of the study, older and younger drivers' mechanism will be presented and investigated in the scope of contextual mediated model of Sümer (2003).

1.2 General Factors related with Elevated Crash Risk of Older Drivers

To support the mobility of older adults and for preparing new aging world, understanding driving patterns of older adults is critical to provide safe traffic environment not only for elderly but also for other road users. With this point of view, many studies investigate specific factors that elevate accident risk of older drivers. In this section, the factors that reflect the characteristics and limitations of this age group will be presented. With respect to the Sümer Model, these factors are assumed as general factors in other words distal factors that are related to increase crash risk of older drivers.

1.2.1 Health and Functional Abilities

Safely operating a car requires acquiring the information around the road quickly, after that processing them accurately for making appropriate response and loss of efficacy any of these processes may lead deadly consequences in traffic. Unfortunately, with age several of the abilities that control these processes start to decline, therefore driving performance of older adults and their ability to adapt complex traffic environment affected negatively. Moreover, it is known that these diminished capabilities contribute to crash risk of older adults (Eby, Trombley, Molnar, & Shope, 1998; Stutts, Stewart, & Martell, 1997; Owsley, 2004). For deep understanding about functional decline and driving performance, literature findings about different categories of the abilities were reviewed and the main findings are presented above.

Psychomotor or physical abilities are one of the critical functional capabilities that are mostly declining with age and necessary for driving safely. These abilities are not only important for controlling the car safely but also they are important for the recovery after crash for older adults (Sivak et al., 1995). The review study of Vichitvanichphong, Talaei-Khoei, Kerr and Ghapanchi show that postural sway, eyesight, motor conditions, physical reaction time, proprioception, sensorimotor performance, executive control mechanism, strength, balance, endurance, wrist flexion and range of motion are some of the critical diminished psychomotor abilities of older adults that are also related to safe driving (2005). All of them critical while driving and even turning the steering wheel or shifting a gear level could be a difficult task for a driver who experience reductions in strength or if there is a problem with neck or head motion of a driver, checking other vehicles, road users or obstacles around the road could be very limited, and which lead bad consequences while driving (Owsley, 2004). In addition to them, inefficient motor coordination, strength or balance is critical skill to control the car and maintaining lane position could be difficult and could lead to more collision, more speed and traffic light violation (Shanmugratnam, Kass, & Arruda, 2010).

Driving is mostly relies on visual tasks and visual functioning plays an essential role while driving because eyes are the major source of information around the vehicle and road. Therefore, changes in visual abilities are also related to driving performance of older adults and older adults with visual impairments report more difficulty in specific driving situations (Carter, 2006; Owsley, & McGwin, 2010; McGwin, Chapman, & Owsley, 2000). Visual impairments that are related to elderly drivers can be listed as anatomic changes, eye movements, visual acuity, contrast sensitivity, sensitivity to light, dark adaptation, visual field, space and motion perception (Eby, Molnar Kartje, 2009). In these abilities, especially useful field of view is a critical ability for predicting crash risk of older drivers (Ball et al., 1993; Owsley et al., 1998). In addition, studies show that older drivers with low visual acuity and contrast sensitivity is found to be increased driving risk and have difficulty in high risk situation such as driving in the rain, on the interstate, at night, on high traffic roads, during rush hour, alone, making left turn and parallel parking (Anstey, Horswill, Wood, & Hatherly, 2012; McGwin, Chapman, & Owsley, 2000)

Driving task require selection the appropriate information, after that successful interpretation of this information and making decisions which should translated into appropriate driving action. For these processes, sufficient working of perceptual and cognitive processes is needed (European Road Safety Observatory, 2006). Unfortunately, for these abilities, again, older drivers are the risk group and cognitive abilities are the other declining abilities that are related to safe driving. It was known that older drivers are more likely to be involved in traffic accident if their cognitive functioning is low (Shinar, 2007; Stutss, Stewart, & Martell, 1998). Slowing response time, difficulty in maintaining attention and switching attention are related to changes in cognitive performance of older adults and these cognitive functions play critical roles for handling complex driving environments (Carter, 2006). In addition to them, other cognitive factors that are related to diminished driving performance of older drivers can be listed as memory and visuo-spatial performance (Anstey, Wood, Lord, &Walker, 2005). Moreover, depth perception divided attention, direct attention, visual attention, working memory and task switching performance of older adults are found to be related to crash involvement and steering wheel, vehicle positioning, lane changes abilities of older adults. Better cognitive abilities support better driving performance (Park et al., 2011).

1.2.2 Critical Driving Skills of Older Drivers

Older drivers mostly involved in distinct type of crashes and this crash type distribution reflects both strengths and weakness of older drivers. Most of older drivers' crashes occur at intersection while crashes due to risk overtaking and speeding are seen very rare among older drivers (Hakamies-Blomqwist, 2004). As it mentioned the previous part, it is known that decline in abilities negatively affect critical driving skills and make worse older adults driving performance as they age. Although, there are individual differences some crash type and contributory critical driving skills are more salient for older drivers that pose particular challenges for older adults (Eby, Molnar, Kartje, 2009).

Studies show that older drivers are more likely to be involved in vehicle-to-vehicle collision and turning and changing lane situations are also other risky situation that increases crash risk of older drivers (Zhang, Fraser, Lindsay, Clarke, & Mao, 1998; McGwin, & Brown, 1999; Evans, 2004). In addition to them, their elevated risk for involving intersection crashes are found to be related to failure in yielding the right of way, unseen the objects and failure to heed stop signs or signals. Another study presents that inappropriate gap selection, high task complexity, presence of other road users, high approach speeds of conflicting traffic, high traffic volumes, limited or restricted sight distance, red-light running, inappropriate response to signals, inappropriate pavement markings, poor channelization and road with restriction may be listed as other contributory factors that increase the risk of older drivers crashes (Oxley, Fildes, Corben, & Langford, 2006).

1.2.3 Self- Rated Abilities and Driving Confidence

In order to decrease the accident risk of older drivers their driving performance changes is important. However, the success of the interventions will rely on the awareness of the drivers. If the drivers recognize their declines and performance changes, they are willing to behave with respect to the interventions that compensate their problems. Their awareness level may depend on self-ratings about their driving abilities and confidence level while driving and self-ratings about their driving abilities (Marottoli & Richardson, 1998).

Although, older drivers have difficulty in some specific driving situation, studies shows that older drivers may have unrealistic opinion about their actual abilities. For example, most of the older drivers rate their driving abilities high and even they made critical errors while driving their do not rate self-rated abilities as lower than the rest of the group (Wood, Lacherez, & Anstley, 2013). In another study, they rated their 15 years ago skills and today's skills and they are mostly reported their skills as unchanged and they reported changes as improvement rather than decline. On the other hand, the elderly mostly reported decline in their low level driving skills such as react to unforeseen events in traffic as declining driving skills that are related to functional impairments (Meng, & Siren, 2012). Realistic self-ratings are particularly important for older adults because they are sign of the self-awareness of declines and changes due to age-related factors. Therefore, ones who has realistic self-ratings about driving ability can adjust driving to cope with them (Horswill, Sullivan, Lurie-Beck, & Smith, 2013).

Driving confidence is important for older drivers' crash involvement and awareness. Moreover, confidence is closely associated with self-rated driving abilities (Marottoli & Richardson, 1998; Parker, Macdonald, Sutcliffe, & Rabbit, 2001). In the study conducted by Wood, Lacherez, & Anstey, it is found that older drivers with higher driving confidence level than their actual driving ability are more likely to report a crash than the rest of the groups (2013). Moreover, it is found that most of the older drivers report that they feel confidence over a range of potentially challenging driving situations with exception of night driving and night driving in a bad weather (Wood, Lacherez, & Anstey, 2013). Parker, Macdonald, Sutcliffe, & Rabbit found the similar trend with different driving situations and they reported that older drivers mostly quite confident in a range of driving situation (2001). Although confidence while driving is desirable, overconfidence can be problematic when it is not in the same direction of driving abilities. However, older drivers reported that their confidence level decreases when joining a motorway, driving in a heavy traffic and changing lanes on a motorway and after compare them with their self-rated abilities it is seen that drivers are aware of their weaken abilities which means their confidence level is not unrealistic (Parker, Macdonald, Sutcliffe, & Rabbit, 2001).

1.2.4 The Place of the General Factors of Older Drivers in the Model

The literature findings about older drivers' characteristics that are related to general tendency of the drivers can be summarized and grouped as health and functional abilities that includes psychomotor, visual and cognitive abilities, critical driving skills that are related to age decline, self-awareness about their driving performance and their driving confidence level. These factors are general factors, they may turn specific driver behaviors that lead accidents, and also they may directly affect accident involvement of older drivers. With this point of view, in this study for older drivers, these factors are placed in the distal context of contextual mediated model that is adapted for older drivers (see Figure 2).

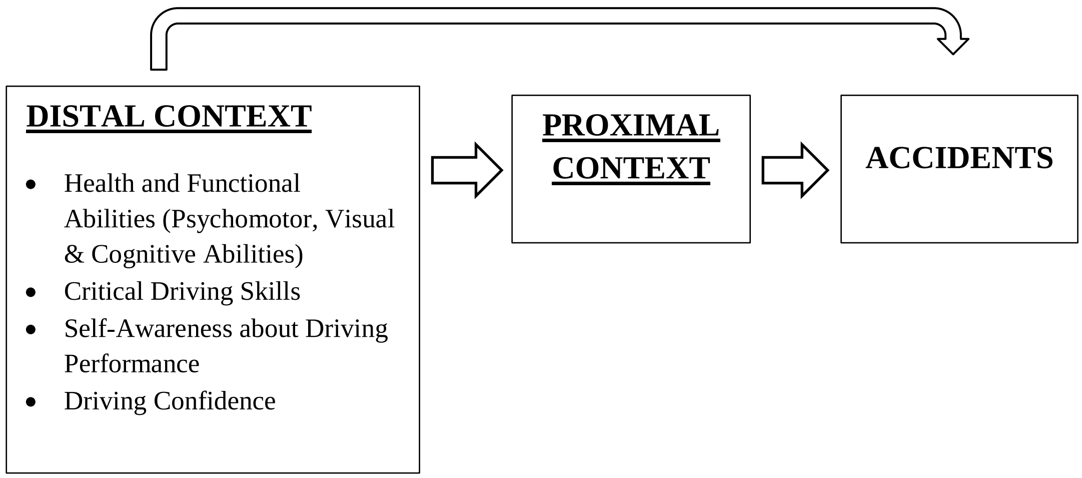

Figure 2. Summary of Distal Factors of Older Drivers

1.3 General Factors Related with Elevated Risk of Younger Drivers

Many factors contributed to accident involvement rate of young drivers but in the literature characteristic of younger drivers that are related with high accident involvement are grouped as age related (immaturity and risk-taking behaviors) and experience related (inadequate driving skills) factors (Shinar, 2007). This grouping is withstand the idea that accident risk of younger adults decline with changing risky lifestyle by getting older and improving their critical driving skills (Williams, 2006; Mccart et al., 2009). Therefore, in this section, the factors that reflect the characteristics and limitations of this age group will be presented. Like older drivers part, these factors are assumed as general factors in other words distal factors that are related to increase crash risk of older drivers.

1.3.1 Health and Functional Abilities (Characteristics of Youthful Age)

Age is one of the critical factors that affect the crash involvement of young drivers. The studies show that the lower the driver age result in higher the crash rate among novice drivers. The reason of it young adults are still not mature physically and emotionally and they are less able to cope with various driving situation with immature risk assessment capabilities (Shope, 2006; Gregersen, & Bjurulf, 1996; Mccartt et al., 2009; Dahl, 2008).

As cognitive and physical development, brain maturation is one of the critical parts for safe driving. Studies about adolescent development show that brain maturation continue until mid- twenties and like other part of the life, this changes in the brain affect young adults behavior and performance while driving and make them vulnerable and need adjustment (Steinberg, 2005; Huang, & Winston, 2011; Keating, & Halpern-Felsher, 2008). A particular focus of brain maturation is prefrontal cortex development, which continues to develop until the age 25. It is known that prefrontal cortex mediates planning, impulse control, perception of risk and decision-making and inappropriate driving plans, impaired ability to weigh consequences of risky driving and impulse control problems of young adults while driving are related to this part maturation. In addition to this part, young drivers' sensation seeking, risk taking and reward seeking behaviors while driving due to the shifting balance between limbic and cortical brain areas. Moreover, the reason of increase rate of sleep and fatigue related crash among young adults is explained by biorhythmic changes due to the melatonin production make them active in the evenings. All of these functioning are critical for safe driving and there are much more evidence about maturation other parts of the brain and their effects on driving (Glendon, 2011; Huang, & Winston, 2011; Steinberg, 2005; Paus, 2005; Shope, & Bingham, 2008).

In addition to cognitive and physical maturation, psychosocial and behavioral development aspects also have effects on young adults driving patterns. Young adults are in the translation period and they are still seeking their identity as individual, their responsibilities are growing, they experience freedom, mood swings, and their relationship with peers and other gender is evolving and their attachment with the social life increase. In addition to them, they realize their skills and abilities and explore their limits. Therefore, they are more active at night and at weekend, they often travel with similar age passengers and they are easily affected by peer pressure so risky driving such as speeding or drunk driving may affect their driving behaviors (Lam, 2003; Williams, 2003; Keating, & Halpern-Felsher, 2008; Arnett, 2002; Shope, & Bingham, 2008). All of these life changes and developmental factors are added the complex set of age-related factors and affect behaviors of young adults directly or indirectly way.

1.3.2 Critical Driving Skills of Younger Drivers (Inexperience)

Experience is the other and the most important factor for young drivers' safety, for initial accident reduction, it has a critical importance, and there is a strong association between accident liability and experience (Shinar, 2007; Gregersen, & Bjurulf, 1996; Maycock, Lockwood, & Lester., 1991).

Mostly, young drivers quickly learn basic skills of driving such as starting and stopping car, making turns, driving in a straight line etc. However, driving is a complex task and for higher order perceptual and cognitive driving skills for safe driving only improved by experience (Deery, 1999; Huang, & Winston, 2011). While driving, drivers should handle large number of task at the same time. They should drive the car, control in vehicle signals and warning signals etc. In addition to them, they should understand each different situation in the environment that is mostly new for them. For example, they should accurately make visual search and then they should correctly interpret them. For novice drivers all of them use their cognitive resources. In order to decrease the workload, decrease unpredictable movements and increase the proficiency of car handling skills, some of these tasks will be automated and it is only achieved by experience (Gregersen, Bjurulf, 1995; Shope, 2006; Groeger; 2006). With the help of experience, they have more memories to rely upon and driving in various traffic environments become easier and safer and error-prone processes decrease (Groeger, 2006).

Separation of age-related and experience-related skill deficits of younger drivers is difficult because each of them interrelated with each other and these two factor have effects on critical driving skills of young adults .Most salient characteristics of young novice drivers are their immature hazard perception (detecting and dealing with traffic hazards), inadequate attentional control (attending right thing at the right time), timesharing problems (able to deal with changing workload) and calibration deficits (cope with the task demands) and all of these skills are important for safe driving (Deery, 1999). Moreover, McKnight and McKnight found that young drivers are involved in the accidents mostly due to errors in attention, visual search, in appropriate speed relative to conditions, hazard recognition, and emergency maneuvers with high speeds. Moreover, it is stated that all of this deficits decrease with the help of experience (2003).

1.3.3 Self-Rated Abilities and Over-Confidence

Perceiving and monitoring driving abilities and skills accurately have an important aspect for dealing with numerous driving situations and potential hazards in traffic. Driving is a complex and self-paced task and in order to deal with various driving situations and regulating various behaviors while driving, one should accurately assess their own skills for controlling the task in order not to make the task too demanding and unsafe (Derry, 1999; Sundstörm, 2011; De Crean et al., 2011; Hatakka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002).

Large number of past studies shows that young novice drivers have poor perception about their actual driving abilities and after initial learning period of driving, they subjectively overestimate their behind the wheel ability (Engström, Gregersen, Hernetkoski, Keskinen, & Nyberg, 2003). Moreover, they overestimate their driving skills more than experienced drivers do and this overconfidence is presented as one of the main reasons of the accident rates of young drivers (Gregersen, & Bjuruf, 1996; OECD, 2006). Moreover, overestimation of skill and overconfidence is important part of the risk assessment in traffic and inaccurate estimation of skill is closely related to inaccurate estimation of risk. That is, if a driver believes that he is a skilled driver who can handle all situations while driving, from that time hazardous situation may not be equally dangerous for them, also they may not seek information about their driving (Deery, 1999; Gregersen, & Bjuruf, 1996). Therefore, risk taking behaviors and risky driving is also associated with young drivers' inaccurate self-rated driving abilities that are related to overconfidence while driving (Deery, 1999; Molina, Sanmartin, & Keskinen, 2013). In addition to them, overconfidence and higher subjective driving abilities scores are negatively related to safety skills of drivers and overestimation of driving skills and underestimation of risk are found to be contributor factor of high accident involvement of young novice drivers (Sümer, Özkan, & Lajunen, 2006, Gregersen, 1996). With the consideration of all information about overconfidence and unrealistic self-assessment of driving skills, for safe driving, realistic self-rated driving skills is important for adapting behaviors with respect to limitations of driving skills, and weak points of driving task is critically important for young novice drivers (Nakai, & Usui, 2012).

1.3.4 The Place of the General Factors of Younger Drivers in the Model

Similar to older drivers, literature findings about younger drivers' characteristics that are related to their increased risk in traffic are presented in this part. Their developmental factors, inexperience, self-awareness and their self-ratings about driving abilities and driving confidence are investigated with literature findings. Similar to older drivers' the factors that are related to characteristics of this age group are general factors and they may turn specific driver behaviors that lead accidents and also they may directly affect accident involvement of this age group drivers. Therefore, in this study these factors are grouped and placed in distal context for understanding their affect for young drivers' acts and accident involvement rate (see Figure 3).

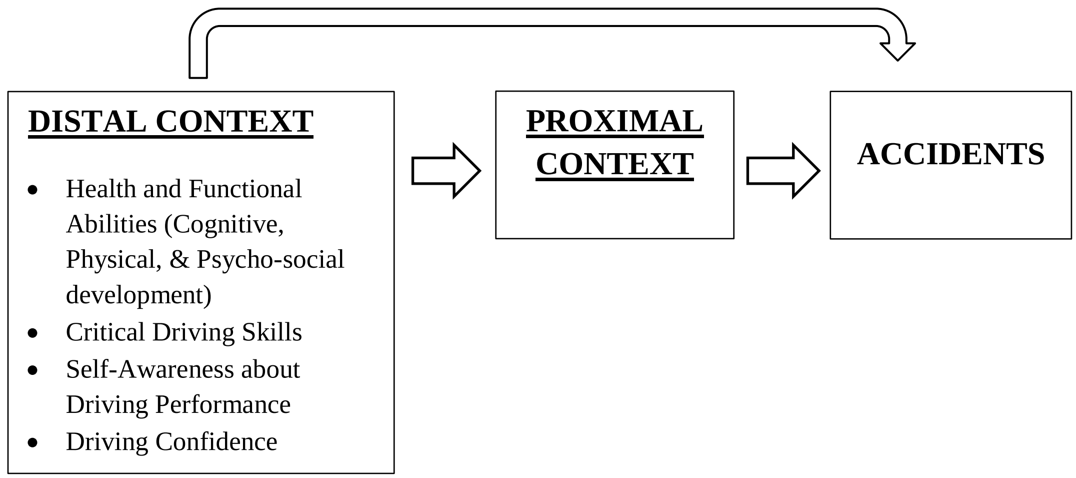

Figure 3. Summary of Distal Factors of Younger Drivers

1.4 Self-Regulatory Driving Behaviors

Until this part, the possible general distal factors related with accidents involvement of older and younger drivers were presented. According to Sümer Contextual Mediated Model (2003), after these factors there should be proximal factors that are directly related to accidents. However, the literature about older drivers and their accident risk, one concept attracts the attention and it is self-regulation. This concept is studied as adaptive strategy for controlling the age-related contributory factors and these behaviors are seen as the answer of "What the drivers can do to compensate risk for crash?" Although this concept is mostly studied for older drivers, with the idea of promoting safety of younger drivers, it is used as the concept between distal and proximal factors for not only older drivers but also younger drivers in this study. There is not enough study about younger drivers' self-regulation. However, the studies shows that younger drivers are also control their behaviors to compensate their limitations. If age related characteristic are seen as general factors, the adaptive strategies will be directly related with these general factors that lead the mediation between proximal and distal factors. With this idea, in this study driving self-regulatory behaviors are added to the model (see Figure 4). Before discussing of the possible relationship between distal factors, driving self-regulation and proximal factors, understanding what self-regulation is will necessary to be sure the place of the self-regulatory driving behaviors.

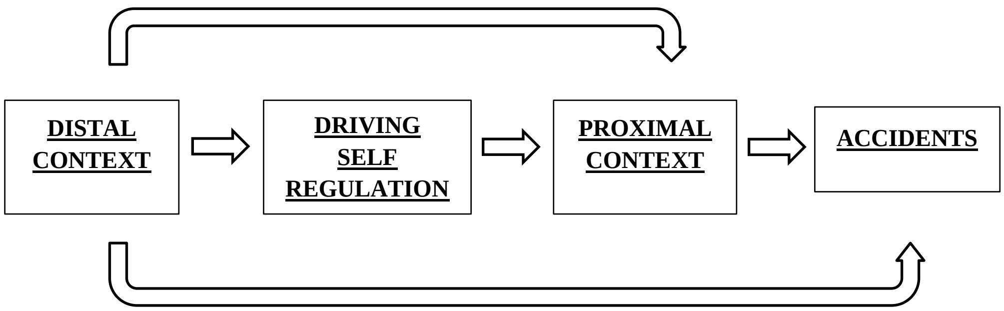

Figure 4. Proposed mediated model

Self-regulation for driving is described as "adjusting one's driving patterns by driving less or avoiding to driving in specific situations in which driver feels unsafe or uncomfortable" and these regulatory behaviors are a well-known adaptive strategy that mostly internalized by older drivers (Molnar, & Eby, 2009). It is known that appropriate self- regulatory driving behaviors are found as a good strategy for compensating older drivers' declining abilities overtime and prolonged the period of time that they can safely drive (Molnar, Eby, Kartje, & Louis, 2010). In this perspective, the driver who has increased crash risk and weak abilities could be self-regulators and this risk reduction strategy could be used by wider risky driving population for decreasing the crash risk (Gwyther, & Holland, 2012). As other age group, that has immature abilities and high crash rates, younger drivers could be also included to investigation of self-regulators in traffic. Studies that investigate young drivers self-regulatory and self-restricted behaviors in traffic are not enough, however, conducted studies shows that young drivers between 18-24 years also apply self-regulatory behaviors (Naumann, Dellinger, & Kresnow, 2011). Moreover, it is known when younger and older drivers compared with middle age group, it is seen that younger and older drivers reported more self-regulatory behaviors than middle aged

(Gwyyther, & Holland, 2012). It should be noted that compensations extend and type of younger and older adults could be different from each other because the characteristics of these each group and their risk factors that promote self-regulatory practices are also different (Motak, Gabaude, Bougeant, & Huet, 2014). Therefore, understanding the characteristics of self-regulators and understanding the underlying mechanism of self-regulatory behaviors may be helpful to promote safe driving environment for both younger and older drivers.

1.4.1 Extend and Type of Self-Regulatory Driving Behaviors

Driving is a task to satisfy the mobility needs of individuals. Drivers control their behaviors and make appropriate decision to satisfy mobility needs by driving. In order to satisfy these needs Michon proposed a model about problem solving task of the drivers which provide a framework to understand the mechanism of self-regulatory behaviors as well (Shinar, 2007; Molnar, 2013).

According to this model, a system made up of three levels. The top level is strategical level that includes planning and strategical decisions. The intermediate level is tactical level, maneuvering and navigational decisions are taken in this phase, and lastly the lowest level is operational level and includes control and automatic action patterns (Michon 1985, Shinar, 2007). The system starts with strategical level and before the person starts to drive high level of decisions and general planning of the trip have to be resolved (Shinar, 2007). Trip goals, route choice, evaluation of cost and risk of a trip are belong to this level (Michon, 1985). In addition to them, driver decisions about continue to drive, decision to take bus, train or postpone the trip, decision about day and time of the trip or decision about wearing seat belts are the examples of strategical level tasks (Smiley, 2004, Shinar, 2007). After straegical level decisions are made, the second level, which is tactical, starts. As it mentioned before, tactical level is navigational level and includes maneuvers that the drivers make while driving in response to the situations in traffic (Molnar, 2013). These decisions are made while driving and avoiding obstacle, adaptation the speed of the car (fast or slow driving), and the decisions about gap distance in traffic, running or stopping in the traffic are the examples of the behaviors related to tactical level decisions (Michon, 1985; Shinar, 2007; Smiley, 2004). After two parts of the system, the lowest level is operational level and this level is automatic part of the hierarchy. In this level, the decisions are mostly unconscious and they are the decisions determined in the specific time in response to the specific situations. The behavioral examples of this level could be scanning the roadway, variation of speed, changing gears, signaling, stopping at the traffic lights, etc. (Smiley, 2004; Shinar, 2007). The system and the decisions in each level are made for achieving some personal criteria and goals and they are ended with different driving performance outcome (Shinar, 2007).

This hierarchical model of Michon is similar to Rasmussen's categories of human behaviors. Parallel to Michon's model, Rasmussen distinguish three typical levels of performance as knowledge, rule and skill based behaviors. Strategical behaviors can be considered as knowledge-based behaviors. Because both levels are higher conceptual levels include plans and predictions of the effects of the plans are considered in these levels. In both levels, there is time needed to make these levels decisions and the behaviors are related to personal limitations. The second level is rule-based behaviors and they are controlled by stored rules and procedures that are leaned in the previous occasions. Tactical behaviors can be considered as rule-based because of these behaviors are the reflection of the road and the traffic rules. Lastly, operational behaviors can be considered as skill-based behaviors because they are take place without conscious control, moment to moment behaviors and includes automated skills related to tasks and rely on sensory-motor performance during acts (Rassmussen, 1983, Smiley, 2004; Oppenheim, & Shinar, 2011). The schematic form of these two models comparisons can be seen in Figure 5.

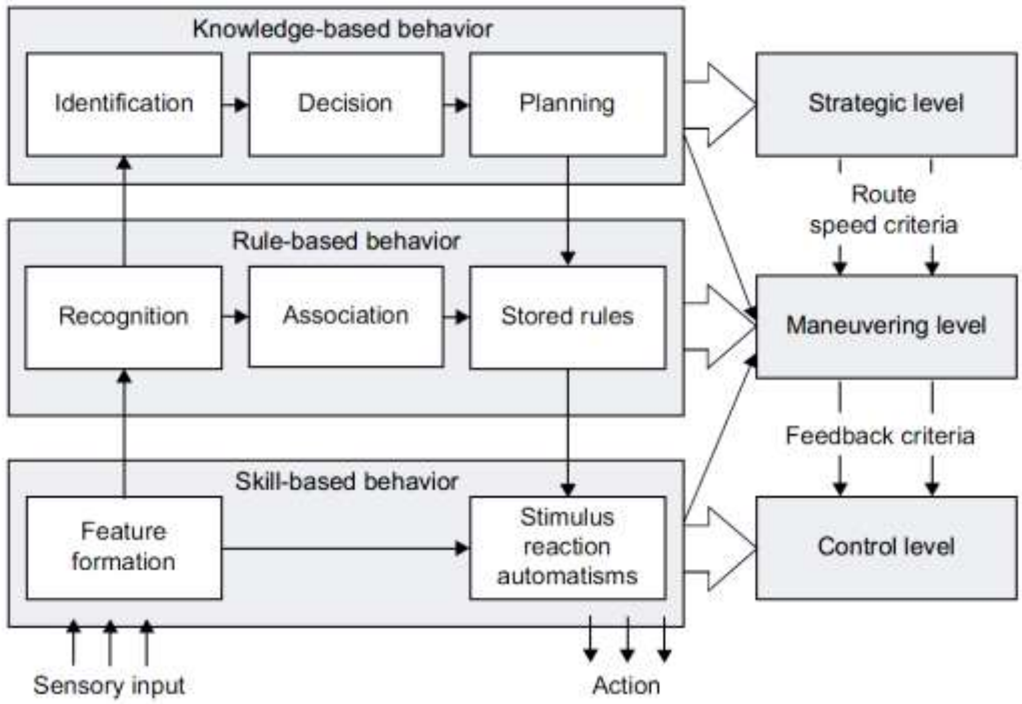

Figure 5. Hierarchical Model of Michon and Performance Levels according to Rasmussen. Source: Oppenheim and Shinar (2011) with kind permission of Elsevier

Mechanisms of self-regulatory driving behaviors are similar to general system of human behaviors and decisions that are studied by Michon and Rasmussen and many studies use Michon models for understanding and investigating self-regulatory behaviors of especially older drivers (Readt, & Ponjaert-Kristoffersen, 2000; Smiley, 2004; Meng, & Siren, 2012; Molnar et al., 2013). With respect to the decisions of the drivers, regulatory behaviors are also investigated by categorization. For example, avoiding complex traffic situations, avoiding driving in the dark, or avoiding driving in bad weathers are the examples of strategical compensation because these decisions are made before the trip and rely on higher functioning with the help of previous knowledge. Tactical compensations includes adaptive behaviors that are relevant in high mental or physical demanding situations such as speed adaptation or avoiding distractions in car (Raedt, & Pojaert-Kristoffersen, 2000; Molnar et al., 2013). Operational level is not included to the model of self-regulatory behaviors because the details of the behaviors are largely automated and consciousness manipulation of these behaviors is impossible (Molnar, 2013).

While strategical and tactical level of self-regulatory driving behaviors are the extension of Hierarchical Model of Michon, Eby and his collogues (2009) added new level to self-regulation mechanism named as life-goal level that is adapted from Keskinen's hierarchical model. According to Keskinen, this level is seen as highest control level of drivers and the behaviors and decisions in this level reflect person's way of life in general and in the specific traffic environments. They are stable, fundamental and guide the other behaviors of driver (Keskinen, & Hernetkoski, 2011). In self-regulation mechanism, parallel to original work this level includes driver's general motives and attitudes in life that affect their driving preferences and indirectly affects driving behaviors and involves decisions about where to live or drive what type of car (Eby et al., 2009; Molnar, 2013). In the previous works, generally life-style of young drivers were investigated like the study of Gregersen and Berg conducted in 1994, the researchers thought and decided that this factor was applicable for older drivers as well and life-goal level became a part of self-regulatory driving behaviors (Molnar, Eby, Roberts, Louis, & Langford, 2009).

After understanding self-regulatory driving behaviors, to place this concept in the model, the possible factors behind self-regulatory behavior should be investigated. Therefore, in the next section, previous studied findings about self-regulatory behaviors of older and younger drivers and the factors that are related to adoption of self-regulatory driving behaviors and driving avoidance will be presented for both old and young drivers.

1.4.2 Factors associated with Self-Regulatory Driving Behaviors

Due to the target group of self-regulatory driving behaviors is older drivers, findings are also mostly about older drivers avoiding behaviors. Before talking about why they modify their behavior, understanding how they modify their behaviors may be helpful.

Previous studies show that older drivers avoid the situations that are thought as more difficult and limit their exposure in these situations such as driving in rain, at night, in heavy traffic and at rush hours (Ball et al., 1997). In addition to them, parallel parking, driving on wet nights are found to be other avoided driving situations reported by older drivers (Baldock, Mathias, McLean, & Berndt, 2006; Charlton et al., 2006). These behaviors are mostly belonged to strategical level. In the study of Molnar and her colleagues, they also added tactical avoidance behaviors and they found that avoiding in-vehicle distraction such as avoiding using sell phone, reading a road map and personal grooming are the other behaviors that older drivers mostly avoid (Molnar et al., 2013). When gender of older adults is taken into account, it is seen that female drivers are more likely to be self-regulators than men are and with age, their self-regulatory behaviors increase (Chartlon et al., 2006). However, it is known that women are also more likely to cease driving than men and after specific age such as 65 finding female drivers to investigate their self-regulatory behaviors is difficult (Vance et al., 2006; Gwyther, & Holland, 2012)

Existing studies about younger drivers' avoidance behaviors and self-regulatory practices show that younger male drivers between the ages of 18 to 25 mostly avoid driving in bad weather and heavy traffic while the same age females avoid changing lane, turning right, driving on motorway, in bad weathers, in heavy traffic. The results proved that not only older females but also younger females reported more self-regulatory driving behaviors than males (Gwyther, & Holland, 2012). Even, in other study investigating all age group driver avoidance, it is found that younger women age between 18- 24, reported more driving avoidance in bad weather than any other age group included older drivers (Naumann, Dellinger, & Kresnow, 2011). However, it should be noted that more studies are needed in order to understand self-regulatory driving practices of younger drivers deeply.

Additional to age and gender, there are several individual factors that affect the drivers' self-regulatory practices in the literature. However, because of the literature is mostly about older drivers, the factors are also more related to older adults' characteristics. Still, literature findings give detailed information about the possible mechanism of driving self-regulation as well.

In the literature, as age related factors functional limitations, medical conditions, visual functions and cognitive functions are found to be related with driving avoidance and self-regulatory practices (Lyman, McGwin, & Sims, 2001). While there are mixed results about this individual factors, most studies found that chronic disease, physiological limitations, visual problems, attentional problems, and cognitive impairments are closely related to driving self-regulation among older drivers (Molnar, 2013, Charlton, et al., 2006; Vance et al,, 2006; Braitman, & Wiliams, 2011; Rapoport, et al., 2013; Ball et al., 1998; Donorfio, D'Ambrosio, Coughlin, & Mohyde, 2008; Sargent-Cox, Windsor, Walker, & Anstey, 2011). However, it should be noted that awareness about declines is critical for self-regulation. For example, individuals with severe cognitive impairments cannot be aware about their functioning therefore, they cannot regulate their behavior appropriately which lead to insignificant association between cognitive functioning and self-regulatory practices. (Devlin, & McGilivray).

In addition to awareness of functional abilities, awareness about driving abilities and driving confidence are other factors that are related to self-regulatory practices. Although, there is no correlation found between on-road driving abilities and self-regulatory behaviors, it is known that driving abilities and avoidance specific driving situations are closely related with each other, which prove that older drivers self-regulate their behaviors with respect to their driving abilities (Baldock, Mathias, McLean, & Berndt, 2006). In addition to them, driving confidence, which is closely related with, self-rated driving abilities also affect self-regulatory practices of drivers (Parker, MacDonald, Sutcliffe, & Rabbit, 2001; Marottoli, & Richardson, 1998; Baldock, Mathias, McLean, & Berndt, 2006; Charlton, et al., 2006). Although, like self-rating of driving abilities, majority of drivers reported being confident in majority of the driving situations, drivers with low confidence reported high avoidance for parallel parking, night driving and driving at night in the rain while drivers with high level of confidence reported low levels of avoidance. In addition to them, review of this findings support the idea that self-confidence is a good predictor of self-regulatory practices and avoidance behaviors more than cognitive declines (Baldock, Mathias, McLean, & Berndt, 2006; Charlton, et al., 2006; Devlin, & McGilivray, 2013; Charlton, Oxley, Fildes, Oxley, & Newstead, 2003).

In addition to these findings, previous crash numbers, traffic related stress, reduced travel needs, availability of second drivers, availability of public transport, being married, divorced or widowed, having active lifestyle and driving experience are the other factors that the studies found effects on avoidance and self-regulatory behaviors of especially older drivers (Charlton et al., 2006; Hakamies-Blomqwist, & Wahlström, 1998; Vance, et al., 2006; Braitman, & Wiliams, 2011). The literature findings about the factors that are related with self-regulatory driving behaviors are summarized in figure 6.

1.4.3 Summary of the Findings about Self-Regulatory Driving Behaviors

In this study, self-regulatory behaviors will be placed as mediator between distal and proximal context because these behaviors are adaptive strategies for the drivers when they feel unsafe or uncomfortable and older drivers' literature shows that drivers use these practices to compensate their age characteristics. Although, the previous studies about self-regulatory driving behaviors are mostly about older drivers, younger drivers may be also used these strategies to compensate their general characteristics that are related to their accident involvement rate. In order to place self-regulatory driving behaviors correctly, literature findings about the factors behind self-regulatory

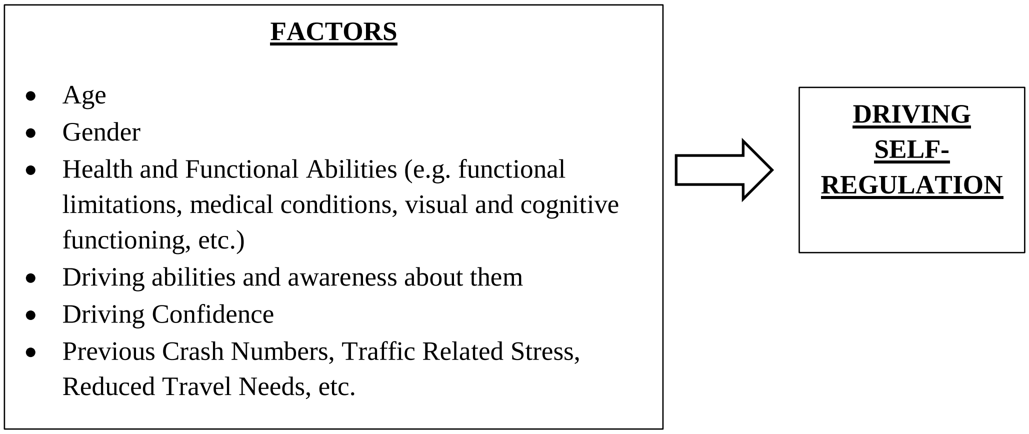

Figure 6. Summary of the Findings about Driving Self-Regulation

behaviors are discussed in the previous section. Although, type of self-regulatory driving behaviors and the factors related to self-regulatory behaviors are mostly generalized for older driver population, for this present study the information gives idea how to place this practices for younger driver model.

Literature findings about general characteristics of older and younger drivers and the possible underlying factors behind self-regulatory practices show that some similar factors that make easier to shape older and younger drivers behavioral mechanism that may be related to accident involvement rate. Therefore, with the combination of the information the model may be shaped as Figure 7.After this part, possible proximal factors that are directly related to accident involvement rate of older, younger drivers will be discussed, and after this part, all the information will be placed in the proposed model.

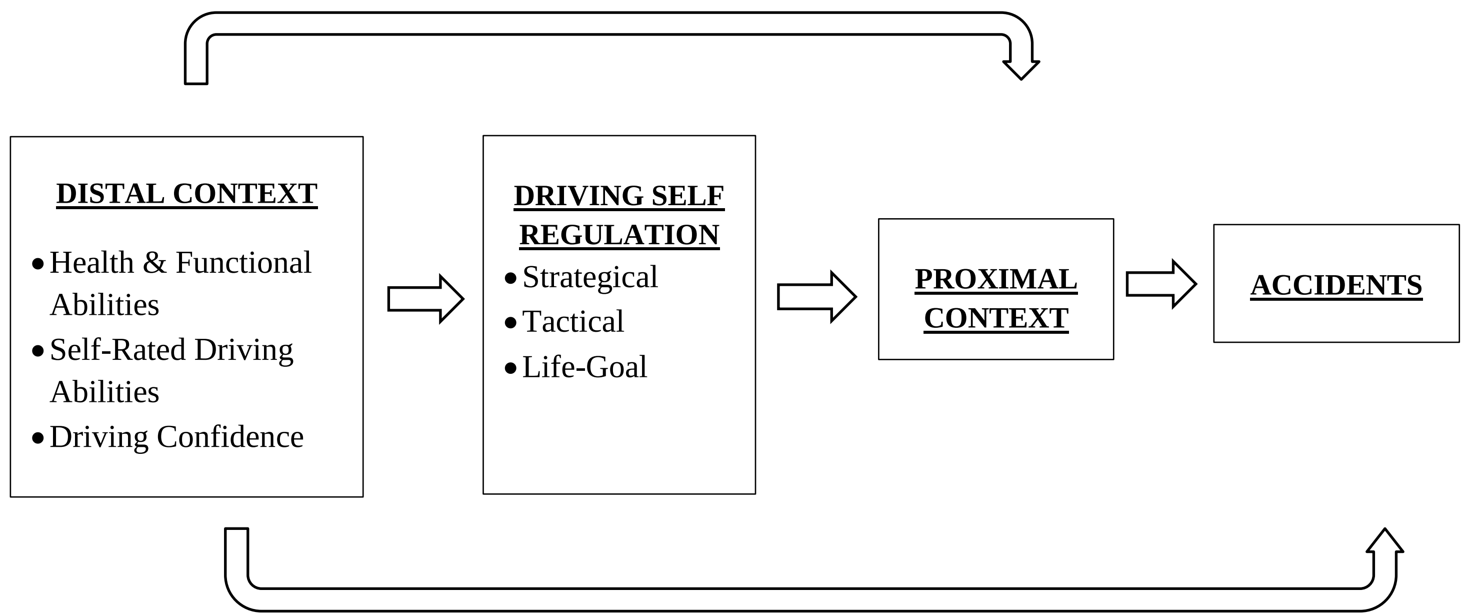

Figure 7. Driving Self-Regulatory Behaviors in the Proposed Model

1.5. Aberrant Driving Behaviors

In the first parts of this section, after stressing the importance of human factors on accident causation, it is stated that driver behaviors are seen as the primary cause of accidents. Therefore, similar to mediated model of Sümer, in this study driver behaviors are investigated as proximal factors because there are direct relationships between drivers' style and accident causations (Lajunen, 1997; Fell, & Freedman, 2001, Sümer,).

In reality, traffic accidents are rare events and finding any causal relationship needed systematic investigation and Reason's study (1990) about human risk behaviors give viable approach for understanding human behavior and accident causation (Aberg, & Rimmö, 1998). Reason investigated human behaviors by dividing them into two categories as violations and errors and with this idea to measure these two concept the Manchester Driver Behaviour Questionnaire was developed by Reason and his collogues (1990). According to Reason, there is a clear distinction about errors and violations and in their work violations are defined as 'deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system' and errors are defined as 'the failure of planned actions to achieve their intended consequences' (Reason et al., 1990; Lajunen, Parker, & Summala, 2004). According to this work, the clear distinction between violations and errors is relying on different mechanisms behind these two concepts. They proposed that violations are more related to social environment of the drivers and violations reflect choices, style and habits of the drivers, which can be categorized as intended actions. On the other hand, errors are more related to cognitive processes and performance limits of the drivers, which are unintended actions, and for examples while slips causes were presented as attentional failures, possible causes of lapses were stated as memory failures (Aberg, & Rimmo, 1998; Winter, & Dodou, 2010; Oppenheim, & Shinar, 2011).

After this main categorization, Lawton and his collogues added new items to DBQ scale and they divided violation category into two (1997). The violations that contain aggressive motivation behind them are named as aggressive violations and the other violations without aggressive motivations are named as ordinary violations (Lajunen, Parker, & Summala, 2004). After this addition, whereas there are some studies ended up with different categorization, aggressive violations, ordinary violations, errors and lapses factors has been broadly replicated and accepted with different target populations, different driving context, different traffic cultures and different environments internationally (Özkan, Lajunen, & Summala, 2006). Moreover, the meta-analysis of DBQ studies show that DBQ predicted accidents both prospectively and retrospectively with different constructs reflects the behaviors of drivers (Winter, & Dodou, 2010). Therefore, in this study, aberrant driver behaviors are used as proximal factors that may have direct effect on accident causation for old and young driver groups.

Since the study of Reason, there have been too much study that investigate driver behaviors and DBQ (Winter, & Dodou; 2010). The structure of DBQ, the relationship between DBQ and crash involvement, traffic offences, unsafe driving behaviors, aberrant driving behaviors of old, young drivers, motorcyclist, bus and truck drivers, DBQ, aggressive and criminal driving behaviors, the relationship between DBQ and occupational safety are some of the examples of the studies that may show the extend of aberrant driver behaviors' literature (Harrison, 2009). Although, there are too much studies about aberrant driving behaviors, there is no studies that investigate older and younger drivers accident liability with a framework that include aberrant driver behaviors.

The studies about older and younger drivers show that violations are more common in younger driver population while errors are more common in older driver population (Özkan, Lajunen, & Summala, 2006; Parker, McDonald, Rabbitt, & Sutcliffe, 2000). However, the underlying mechanism behind them is not investigated deeply. With this idea, putting aberrant driver behaviors in a contextual model that is developed by the literature findings about older and younger drivers both may be helpful to understand aberrant driving behaviors underlying factors and also may be beneficial to understand safe and unsafe acts of this age groups.

1.6 Framework of this Study

With the light of the information that is given in the previous part of this study, in this study older and younger drivers behavioral mechanisms are investigated separately with same constructs which were found as related with accident causation for understanding why they are listed as risky driving population in traffic. For systematic investigation, Contextual Mediated Model of Sümer (2003) is adapted for this study and proposed model was named as Contextual Model of Self-Regulatory Driving Practices.

Distal factors are determined by screening the characteristics of older and younger drivers, also self-regulatory driving literature findings were taken into account while deciding this specific factors. Health and functional abilities, self-rated driving abilities and driving confidence are found as the critical factors for older and younger drivers' behavioral mechanism that includes self-regulatory driving literature. Although, the previous studies (e.g. Parker et al., 2001; Molnar et al., 2009) were selected target groups as older drivers while studying these concepts by the way that are used in this study, literature findings about younger drivers support the idea that they might be studied for younger driver population as well. Therefore, this present study will be the first study that investigates younger drivers' health and functional abilities, self-rated driving abilities and driving confidence in one study. In addition to them, this study will be the first study that includes the comparison of older and younger drivers' health and functional abilities, self-rated driving abilities and driving confidence.

As it mentioned before, self-regulatory behaviors are proposed as the mediator of the proposed model between distal and proximal context with respect to the literature findings about older driver self-regulatory driving behaviors. Whereas, health and functional abilities, self-rated driving abilities and driving confidence are mentioned as related factors for self-regulatory behaviors, self-regulatory driving behaviors and aberrant driving behavior relation is not studied before in the scope of this study. The only study that was similar to this study is Rimmö and Hakamies-Blomqvist (2002) study and they investigated driving limitations and aberrant driving behaviors and did not find any relationship between self-imposed driving limitation and aberrant driving behaviors. Therefore, the examination of self-regulatory behavior and aberrant driving behaviors might give more detailed information about possible safety advance of self-regulatory behaviors in addition to them; the findings will give information about not only older drivers' behavioral mechanism but also younger drivers self-regulatory behaviors that have been not studied enough.

Lastly, aberrant driver behaviors are determined as proximal factors for this study. For understanding, safety benefits of self-regulatory driving behaviors' and the effects of the characteristics of older and younger drivers investigating aberrant driving behaviors might give detailed information to understanding the reason of accident liability of older and younger drivers retrospectively by investigating possible factors behind behavioral mechanism. In this study aberrant driver behaviors are placed as the last factor of the model and accidents are excluded with the reason of they are rare and measuring them is difficult. Therefore, aberrant driver behaviors are placed for understanding unsafe acts of older and younger drivers.

The final version of proposed model is presented in figure 8. Same model is used for understanding older and younger drivers behavioral mechanism for comparing these two groups behavioral trend, however, the mechanism and the factor structure of old and young drivers may found as different from each other because these two age groups dynamics and characteristic are different from each other as well.

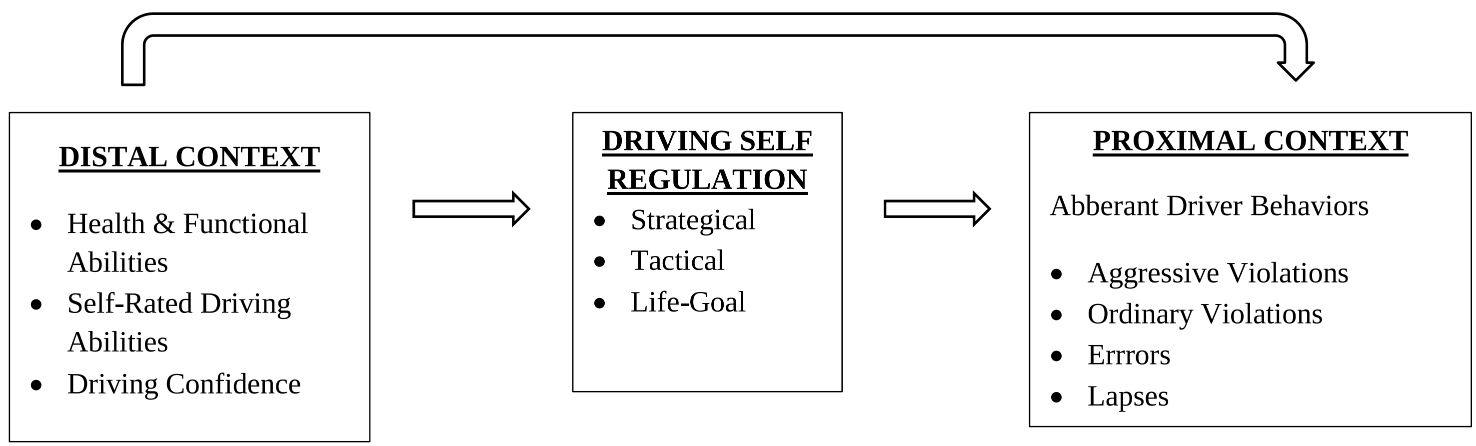

Figure 8. Proposed model of this present study

1.7 Aim of this Study

In general, the present study is aimed to investigate older and younger drivers' behavioral mechanism with the proposed model that includes the relationships between health and functional abilities, self-rated driving abilities, driving confidence and self-regulation self-regulatory driving practices; Self-regulatory driving practices and aberrant driving behaviors, and lastly health and functional abilities, self-rated driving abilities, driving confidence and aberrant driving behaviors.

More specifically, the study has the following objectives of:

- Investigating the differences between older and younger drivers by comparing the scores of health and functional abilities, self-rating driving abilities, driving confidence, self-regulatory driving behaviors and aberrant driver behaviors in order to examine the behavioral trend of older and younger drivers.
- Investigating the proposed contextual model of self-regulatory driving practices which includes health and functional abilities, self-rated driving abilities, driving confidence, self-regulatory driving behavior and aberrant driving behaviors.
    - Investigating the relationships between health and functional abilities, self-rated driving abilities, driving confidence and self-regulation self-regulatory driving practices; Self-regulatory driving practices and aberrant driving behaviors, and health and functional abilities, self-rated driving abilities, driving confidence and aberrant driving behaviors for old drivers.
    - Investigating the relationships between health and functional abilities, self-rated driving abilities, driving confidence and self-regulation self-regulatory driving practices; Self-regulatory driving practices and aberrant driving behaviors, and health and functional abilities, self-rated driving abilities, driving confidence and aberrant driving behaviors for young drivers.

    - Investigating the differences among older and younger drivers in terms of the possible paths between factors of the proposed model.
- Adaptation of Health and Functional Abilities for Safe Driving Scale, Self-Rated Driving Ability Scale, Driving Confidence Scale and Advanced Driving Decisions and Patterns of Travel Scale for young drivers and Turkish drivers by investigating their factor structure.

CHAPTER II

METHOD

2.1 Participants

The total number of the participants that completed the present study was 258 active male drivers living rural and urban areas of Ankara, İstanbul, İzmir and Balıkesir, Turkey. There were two groups as older and younger drivers. The number of the participants in each group was 120 older adults and 138 younger adults.

As a condition, older drivers' age range was determined as 60 to 75. It is known that cognitive impairments increases with age and more prominent especially for 75 and older (Lopez et al., 2003). Therefore, in order to eliminate severe age-related impairments effects on self-awareness, critical driving skills and self-regulatory mechanism, the upper age limit was set as 75 for older group. In addition to them, due to older female drivers mostly prefer driving restriction rather than self-regulation, like other countries finding active female older drivers was difficult in Turkey, therefore only older male drivers were included in this study (Vance et al., 2006; Gwyther, & Holland, 2012). Moreover, young drivers should had driving license at least 3 years ago and should been driving over 3000 km/h to participate this study. This condition was determined in order to eliminate possible developmental factor effects and eliminate inexperience effect. Furthermore, it is known that drivers should be cognitively mature in order to be able to self-regulate their behavior and at least 2 year of experience is needed for learners to use their cognitive resources appropriately (Keating, & Halpern-Felsher, 2008; Gregersen, & Bjurulf, 1995). Lastly, because of the mechanism of older and younger drivers were compared, after older male drivers selection, younger drivers were also selected as male in order to control gender effect on self-regulatory driving practices.

Older drivers age range was between 60 and 75 (*M* = 65.30, *SD* = 4.70) with a range of 8 – 57 years of driving experience (*M* = 33.68, *SD* = 9.14). The mean value of older adults' last year mileage was 9,847.05 km (*SD* = 16,466.62) and their lifetime mileage ranging from 4,000 to 3,000,000 km (*M* = 441,612.07, *SD* = 538,971.27). Last 3 years accident involvement number of older drivers were ranged from 0 to 9 (*M* = .59, *SD* = 1.21) with active accidents mean value was .25 (*SD* = .71) and passive accidents mean value was .35 (*SD* = .69).In addition to them, 105 of the older participants (87.5%) mostly drove passenger cars, and 15 of them (12.5%) preferred other type of cars. In terms of older drivers education level, one participant (.8%) had a doctorate degree, nine of the participants (7.5 %) had master degree, 37 of the participants (30.8%) had bachelor degree, 15 of the participants (12.5%) had associate degree, 22 of the participants (18.3%) graduated from high school, 14 of the participants graduated from secondary school and lastly, 22 of the participants (18.3%) graduated from primary school.

Age range of younger driver group was found to be 21 to 30 and the mean value of their age was 24.52 (*SD* = 2.42). The mean value of time that pass after getting driving license was 5.41 years (*SD* = 2.12) and the past year mileage of younger adults mean value was found as 13,709.19 (*SD* = 20,345.87). In addition to them, the lifetime mileage was ranging from 3000 to 2,000,000 (*M* = 72,819.33, *SD* = 196,773.05). Past 3 year accident involvement number of younger drivers were ranged between 0 and 10 (*M* = 1.78, *SD* = 1.90) and the mean of active accidents was .86 (*SD* = 1.17) and .87 (*SD* = 1.18) for passive accidents. Mostly younger adults drove passenger car and 134 drivers (97.1%) reported driving passenger car while 4 drivers (2.9 %) selected other option. Moreover, educational information screening showed that three of them (2.2%) had doctorate degree, 21 of them (15.2%) of them got master degree, 90 of them (65.2%) graduated from university, 16 (11.6%) of them had associate degree, seven of them

(5.1%) graduated from high school and lastly, one of them graduated from secondary school. The sample characteristics of older and younger drivers sample are presented in Table 1.1 and Table 1.2.

2.2 Data Collection Instruments

Participants received an informed consent form at the beginning of the survey package. (see Appendix A). Participant also took a demographic information form that was developed for getting information about participants' age, years of driving license, total mileage, past year mileage, last 3 years total, active and passive accident number, education level, place of residence, and car types. (see Appendix B). The scales that were used in the survey package are explained below:

2.2.1 Health and Functional Abilities for Safe Driving Scale

The items of the scale were a part of survey package and composed of 9 items. First three separate items commonly used in surveys and the rest of the items were originally developed by Molnar, Eby, Langford, Charlton, Louis and Roberts in 2013. Items that were related to current study were adapted and translated to Turkish by three researchers for this present study (see Appendix C). It measures self-ratings of health and functional abilities of the participants for safe driving (e.g. "How would you rate your overall health?"). The scale items are rated on a 7-point Likert scale (1 = Poor; 7 = Extremely Good).

2.2.2 Self-Rated Driving Ability Scale

The Self- Rated Driving Ability Scale was originally developed by Parker, Lorraine, Macdonald, Sutchliffe and Rabbit in 2001. It measures participants' own ability as in a range of driving situations and scale items were translated to Turkish by the researcher of this study and three of her colleagues. This scale was originally developed for older drivers but, in this study it was also used for assessing young drivers' self-rated driving ability. A sample item for the scale is "How would you rate your ability to read road signs." In total, this scale has 14 items with no reversed coded item (see Appendix D).

Table 1.1 *Sample Characteristics* (*N = 258*)

Demographic Variables	Frequencies/Percentages					
Driver Groups	Older Drivers		Younger Drivers		Total	
	N	%	N	%	N	%
Education						
Primary School	22	18.3%	0	0%	22	8.5%
Secondary School	14	11.7%	1	.7%	15	5.8%
High School	22	18.3%	7	5.1%	29	11.2%
Associate Degree	15	12.5%	16	11.6%	31	12%
Bachelor Degree	37	30.8%	90	65.2%	127	49.2%
Master Degree	9	7.5%	21	15.2%	30	11.6%
Doctorate Degree	1	.8%	3	2.2%	4	1.6%
Total	120	100%	138	100%	258	100%
City of Resistance						
Village	2	1.7%	0	0%	2	.8%
Small Town	1	.8%	1	.7%	2	.8%
District	21	17.5%	9	6.5%	30	11.6%
Small City	65	54.2%	11	8%	76	29.5%
Big City	31	25.8%	117	84.8%	148	57.4%
Total	120	100%	138	100%	258	100%
Type of Vehicle						
Passenger Car	105	87.5%	134	97.1%	239	92.6%
Other Type of Cars	15	12.5%	4	2.9%	19	7.4%
Total	120	100%	138	100%	258	100%

Table 1.2 *Sample Characteristics* (*N = 258*)

Demographic Variables	**Means**					
Driver Groups	**Older Driver**		**Younger Driver**		**Total Groups**	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age	65.30	4.70	24.52	2.42	43.49	20.70
Driver License Year	33.68	9.14	5.41	2.12	18.58	15.56
Last Year Mileage	9,847.05	16,466.62	13,709.19	20,345.87	11,923	18,716.27
Life Time Mileage	441,612.07	538,971.27	72,819.33	196,773.05	243,939.16	434,517.24
Last 3-year Accident Number	.59	1.21	1.78	1.9	1.23	1.72
Last 3- year Active Accident Number	.25	.71	.86	1.17	.57	1.03
Last 3-year Passive Accident Number	.35	.69	.87	1.18	.63	1.02

All items were rated 5-point response scale ranging from very poor to very good, and higher means indicate higher driving ability.

The Cronbach's alpha coefficient for this 5-item scale was found to be .91 in the original study and it was one factor in the original study (Parker et al., 2001). For this study before the main analyses, factor analyses was done for younger and older drivers separately and the Cronbach's alpha values of the factors was reported in the next parts of this study.

2.2.3 Driving Confidence Scale

In order to assess drivers' confidence level while driving, Driving Confidence Scale was used in this present study. It was composed of 12 items that were developed by Parker, Lorraine, Macdonald, Sutchliffe and Rabbit in 2001. The scale is five-point response scale (1 = Very Poor; 5 = Very Good) and "Not Applicable" was the sixth response option label. Sixth response option was designed to eliminate from the analyses participants with no experience of the situation listed. First seven items were related to nervousness level of the participants in a range of driving situation and further three items asked how relaxed, stress and confident participants usually felt while driving. Reverse item coding was necessary 9 of the 12 items of the scale. "When driving, how relaxed do you usually feel?", "When driving, how confident do you usually fell?" and "When you are driving and things happen quickly, giving you little time to thing, how calm do you remain?" items were not reversed coded. All items translated and adapted to Turkish by researcher of this present study and her three colleagues. (see Appendix E).

This scale gave an alpha coefficient of .87 in the original study of Parker, Macdonald, Sutcliffe, and Rabbit in 2001. In this present study, the factor structure was checked before the main analyses and with Cronbach's alpha scores were reported with respect to these analyses in the result part of this study.

2.2.4 Revised Version of Advanced Driving Decisions and Patterns of Travel Scale (ADDAPT)

ADDAPT was designed to measure reported self-regulation at multiple levels of driver performance and decision-making. It includes tactical, strategical and life-goals levels and developed by Molnar, Eby, Roberts, Louis and Langford in 2009. There were other parts of this survey package, but in this study only the main subscales that measure life-goal, tactical and strategical levels of driver self-regulation with yes/no options were included. Moreover, to get more information about participants' exposure changes, a part was included to this section and generally, they measure if the participant reduced driving during the past year, how and why they reduced their driving patterns. In total this scale has 25 items with 2 exposure items. All the items were answered with respect to Yes/No options (see Appendix F). The original survey package is computer based and English, for this study it was adapted as paper-pencil survey and it was translated to Turkish by the researcher and three of her colleagues.

In the original scale, life goal level of this scale examines drivers' lifestyles-related changes during the past year that could have an impact of their driving patterns. This level has 3 items that are related to moving to new location, purchasing new car and starting exercise program. At the strategical level, higher levels of decisions about driving (such as trip goals, route and risk analysis) were measured. In this part, there are 15 items measured participant's avoidance behavior at night, in bad weather, on busy roads, in unfamiliar areas, alone, at night in bad weather, during rush hour traffic, on the freeway and while making unprotected right turns and reversing. Moreover, participants were also asked whether they planned their route before trip, made a practice run, combined trips, and brought passenger for helping navigate. Lastly, tactical level has 7 items and it includes responses and maneuvers with respect to the conditions in traffic (such as gap acceptance, passing and turning). The questions of this level is about avoidance behavior various in-vehicle distractions while driving, including chatting with passengers, eating, reading a road map, changing radio stations, talking on a mobile phone, or personal grooming. Moreover, participants' were asked to compare their past and today vehicle distance between their car and the car ahead of them (Molnar, 2013).

In this present study, after doing simplification and adaptation from the original scale, factor structure analyses were done before the main analyses and new factor structure and reliability values were reported in the result section.

2.2.5 Driver Behavior Questionnaire (DBQ)

Driver Behavior Questionnaire was used to measure aberrant behaviors of drivers and it was originally developed by Reason, Manstead, Stradling, Baxter and Campbell in 1990. This questionnaire consists of 28 items and 4 subscales (aggressive violation, ordinary violation, errors, and lapses). It includes eight slips and lapses, eight errors, eight ordinary and four aggressive violations (see Appendix G). Participants were asked to indicate how often they committed each of the 28 behaviors in the previous year on a six-point scale (0 = Never; 5 = Nearly All the Time).

The Turkish translation and the factor structure of this scale have been validated by Lajunen and Özkan for non-professional drivers in 2004 and in this present study this Turkish version of DBQ was used to measure aberrant behaviors of old and young drivers. The reliability values of these subscales were reported as .81 for errors, .56 for lapses and slips, .86 for ordinary violation and .71 for aggressive violations (Lajunen, & Özkan, 2004).

In this present study, Cronbach's alpha values of subscales were reported as .72 for error, .73 for lapses and slips, .84 for ordinary violations, and. 71 for aggressive violations. When reliability analyses of older drivers' were calculated, error subscale alpha value was found .71, lapses and slips subscale was found .77, ordinary violation scale alpha value was found .78 and aggressive violation subscale alpha value was found. 65. Lastly, in terms of reliability analyses of young drivers' data, alpha value of error subscale was found as .73, alpha value of lapses and slips subscale was found as .70, alpha value of ordinary violation subscale was found as .82 and alpha value of aggressive violation subscale was found as .71.

2.3 Procedure

Prior to data collection, permission was taken from METU Human Subjects Ethics Committee (HSEC). As stated before, the data of this present study was collected from active drivers who have been living rural and urban areas of Ankara, İstanbul, İzmir and Balıkesir. The participants were involved in the study on a voluntary basis, and they were informed about the aim and the content of the study by the informed consent before the survey package application. Moreover, the participants were also informed that the data collected by this survey package would be used for a master thesis study.

The data of this present study was collected with two parts. Firstly, older drivers' data was collected and then younger drivers' data collection part started. The survey package including the demographic information questions, health and functional abilities for safe driving scale, self-rated driving ability scale, driving confidence scale, scale and driver behavior questionnaire were distributed to older and younger driver sample in the same order. The survey package administration for older driver sample was conducted by the researchers herself. Researcher collected data of older driver sample from İzmir, İstanbul and Balıkesir via snowball sampling procedure. Participant number was determined as minimum 89 for older (power = .95, α = .05, 5 predictors) and 89 for younger driver sample (power = .95, α = .05, 8 predictors) with effect size value as 0.15 for both of the groups. This analysis were done with respect to Power Analysis and sample size was calculated by G*Power statistical software (Faul, Erdfelder, Buncher, & Lang, 2009). The survey package was distributed to 200 active drivers age between 60 and 75 and 120 of them were returned (return rate of %60). After this phase end, younger drivers' data had been started to collected. Younger drivers' data were collected from Middle East Technical University and online survey via Internet.

Students of METU who completed the survey received bonus points for their final grades. 280 survey package sheets were distributed to drivers under the age of 30 and 138 of them were returned to researcher (return rate of %49.28). While 89 of the younger drivers were the students or the academicians of METU, 49 of them were filled the questionnaire via Internet.

All the data of this study were collected over a one and half month period, starting from 8 April and ending of May. Data collection procedure followed with respect to the ethical guidelines and name of the participants and personnel information were not been asked to the participants for anonymity, only participants signature was requested in order to indicate voluntary participation to the study.

CHAPTER III

RESULTS

In this chapter, results of the analyses are presented in six different parts. In the first part, data screening and cleaning procedure are described. In the second part descriptive information about the study variables are provided. In the third part, principal axis factoring analyses that showed factor structure of self-rated driving abilities, driving confidence and driving self-regulation measures are described due to the fact that the first application of Turkish sample of these scales. In the fourth part, descriptive statistics and bivariate correlations among variables are presented. In the firth part, model testing results for old and young drivers are provided. In the sixth part, results of hierarchical regressions are presented.

3.1 Data Screening and Cleaning

Prior to main analyses, data screening and cleaning procedure was done in order to enhance the accuracy and the quality of the data. Firstly, out of range values and inaccurate data entries were checked. Any out of range values were not be found and inaccurate data entries were corrected. After this procedure, missing values screening were done. The participants who have four or more missing values in any scales were excluded from the study and after this method, missing values were found to be less than 5% of all the participants on all variables. According to Tabachnick and Fidell (2006), if the missing values are less than 5% of all participants on all variables, all methods can be used to handle missing values. Therefore, in this study missing values were entered the further analyses as missing and pairwise deletion method was used in the main analyses. After missing values screening, univariate and multivariate outliers of old driver sample, univariate, and multivariate outliers of young driver sample were identified separately. One of the cases was deleted in older driver data that was both univariate and multivariate outlier based on Mahalonobis distance ($\chi^2 > 25.18$, $p < .005$). Except for this outlier, none of the cases was deleted in these two different data sets and further analyses were conducted with the remaining 119 older drivers and 138 younger drivers.

3.2 Factor Structures of the Scales Used

In this part, factor structures of Health and Functional Abilities for Safe Driving Scale, Self-Rating Driving Ability Scale, Driving Confidence Scale and Revised Version of Advanced Driving Decisions and Patterns of Travel Scale were tested in order to examine Turkish drivers sample factor loadings. Factor structure examinations of these scales were done separately for old and young sample in each scale in order to find the differences between cases.

3.2.1 Health and Functional Ability for Safe Driving Scale Factor Structure

This scale adapted from Parker, Lorraine, Macdonald, Sutchliffe study and for this study factor structure of nine items was tested for Turkish driver sample. Factor structure examination was done old and young driver sample, separately.

Older driver sample with 119 cases was tested by a principal axis factoring analysis (PFA) with promax rotation was performed and one factor was found according to Kaiser Criterion. Examination of scree plot also suggested one factor and it explained 46.46% of the variance. There were no cross loading items and values lower than .30 (see Table 2.1).

After older driver, factor structure examination, younger driver sample with 138 cases was tested. A PFA with promax rotation was performed. Results showed that according to Kaiser Criterion, three factors explained 52.07% of the variance. For the next step, examination of extraction eigenvalues and the scree plot was performed and both of them, suggested a two factor solution, therefore A PFA with promax rotation was run again by forcing the factor number as two with the cut-off values lower than .30. This analysis show that two factor solution explained 40.98% of the variance. After this step to confirm the two-factor solution, a parallel analysis (PA) which was developed by Lautensclager in 1989 was performed by using the RanEigen computer program and the PA suggested two factor solutions for young sample, as well. There were five items in the first factor and three items in the second factor. One item, which was "Your strength, flexibility, or general mobility", loaded to two factors; therefore, it was decided to drop this item.

First factors' content generally was about functioning therefore these five items' factor was named as functioning, it explained 29.42% of the variance, and Cronbach's alpha value was found to be .71. Second factor was generally about mobility and it was named as mobility. In addition to them, this three item factor explained 11.55% of the variance and the Cronbach's alpha value of this factor was .66. All the loading values of the items on factors, percent of the variance, eigenvalues and the reliabilities of the factors can be seen in Table 2.2.

3.2.2 Self-Rated Driving Ability Scale Factor Structure

In the Parker, Lorraine, Macdonald, Sutchliffe study the14 item Self-Rated Driving Ability Scale was made up of one factor. For this study, factor structure was also tested for Turkish old and young driver sample.

Firstly, older drivers sample consist of 119 cases was tested. A PFA with promax rotation was done on 14 items. According to Kaiser Criterion, two factors explain 47.73% of the variance. After that, examination of extraction eigenvalues and the scree plot the one factor solution were suggested. Therefore, by forcing the factor number as one, PFA was run again. With this analysis, one-factor solutions explained 42.07% of the variance. After this step to confirm the one factor solution, a PA was performed and the PA also suggested one factor solutions for young sample. After a cut-off .30 factor loadings, no items were needed to dropped, so the decision was made as one factor for this scale as the original for older drivers (see Table 3.1).

Table 2.1

Older driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 9 items of Health and Functional Ability for Safe Driving Scale (N = 119)

Items	**Factor 1**
8- Your strength, flexibility, or general mobility	.84
7- Your ability to concentrate on more than one thing at a time	.75
6- Your ability to remember things	.72
5- Your ability to see during the night	.68
4- Your ability to see during the day	.66
1- Your overall health	.66
3- Your ability to climb two flights of stairs	.66
9- Your ability to drive safely compared to other drivers your age	.57
2- Your ability to walk one kilometer	.49
Eigenvalues	4.18
Percent of explained variance	46.46%
Reliability	.87

Note. Factor loadings < .3 are suppressed.

Table 2.2

Younger driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 9 items of Health and Functional Ability for Safe Driving Scale (N = 138)

Items	**Factor 1[a]**	**Factor 2**
6- Your ability to remember things	.61	
7- Your ability to concentrate on more than one thing at a time	.69	
5- Your ability to see during the night	.47	
4- Your ability to see during the day	.40	
9- Your ability to drive safely compared to other drivers your age	.38	
2- Your ability to walk one kilometer		.77
3- Your ability to climb two flights of stairs		.74
1- Your overall health		.43
Eigenvalues	2.64	1.04
Percent of explained variance	29.42%	11.55%
Reliability	.71	.66

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1= Functioning, Factor 2= Mobility.

In the second step, factor structure for younger driver was checked. As older driver sample factor structure examination, a PFA with promax rotation was performed for 138 cases. Four factors were found with respect to the Kaiser Criterion and these four factors explain 53.36% of the variance in total. However, there were three factors that eigenvalues greater than one. Moreover, the scree plot and conceptual content of the items suggested a three-factor solution that was also supported by PA. Therefore, the

PFA was run again by forcing the number of factors three for young driver sample with a cut-off .30 factor loading. After this analysis, two items that are “To stay alert for long periods while driving” and “To recognize when your attention has wandered” did not load on any factor.

Seven factors were load to Factor 1 and this factor explained 33.81% of the variance. The content of this factor related to decision-making, response time, attention and judgment while driving, so it was named as Driving Cognitive Abilities. The second factor was consist of two factors and explained 7.94% of the variance. The items in this factor were related to route finding and route memory, therefore this factor was named as Navigation Abilities. Lastly, three items were loaded to factor 4 and 7.1% of the variance explained by it. The items generally were related to vision and it was named as Vision Abilities. In total, with three factors, 48.85% of the variance was obtained for young driver sample and the factor structure found different from old driver sample and the original study. All the loading values of the items on factors, percent of the variance, eigenvalues and the reliabilities of the factors can be seen in Table 3.2.

3.2.3 Driving Confidence Scale Factor Structure

This scale composed of 12 items and in the original study done by Parker, Lorraine, Macdonald, Sutchliffe it had one factor. In order to test Turkish sample factor structure PFA was performed separately for older driver sample and young driver sample.

Older driver driving confidence cases were tested via PFA with promax rotation. Kaiser Criterion showed up three factors. These three factors explained 59.43 of the total variance. However, it was observed that there were two factors that eigenvalues greater than one and scree plot also suggested a two factor solution for older drivers’ cases of this scale. Therefore, PFA with promax rotation was performed again by forcing the factor number as two.

Table 3.1

Older driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 14 items of Self-Rated Driving Ability Scale (N = 119)

Items	**Factor 1**
11- To recognize when your attention has wandered	.75
12- To judge the speed of oncoming traffic	.72
10- To stay alert for long periods while driving	.70
3- To notice vehicles, pedestrians, etc. out of the corner of your eye	.68
6- To make decisions quickly in traffic	.66
2- To judge gaps in traffic	.65
1- To read road signs	.65
14- To reverse park into confined space	.63
4- To see clearly in low light conditions	.63
5- To see clearly in bright light conditions	.61
13- To divide your attention between two tasks	.59
9- To follow a route travelled only once before, from memory	.58
7- To react quickly in traffic	.58
8- To navigate efficiently an unknown area	.56
Eigenvalues	5.89
Percent of explained variance	42.07%
Reliability	.90

Note. Factor loadings < .3 are suppressed.

Table 3.2

Young driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 14 items of Self-Rated Driving Ability Scale (N = 138)

Items	**Factor 1[a]**	**Factor 2**	**Factor 3**
7- To react quickly in traffic	.89		
6- To make decisions quickly in traffic	.84		
13- To divide your attention between two tasks	.71		
14- To reverse park into confined space	.70		
12- To judge the speed of oncoming traffic	.62		
2- To judge gaps in traffic	.42		
1- To read road signs	.34		
8- To navigate efficiently an unknown area		.95	
9- To follow a route travelled only once before, from memory		.78	
4- To see clearly in low light conditions			.83
5- To see clearly in bright light conditions			.82
3- To notice vehicles, pedestrians, etc. out of the corner of your eye			.32
Eigenvalues	4.73	1.11	.99
Percent of explained variance	33.81%	7.9%	7.1%
Reliability	.83	.84	.73

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1= Driving Cognitive Abilities, Factor 2= Navigation Abilities, Factor 3= Vision Abilities.

After this analysis, two factors explained 51.68% of the variance and PA was confirmed two factors solution as well. After suppressing the factor loadings value lower than .30, no item was dropped. Conceptually, driving confidence of older driver was separated as confidence negative feelings and positive feelings that revealed the confidence level in traffic settings. The first factor included nine items, it was named as negative feelings, and it explained 41.83% of the variance. In addition to them, the second factor was contained three items that was explained 9.8% of the variance and named as positive feelings. The loading values of the items on factors, percent of the variance, eigenvalues and the reliabilities of the factors for driving confidence questionnaire of older driver sample can be seen in Table 4.1.

After Turkish older driver driving confidence factor structure examination was obtained, younger drivers' were examined. A PFA with promax rotation was exposed to young drivers' cases. It was performed for the 138 cases on 12 items with the .30 cut-off values. This analysis showed that there were two factors and these two factors eigenvalues were greater than one. After that, scree plot and content examination were done and they were also suggested two factors. In addition to them, to confirm this two factor solution PA was applied and it was suggested two factors as well. In total, two factors explained 44.90% of the variance, and before named the factors cross-loading items screening was done and, "How nervous do you usually feel when driving in heavy traffic?" item was decided to be dropped. After that factors content was evaluated in order to be named them. The first factor explained 34.36% of the variance and it contained five items. The items were generally asked nervousness level of the participants in specific situations in traffic; therefore, this factor was named as situational confidence. The second factor was consisting of six items and it explained 10.54% of the variance. The content of this factor was broadly about general traffic situations and this factor was named as general confidence. The loading values of the items on factors, dropped item, percent of the variance, eigenvalues, and the reliabilities of the factors was revealed in Table 4.2.

3.2.4 Revised Version of Advanced Driving Decisions and Patterns of Travel Scale Factor Structure

The 25-item driving self-regulation questionnaire originally included three factors as life-goal, strategical and tactical. For this study, factor structure was also tested in order to be able to examine driving self-regulation dimensions of Turkish driver sample. Factor structure examination was done separately for old and young sample as the scales above to find the factor structure differences between groups.

A PFA with promax rotation was performed to examine self-regulation dimensions of 119 older driver cases and nine factors were found in total. The random initial eigenvalues compared with PA eigenvalues and this analysis suggested 2 factor solutions while extraction eigenvalues and screeplot suggested 3 factor solutions. Therefore, PFA with promax rotation was performed by forcing the number of factors to two and then by forcing to three. The two-factor solution explained 19.53% of the variance and the three-factor solution explained 23.17% of the variance. After this step, conceptual and factor loadings examination was done. Firstly, factor loadings of three factor solutions examined, with the cut-of .30 values, eight items were dropped. After this step, cross-loading items were screened and there were no cross loading item was found. Then, contents of the factors were evaluated with the rest of 17 items. It seemed that strategical level in the original scale was separated into two in Turkish older driver sample and tactical level was grouped like the original scale. Nine items were grouped as factor one and eight of them were in the strategical group in the original scale. This fist factor explained 14.11% of the variance and only the item “Do you now leave greater distances between your car and the car ahead of you than you used to?” was tactical item in this scale. In addition to them, its Cronbach’s alpha values found as .79. After, the first factor, the other factor was examined. This next factor explained 5.59% of the variance and the Cronbach’s alpha value was found as .56.

Table 4.1

Older driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 12 items of Driving Confidence Scale (N = 119)

Items	**Factor 1[a]**	**Factor 2**
4- How nervous do you usually feel when negotiating a large roundabout?	.84	
3- How nervous do you usually feel when negotiating a mini- roundabout?	.82	
1- How nervous do you usually feel when overtaking?	.82	
5- How nervous do you usually feel when joining a motorway?	.79	
2- How nervous do you usually feel when turning right?	.79	
6- How nervous do you usually feel when changing lanes on a motorway?	.74	
7- How nervous do you usually feel when driving in heavy traffic?	.57	
9- When driving, how stressed do you usually feel?	.52	
11-When you are driving and you are suddenly faced with a potentially dangerous situation how flustered do you become?	.44	
8- When driving how relaxed do you usually feel?		.83
10- When driving, how confident do you usually feel?		.65
12- When you are driving and things happen quickly, giving you little time to think, how calm do you remain?		.52
Eigenvalues	5.20	1.18
Percent of explained variance	41.83%	9.85%
Reliability	.90	.69

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1= Confidence Negative Feelings, Factor 2= Confidence Positive Feelings.

Table 4.2

Young driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 12 items of Driving Confidence Scale (N = 138)

Items	**Factor 1**[a]	**Factor 2**
4- How nervous do you usually feel when negotiating a large roundabout?	.87	
3- How nervous do you usually feel when negotiating a mini- roundabout?	.85	
5- How nervous do you usually feel when joining a motorway?	.70	
2- How nervous do you usually feel when turning right?	.70	
6- How nervous do you usually feel when changing lanes on a motorway?	.67	
8- When driving how relaxed do you usually feel?		.74
10- When driving, how confident do you usually feel?		.60
9- When driving, how stressed do you usually feel?		.59
12- When you are driving and things happen quickly, giving you little time to think, how calm do you remain?		.52
1- How nervous do you usually feel when overtaking?		.45
11- When you are driving and you are suddenly faced with a potentially dangerous situation how flustered do you become?		.33
Eigenvalues	4.12	1.26
Percent of explained variance	34.36%	10.54%
Reliability	.85	.72

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1= Situational Confidence, Factor 2= General Confidence.

Four items were tactical level items in the original scale and they grouped in the same factor as factor two after the analysis. In the last group, there were four items and it explained 3.45% of the variance. Three of them strategical level item and one of them was life-goal level item in the original study. However, this last factor's reliability was found as .13, therefore it was decided to run the whole analysis by forcing the factor number as two. Content of the factors made more sense in two-factor solution. Tactical and strategical level items were divided more clearly and the Cronbach's alpha values were more satisfied. Therefore, the decision was made as a two factor solution for older driver sample. Item loadings lower than .30 values, and cross loading items were dropped, These dropped items were "Do you usually make a practice run ahead of time to become familiar with your route?", "Do you usually plan your trip ahead of time, including writing down your route?", " Do you try to avoid reversing?", "During the past year, have you begun a regular exercise program or fitness routine?", "Do you reduce your overall travel by combining several trips into a single outing?", "Do you try to avoid driving on the freeway?", "At intersections where there is no right turn arrow, do you try to avoid making right turns across oncoming traffic?", "While driving, do you try to avoid reading a road map?", "During the past year, have you reduced the amount of driving you do in any way?", "While driving, do you try to avoid personal grooming?", "During the past year, have you moved to a new location?", "During the past year, have you bought a different car?". After excluded this low value items, there were 13 items left. First factor was included eight strategical self-regulatory behaviors and one tactical driving self-regulatory behavior; therefore, it was named as strategical level. The Cronbach's alpha value was .79 and it explained 14.05% of the variance. The other factor consisted of four tactical driving self-regulatory behaviors; therefore, it was named as tactical level. The loading values of the items on factors, dropped items percent of the variance, eigenvalues and the reliabilities of the factors for older driver sample can be seen in Table 5.1.

Table 5.1

Older driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 25 items of Revised Version of Advanced Driving Decisions and Patterns of Travel Scale (N = 119)

Items	**Factor 1[a]**	**Factor 2**
8- Do you try to avoid driving on busy roads?	.77	
12- Do you try to avoid driving in rush hour traffic?	.69	
7- Do you try to avoid driving in bad weather?	.677	
11- Do you try to avoid driving at night in bad weather?	.63	
5- Do you try to avoid driving at night?	.61	
9- Do you try to avoid driving in unfamiliar areas?	.52	
10- Do you avoid driving alone?	.39	
25- Do you bring along a passenger specifically to help you navigate?	.35	
24- Do you now leave greater distances between your car and the car ahead of you than you used to?	.31	
16- While driving, do you try to avoid eating?		.67
15- While driving, do you try to avoid chatting with passengers?		.57
19- While driving, do you try to avoid talking on a mobile phone?		.55
18- While driving, do you try to avoid changing the radio stations?		.37
Eigenvalues	3.51	1.37
Percent of explained variance	14.05%	5.48%
Reliability	.79	.56

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1=Strategical Level, Factor 2= Tactical Level.

For young driver sample, as older driver sample, PFA with promax rotation was performed on 25 items. According to Kaiser Criterion, nine factors explaining 43.04% of the variance were found. However, examination of extraction eigenvalues and the scree plot suggested the three-factor solution. Therefore, by forcing the factor number as three, a PFA was run again. With this analysis, three-factor solutions explained 24.36% of the variance. After this, to confirm the three-factor solution, PA was performed. The PA suggested three factor solutions for young sample, as well. After this step, factor loadings were examined and eight items were dropped because the values of these items were lower than .30 and cross loading items were excluded. There were 15 items left whole scale for young driver sample. In the next step, contents and the reliabilities of the factors for young driver sample were assessed. First factor mostly was formed by tactical level items in the original scale, six items were tactical self-regulatory behavior, and two items were strategical regulatory behavior. This factor was found to explain 13.77% of the variance and with respect to the reliability check; the Cronbach's alpha value was found. 71. In addition to this factor, as older driver sample strategical level of the original scale was divided as two factors. Second factor consisted of four items and it was explained 6.84% of the variance and Cronbach's alpha values was .76. The last factor explained 3.74% of the variance and included three items. Two items were originally strategical self-regulatory behavior and one item was tactical self-regulatory behavior. The Cronbach's alpha values were found to be .40. After these content and reliabilities check, it was decided to run the PFA analysis with promax rotation by forcing the factor number as two. The result was evaluated and the two factor solution made more sense with respect to the content and factor separation. Moreover, by forcing to 2 factors, cross loading items were not existed. On the other hand, nine items were dropped because of low values. These items were "Do you reduce your overall travel by combining several trips into a single outing?", "Do you usually plan your trip ahead of time, including writing down your route?", "Do you try to avoid driving at night?", "During the past year, have you reduced the amount of driving you do in any way?", "Do you avoid driving alone?", "Do you try to avoid driving in unfamiliar areas?", "During the past year, have you moved to a new location?", "During the past year, have you bought a different car?". With the left items, as older driver sample, young driver self-regulatory behaviors were also grouped as tactical and strategical. The first factor was tactical level and consisted of six tactical self-regulatory behaviors and three strategical self-regulatory behaviors. The Cronbach's alpha value was .73 of this level and it explained 13.59% of the variance. The second factor was strategical level and it included seven strategical self-regulatory behaviors. The Cronbach's alpha value was .76 and it was found that this factor explained 6.59% of the variance. All the factor loadings, percent of the variance, eigenvalues and the reliabilities of the factors for young drivers' self-regulatory behavior in traffic can be seen in table 5.2.

The possible reasons of dropped items in each scales item distributions and factor naming were discussed in the discussion section in detailed.

3.3 Descriptive Statistics and Bivariate Correlations

3.3.1 Bivariate Correlations between Study Variables of Older Drivers

Means, standard deviations, number of items and the correlation matrix were calculated separately for older and younger driver groups. Older drivers sample descriptive statistics and the correlation matrix of study variables is presented in Table 6.1. and younger driver group descriptive statistic and the correlation matrix is presented in Table 6.2.

The bivariate correlations between study's variables were examined for older driver sample. Firstly, significant relationships of demographic variables were tested.

Table 5.2

Young driver sample - factor loadings based on principal axis factoring analysis with promax rotation for 25 items of Revised Version of Advanced Driving Decisions and Patterns of Travel Scale (N = 138)

Items	**Factor 1[a]**	**Factor 2**
19- While driving, do you try to avoid talking on a mobile phone?	.69	
16- While driving, do you try to avoid eating?	.64	
18- While driving, do you try to avoid changing the radio stations?	.53	
22- Do you usually make a practice run ahead of time to become familiar with your route?	.47	
15- While driving, do you try to avoid chatting with passengers?	.44	
17- While driving, do you try to avoid reading a road map?	.43	
6- At intersections where there is no right turn arrow, do you try to avoid making right turns across oncoming traffic?	.41	
20- While driving, do you try to avoid personal grooming?	.40	
25- Do you bring along a passenger specifically to help you navigate?	.39	
8- Do you try to avoid driving on busy roads?		.75
12-Do you try to avoid driving in rush hour traffic?		.64
9- Do you try to avoid driving in unfamiliar areas?		.57
11- Do you try to avoid driving at night in bad weather?		.46
14- Do you try to avoid reversing?		.45
Eigenvalues	3.40	1.65
Percent of explained variance	13.59%	6.59%
Reliability	.73	.76

Note. Factor loadings < .3 are suppressed. [a] Factor labels. Factor 1=Tactical Level, Factor 2= Strategical Level

The examination of age and the main study variables relationship showed that age was positively related to tactical self-regulatory behavior (r = .22, p < .05) and negatively related to ordinary violation (r = -.27, p < .01). After age, last 3 year accident involvement scores were examined, and it was found that last 3 year accident involvement scores were positively correlated with positive feelings of confidence (r = .23, p < .01) and positively correlated with errors while driving (r =. 20, p < .05). When significant correlates of last year mileage was examined, it was found that last year mileage was positively related to self-rated ability (r = .26, p< .01) and negative feelings of confidence (r = .24, p< .01). Moreover, last year mileage was negatively related to strategical self-regulatory driving behaviors (r = -.27, p < .01) and lapses (r = -.21, p < .05).

After demographic variables, health and functional abilities were examined. It was found that health and functional abilities were positively related to self-rated abilities (r = .56, p < .01) and negatively related to strategical self-regulatory driving behaviors (r = -.38, p < .01), ordinary violations (r = -.22, p < .05), errors (r = -.34, p < .01), and lapses (r = -.48, p < .01).

The relationships between self-rated abilities and confidence related factors showed that self-rated abilities were positively related to negative feelings of confidence (r = .47, p < .01), and positively related to positive feelings of confidence (r = .42, p < .01). Moreover, there were negative relationships between health and functional abilities and strategical self-regulatory driving behaviors (r = -.53, p < .01). In addition to them, negative correlations were found between health and functional abilities and aggressive violation (r = -.24, p < .01), ordinary violation (r = -.28, p < .01), error (r = -.45, p < .01), and lapses (r = -.56, p < .01).

The relationship among confidence related factors were examined and negative feelings of confidence was positively related to positive feelings of driving confidence (r = .31, p < .01). When the associations between confidence related variables and driving self-regulatory behaviors were tested, it was found that negative feelings of driving confidence negatively related to strategical self-regulatory behavior (r = -.40, p < .01), and positive feelings of driving confidence were also negatively related to strategical self-regulatory behaviors (r = -.32, p < .01). After this step, confidence related factors and DBQ subscales relationships were assessed and negative feelings of driving confidence were negatively related to ordinary violation (r = -.24, p< .01), error (r = -.44, p < .01), and lapses (r = -.48, p < .01), while positive feelings of driving confidence negatively related to error (r= -.21, p < .05), and lapses (r = -.25, p < .01) scores of older drivers.

The relationships between self-regulatory behavior and DBQ subscales were also examined, it was found that strategical self-regulation behaviors were positively related to error (r = .30, p < .01)and lapses scores (r = .42, p < .01). In addition to them, tactical self-regulatory driving behavior was negatively related to ordinary violation scores of older drivers (r = -.23, p < .01).

Lastly, the associations among DBQ subscales were investigated. Aggressive violations were positively correlated with ordinary violations (r = .47, p < .01), error (r = .38, p < .01), and lapses (r = .31, p < .01). Ordinary violations positively correlated with error (r = 52, p < .01) and lapses (r = .56, p < .01) and errors were positively correlated with lapses (r = .70, p < .01).

3.3.1 Bivariate Correlations between Study Variables of Younger Drivers

For young drivers bivariate correlations were also examined. When the demographic variables were examined, age was positively related to last year mileage (r = .20, p < .05). Last 3 year accident involvement was positively correlated with lapses scores (r = .27, p < .01). Last year mileage was positively correlated with functioning factor of health and functional abilities (r = .16, p < .05). In addition to them there was negative relationship between last year mileage and driving cognitive abilities (r = -.27, p < .01), and positive relationship between last year mileage and navigation abilities subscale of self-rated ability scale (r = .19, p < .05). When last year mileage and confidence subscales associations was tested, it was found that last year mileage and situational driving confidence positively correlated with each other (r = .18, p < .05). Last year mileage was also negatively related with tactical self-regulatory driving behavior (r = -.28, p < .01). It is found that last year mileage was positively related to aggressive violation (r = .20, p < .05) and ordinary violation scores of young drivers(r = .27, p < .01).

The relationship among health and functional abilities subscales were examined, and functioning was found positively correlated with mobility (r = .27, p < .01). After the associations between health and functional abilities subscales and self-rated abilities were tested. Functioning was positively related to driving cognitive abilities (r = .49, p < .01), navigation abilities (r = .34, p < .01), and vision abilities (r = .60, p < .01). Also, it was found that mobility was also positively correlated with driving cognitive abilities(r = .20, p < .01), and vision abilities (r = .37, p < .01). The examination of health and functional abilities subscales and confidence related factors showed that functioning was positively correlated with situational driving confidence (r = .32, p < .01), and general driving confidence (r = .32, p < .01). Moreover, in terms of self-regulatory behaviors, functioning was also negatively related to strategical driving self-regulatory behaviors (r = -.33, p < .01). After testing the association of health and functional abilities factors and DBQ subscales, it was found that functioning was negatively related with error(r = -.28, p < .01), and lapses scores (r = -.41, p < .01), and mobility was negatively correlated with ordinary violations (r = -.10, p < .05), errors (r = -.18, p < .05), and lapses scores of young drivers (r = -.21, p < .05).

The relationships among self-rated driving abilities were assessed. It was found that driving cognitive abilities were positively related to navigation abilities (r = .36, p < .01), and vision abilities (r = *.47*, p < .01), and navigation abilities was also positively correlated with vision abilities (r = *.31*, $p < .01$). Driving cognitive abilities was positively related to situational driving confidence (r = *.50*, $p < .01$) and general driving confidence (r = *.58*, $p < .01$). Furthermore, vision abilities was also positively correlated with general driving confidence (r = *.35*, $p < .01$). The examination of self-rated abilities and driving self-regulatory behaviors showed that driving cognitive abilities were negatively related to tactical self-regulatory driving behaviors (r = *-.33*, $p < .01$) and strategical self-regulatory behaviors (r = *-.45*, $p < .01$). There were negative relation between navigation abilities and strategical self-regulatory driving behaviors (r = *-24*, $p < .01$). Negative relationships were also found between vision abilities and tactical self-regulation (r = *-.16*, $p < .05$), also vision abilities and strategical self-regulation (r = *-.19*, $p < .05$). Self-rated abilities and DBQ subscales associations were also examined. Driving cognitive abilities was negatively related to error (r = *-.31*, $p < .01$), and lapses scores (r = *-.38*, $p < .01$). Similarly, vision abilities were negatively correlated with error (r = *-.24*, $p < .01$), and lapses scores of young drivers (r = *-.29*, $p < .01$).

The associations of confidence related factors were also examined. Situational driving confidence was found positively correlated with general driving confidence (r = *.41*, $p < .01$). After that confidence related factors and self-regulatory behaviors relations were checked and situational confidence was found negatively correlated with strategical driving self-regulatory behaviors (r = *-.40*, $p < .01$). General driving confidence was negatively related to both tactical self-regulation (r = *-.30*, $p < .01$), and strategical self-regulation (r = *-.52*, $p < .01$). Moreover, confidence related factors and DBQ subscales associations were also tested and situational driving confidence found negatively correlated with error (r = *-.37*, $p < .01$) and lapses scores (r = *-.46*, $p < .01$). General driving confidence was also found negatively related with error (r = *-.26*, $p < .01$) and lapses scores of young drivers (r = *-.31*, $p < .01$).

The relationship among self-regulatory driving behaviors was checked. Tactical self-regulatory behaviors was positively correlated with strategical self-regulation ($r = .29$, $p < .01$). Then, driving self-regulatory behaviors factors and DBQ subscales associations was checked. Tactical self-regulation was negatively related to aggressive violation ($r = -.30$, $p < .01$), ordinary violation ($r = -.52$, $p < .01$), and error($r = -.19$, $p < .05$) while strategical self-regulation was positively correlated with error ($r = .23$, $p < .01$) and lapses ($r = .35$, $p < .01$).

Lastly, the correlation among DBQ subscales was assessed. There were positive relationship between aggressive violation and ordinary violation ($r = .63$, $p < .01$), and between aggressive violation and error ($r = .34$, $p < .01$). In addition to them, the positive correlation was found between ordinary violation and error ($r = .48$, $p < .01$), and ordinary violation and lapses ($r = .32$, $p < .01$). In addition to them, it was found that error and lapses were positively correlated with each other ($r = .66$, $p < .01$).

3.4 Main Analyses

3.4.1 Comparison of Old and Young Drivers on Main Study Variables

3.4.1.1 Comparison of Old and Young Drivers on Number of Accidents

The first comparison was done for last 3 year number of accidents of old and young drivers by controlling last year mileage of the participants. A one-way analysis of covariance (ANCOVA) between subjects was run to check differences. According to result, the covariate, last year mileage was not significantly related to last 3 year accident numbers. After adjustment of last year mileage, the last 3 year accidents numbers of older and younger drivers were significantly different from each other ($F(1, 249) = 31.58$, $p < .01$, $\eta^2 = .11$). It was found that younger drivers (*adjusted M* = .60, *SD* = 1.91) significantly experienced more accidents in last 3 years than older ones (*adjusted M* = 1.77, *SD* = 1.23).

Table 6.1 *Correlations, Means and Standard Deviations of Older Driver Study Variables*

Variables	N	#Items	1	2	3	4	5	6	7
1.Age	119	-	-						
2. Last 3 Year Accidents	119	-	-.10	-					
3. Last Year Mileage	116	-	-.15	.11	-				
4. H1_Health&Funct	119	9	-.59	.06	.11	-			
5. S1_SelfRatedAb	119	14	-.17	.03	.26**	.56**	-		
6. C1_NegativeF	119	9	.00	-.01	.24**	.13	.47**.	-	
7. C2_PositiveF	119	3	-.13	.23**	.15	.11	.42**	.31**	-
8. R1_Strategical	119	9	.04	-.07	-.27**	-.38**	-.53**	-.40**	-.32**
9. R2_Tactical	119	4	.22*	.08	-.02	-.17	-.18	.00	.04
10. AggressiveVio	119	4	-.09	.12	-.03	-.10	-.24**	-.10	-.17
11. OrdinaryVio	119	8	-.27**	.08	-.04	-.22*	-.28**	-.24**	-.09
12. Error	119	8	-.60	.20*	-.17	-.34**	-.45**	-.44**	-.21*
13. Lapses	119	8	-.00	.10	-.21*	-.48**	-.56**	-.48**	-.25**
		M =	65.34	.60	9,923.32	5.20	3.64	3.87	3.53
		SD =	4.69	1.21	16,517.29	1.10	.62	.78	.67

** Correlation significant at the .05 level (2-Tailed). **Correlation significant at the .01 level (2-Tailed).*

Note: H1_Health&Funct= Health and Functional Abilities. S1_SelfRatedAb= Self-Rated Driving Abilities. C1_NegativeF= Negative Feelings of Confidence. C2_PositiveF= Positive Feelings of Confidence. R1_Strategical= Strategical Self-Regulation. R2_Tactical= Tactical Self-Regulation.

Table 6.1 (continued)

Variables	N	#Items	8	9	10	11	12	13
8. R1_Strategical	119	9	-					
9. R2_Tactical	119	4	.14	-				
10. AggresiveVio	119	4	.12	-.15	-			
11. OrdinaryVio	119	8	.16	-.23**	.47**	-		
12. Error	119	8	.30**	-.00	.38**	.52**	-	
13. Lapses	119	8	.42**	.03	.31**	.56**	.70**	-
		***M* =**	.52	.75	.76	.47	.56	.61
		***SD* =**	.28	.25	.70	.50	.51	.50

** Correlation significant at the .05 level (2-Tailed). **Correlation significant at the .01 level (2-Tailed).*

Note: H1_Health&Funct= Health and Functional Abilities. S1_SelfRatedAb= Self-Rated Driving Abilities. C1_NegativeF= Negative Feelings of Confidence. C2_PositiveF= Positive Feelings of Confidence. R1_Strategical= Strategical Self-Regulation. R2_Tactical= Tactical Self-Regulation.

Table 6.2 *Correlations, Means and Standard Deviations of Younger Driver Study Variables*

Variables	N	#Items	1	2	3	4	5	6	7
1.Age	138	-	-						
2. Last 3 Year Accidents	138	-	-.11	-					
3. Last Year Mileage	136	-	.20*	.02					
4. H1_Functioning	138	5	.07	-.07	.16*	-			
5. H2_Mobility	138	3	-.11	-.01	-.104	.27**	-		
6. S1_Driving CogAb	138	7	.02	-.05	-.27**	.49**	.20*	-	
7- S2_NavigationAb	138	2	.08	-.03	.19*	.34**	.02	.36**	-
8- S3_VisionAb	138	3	.00	-.08	.09	.60**	.37**	.47**	.31**
9. C1_SituationalCon	138	5	.05	-.06	.18*	.32**	.11	.50**	.13
10. C2_GeneralConf	138	6	-.00	-.12	.16	.32**	.12	.58**	.27
11. R1_Tactical	138	9	.05	-.06	-.28**	-.12	-.01	-.33**	-.15
12. R2_Strategical	138	7	-.07	-.00	-.23	-.33**	-.09	-.45**	-.24**
13. AggresiveVio	138	4	.01	.15	.20*	.08	-.11	.20*	.04
14. OrdinaryVio	138	8	-.02	.10	.27**	-.09	-.10*	.07	.00
15. Error	138	8	-.04-	.10.	.08	-.28**	-.18*	-.31**	-.04
16. Lapses	138	8	-.14	.27**	-.03	-.41**	-.21*	-.38**	-.15
		***M* =**	24.52	1.78	13,709.19	5.82	6.23	4.12	3.76
		***SD* =**	2.42	1.90	20,345.87	.82	.75	.61	1.00

Table 6.2 (continued)

Variables	N	#Items	8	9	10	11	12	13	14	15	16
8- S3_VisionAb	138	3	-								
9. C1_SituationalCon	138	5	.27	-							
10. C2_GeneralConf	138	6	.35**	.41**	-						
11. R1_Tactical	138	9	-.16*	-.12	-.30**	-					
12. R2_Strategical	138	7	-.19*	-.40**	-.52**	.29**	-				
13. AggresiveVio	138	4	-.03	.04	.02	-.30**	-.04	-			
14. OrdinaryVio	138	8	-.15	.03	.10	-.52**	-.08	.63**	-		
15. Error	138	8	-.24**	-.37**	-.26**	-.19*	.23**	.34**	.48**	-	
16. Lapses	138	8	-.29**	-.46**	-.31**	-.13	.35**	.156	.32**	.66**	-
		M =	3.76	4.38	3.80	.45	.29	1.43	1.12	.68	.72
		SD =	.71	.67	.57	.24	.27	1.07	.75	.57	.48

** Correlation significant at the .05 level (2-Tailed). **Correlation significant at the .01 level (2-Tailed).*

Note: H1_Functioning = Functioning. H2_Mobility= Mobility.. C1_SituationalCon= Situational Confidence. S1_Driving CogAb= Driving Cognitive Abilities. S2_NavigationAb= Navigation Abilities. S3_VisionAb= Vision Abilities. C1_SituationalCon= Situational Confidence. C2_GenaralConf= General Confidence. R1_Strategical= Strategical Self-Regulation. R2_Tactical= Tactical Self-Regulation.

3.4.1.2 Comparison of Old and Young Drivers on Health and Functional Abilities for Safe Driving Scale

The comparison of old and young driver groups on health and functional abilities was done for each items separately because of these two groups' factor structures were found different in the previous analysis. The effect of group differences on health and functional items was checked by one- way ANCOVA. The covariate was last year mileage and all the analyses were run by controlling the effect of last year mileage while examining group effect on each item.

In general, the analysis results were in the same direction for health and functional abilities. The analyses of item 1 (Your overall health), item 2 (Your ability to walk one kilometer), item 3 (Your ability to climb two flights of stairs), item 4 (Your ability to see during the day), item 5 (Your ability to see during the night), item 6 (Your ability to remember things), item 7 (Your ability to concentrate on more than one thing at a time), and item 8 (Your strength, flexibility, or general mobility) showed that group differences significantly affected the ratings of these items, separately. For these items, it was found that younger drivers' ratings were significantly higher than older drivers'. Only the last item (item 9), your ability to drive safely compared to other drivers your age, was not significantly related to group differences after controlling last year mileage of the participants. All the analysis results of this part are presented in table 7.

3.4.1.3 Comparison of Old and Young Drivers on Self-Rated Driving Abilities Scale

A one-way ANCOVA analysis between subject was done for measuring group differences effect on self-rated driving ability items by controlling last year mileage of the participants. Analyses were done separately for each item to test group differences effect on self-rated abilities. In general, the results showed that group differences had significant effect on self-rated abilities items. Examination of item 1 (To read road signs), item 2 (To judge gaps in traffic), item 3 (To notice vehicles, pedestrians, etc. out of the corner of your eye), item 4 (To see clearly in low light conditions), item 6 (To make decisions quickly in traffic), item 7 (To react quickly in traffic), item 8 (To navigate efficiently an unknown area), item 9 (To follow a route travelled only once before, from memory), item 10 (To stay alert for long periods while driving), item 12 (To judge the speed of oncoming traffic), item 13 (To divide your attention between two tasks) showed significant group differences and the differences were in the same direction. For these items, the significant effects were found as younger drivers' ratings were higher than older drivers'.

Table 7

Analysis of Covariance Summary- Comparison of Old and Young Drivers on Health and Functional Abilities for Safe Driving Items

Source	*Old Drivers Mean*	*Young Drivers Mean*	*F*	*Partial Eta Squared*
1- Your overall health	5.53	6.04	15.25**	.05
2- Your ability to walk one kilometer	5.84	6.29	8.11**	.03
3- Your ability to climb two flights of stairs	4.33	6.34	99.80**	.28
4- Your ability to see during the day	5.65	6.30	20.15**	.07
5- Your ability to see during the night	4.87	5.50	10.80**	.04
6- Your ability to remember things	5.10	5.65	9.35**	.03
7- Your ability to concentrate on more than one thing at a time	4.28	5.54	31.92**	.11
8- Your strength, flexibility, or general mobility	5.03	5.83	25.57**	.09
9- Your ability to drive safely compared to other drivers your age	6.06	6.04	.02	.00

Note. * p<.05; ** p<.01. *Adjusted mean scores are used.*

The analyses results also showed that there were no significant effects of group differences on ratings of item 5 (To see clearly in bright light conditions), item 11 (To recognize when your attention has wandered), and item 14 (To reverse park into confined space) after controlling the effect of last year mileage of the participants. All the values and results can be seen in table 8.

3.4.1.4 Comparison of Old and Young Drivers on Driving Confidence Scale

Driving confidence scale items were also examined for testing the effect of group differences after controlling last year mileage of the participants. One-way ANCOVA between subject was used to test the effect.

In this scale, there were nine reversed items and after rotated them, higher ratings mean higher confidence level independent of direction of the questions. According to result, the items that are item 2 (How nervous do you usually feel when turning right?), item 3 (How nervous do you usually feel when negotiating a mini- roundabout?), item 5 (How nervous do you usually feel when joining a motorway?), item 6 (How nervous do you usually feel when changing lanes on a motorway?), item 8 (When driving how relaxed do you usually feel?), item 10 (When driving, how confident do you usually feel?), and item 12 (When you are driving and things happen quickly, giving you little time to think, how calm do you remain?) ratings were significantly affected by group differences after controlling the effect of last year mileage of the participants. For these items, younger participants driving confidence level was found significantly higher than older participants' driving confidence level.

There were no significant effect of group differences found for item 1 (How nervous do you usually feel when overtaking?), item 4 (How nervous do you usually feel when negotiating a large roundabout?), item 7 (How nervous do you usually feel when driving in heavy traffic?), item 9 (When driving, how stressed do you usually feel?), item 11 (When you are driving and you are suddenly faced with a potentially dangerous situation how flustered do you become?). All the values and results can be seen in table 9.

3.4.1.5 Comparison of Old and Young Drivers on Driving Self- Regulation Scale

Old and young driver samples were also examined to test the differences of driving self-regulatory behaviors items. There were 2 answer options as Yes/No for all the items in this scale, therefore to test the group differences Chi-Square analyses was performed. Older and younger drivers Yes/ No answers counts, and chi square values for all the items are displayed in table 10.

The results showed that the differences in proportions for old and young drivers are significant for most of the items. The people who answer Yes to each item means for this item, the participants adapt self-regulatory behavior. The comparison of groups on item 1 (During the past year, have you moved to a new location?), item 2 (During the past year, have you begun a regular exercise program or fitness routine?), item 3 (During the past year, have you bought a different car?), and item 25 (Do you bring along a passenger specifically to help you navigate?) showed that Yes and No choices of the age group were significantly different from each other. When the proportions of the choices were assessed it was found that young drivers gave more yes answer to these questions than older drivers. It means that younger drivers adapted these self-regulatory behaviors more than older drivers. The significant differences between age groups were also found for item 4 (During the past year, have you reduced the amount of driving you do in any way?), item 5 (Do you try to avoid driving at night?), item 6 (At intersections where there is no right turn arrow, do you try to avoid making right turns across oncoming traffic?), item 7 (Do you try to avoid driving in bad weather?), item 8 (Do you try to avoid driving on busy roads?), item 9 (Do you try to avoid driving in unfamiliar areas?), item 10 (Do you avoid driving alone?), item 11 (Do you try to avoid driving at night in bad weather?), item 12 (Do you try to avoid driving in rush hour traffic?), item 13 (Do you try to avoid driving on the freeway?),

Table 8

Analysis of Covariance Summary- Comparison of Old and Young Drivers on Self-Rated Driving Abilities Items

Source	*Old Drivers Mean*	*Young Drivers Mean*	*F*	*Partial Eta Squared*
1- To read road signs	4.07	4.33	7.40**	.02
2- To judge gaps in traffic	3.64	4.06	13.63**	.05
3- To notice vehicles, pedestrians, etc. out of the corner of your eye	3.95	4.16	4.28*	.01
4- To see clearly in low light conditions	3.34	3.64	6.19*	.02
5- To see clearly in bright light conditions	3.22	3.42	2.83	.01
6- To make decisions quickly in traffic	3.88	4.14	5.59*	.02
7- To react quickly in traffic	3.70	4.14	14.79**	.05
8- To navigate efficiently an unknown area	3.10	3.45	6.74*	.02
9- To follow a route travelled only once before, from memory	3.50	4.00	16.04**	.06
10- To stay alert for long periods while driving	3.77	4.19	12.18**	.04
11- To recognize when your attention has wandered	3.86	4.05	3.76	.01
12- To judge the speed of oncoming traffic	3.86	4.20	13.52**	.05
13- To divide your attention between two tasks	3.18	3.73	19.57**	.07
14- To reverse park into confined space	3.94	4.09	1.38	.00

Note. * $p<.05$; ** $p<.01$. *Adjusted mean scores are used.*

Table 9

Analysis of Covariance Summary- Comparison of Old and Young Drivers on Driving Confidence Items

Source	*Old Drivers Mean*	*Young Drivers Mean*	*F*	*Partial Eta Squared*
1- How nervous do you usually feel when overtaking?	3.82	3.96	1.29	.00
2- How nervous do you usually feel when turning right?	4.07	4.57	20.02**	.07
3- How nervous do you usually feel when negotiating a mini-roundabout?	4.04	4.28	4.12*	.01
4- How nervous do you usually feel when negotiating a large roundabout?	4.25	4.43	2.73	.01
5- How nervous do you usually feel when joining a motorway?	4.04	4.28	3.72*	.01
6- How nervous do you usually feel when changing lanes on a motorway?	4.03	4.30	4.35*	.01
7- How nervous do you usually feel when driving in heavy traffic?	3.39	3.55	1.25	.00
8- When driving how relaxed do you usually feel?	3.65	4.01	12.79**	.04
9- When driving, how stressed do you usually feel?	3.86	4.02	1.79	.00
10-When driving, how confident do you usually feel?	3.85	4.08	4.38*	.01
11-When you are driving and you are suddenly faced with a potentially dangerous situation how flustered do you become?	3.50	3.32	2.14	.00
12-When you are driving and things happen quickly, giving you little time to think, how calm do you remain?	3.08	3.33	4.73*	.01

Note. * $p<.05$; ** $p<.01$. *Adjusted mean scores are used.*

item 15 (While driving, do you try to avoid chatting with passengers?), item 16 (While driving, do you try to avoid eating?), item 17 (While driving, do you try to avoid reading a road map?), item 18 (While driving, do you try to avoid changing the radio stations?), item 19 (While driving, do you try to avoid talking on a mobile phone?), item 21 (Do you usually plan your trip ahead of time, including writing down your route?), and item 24 (Do you now leave greater distances between your car and the car ahead of you than you used to?) with respect to the answer of the self-regulatory behaviors. Generally, for these items older drivers' Yes answers were higher than younger drivers.

In addition to previous results, there were no significant differences of the answer proportion of driving self-regulatory behaviors items for the item 14 (Do you try to avoid reversing?), item 20 (While driving, do you try to avoid personal grooming?), item 22 (Do you usually make a practice run ahead of time to become familiar with your route?), and item 23 (Do you reduce your overall travel by combining several trips into a single outing?).

3.4.1.6 Comparison of Old and Young Drivers on Driver Behavior Questionnaire (DBQ)

In this study, the factor structure analysis was not done for DBQ because it was used in Turkish sample in the previous study and the factor structure was determined before. Therefore, the comparison of old and young drivers on this scale was examined for the subscales instead of item examination.

One-way ANCOVA was done for the test the effect of group differences on the subscales of DBQ by controlling the effect of last year mileage of the participants. After examination, it was found that group differences significantly affected aggressive violation of the participants ($F(1, 249) = 30.82$, $p < .01$, $\eta^2 = .11$). It was found that younger drivers (*adjusted* $M = 1.42$, $SD = 1.07$) significantly engage in more aggressive violation than older ones (*adjusted* $M = .77$, $SD = .71$). In addition to this finding, the significant effect of groups was also found for ordinary violation ($F(1, 249) = 60.27$, p

< .01, η^2 = .24). Younger drivers reported more ordinary violation (*adjusted M* = .1.13, *SD* = .76) than older drivers (*adjusted M* = .49, *SD* = .50) (see Table 11).

3.4.2 Path Model Testing

For testing the proposed models, health and functional abilities, self-rated driving abilities, driving confidence, self-regulatory driving behaviors and aberrant driver behaviors were tested by using structural equation modeling. Lisrel 9.10 (Jöreskog, & Sörbom, 2013) with maximum likelihood estimation was used to test the proposed model. Sample correlation matrix was used to test proposed model for older and younger drivers sample separately. In the correlation matrix, last year mileages of the participants were controlled.

For older drivers sample model testing were done with health and functional abilities, self-rated abilities, negative feelings of confidence and positive feelings of confidence, strategical level of driving self-regulatory behavior, tactical level of self-regulatory behavior that were determined by factor analyses. Moreover, Aggressive violation, ordinary violation, errors and lapses were also included in the model. All the models testing were done step by step and in each step model were tested with respect to one DBQ subscales.

The proposed models were tested as a full mediation model to be able to see all direct and indirect effect on DBQ subscales. $\chi 2$ to degrees of freedom ratio ($\chi 2$ /df), root means error of approximation (RMSEA), goodness of fit index (GFI), non-normed fit index (NNFI) were used to evaluate the model. Contrary to proposed model, there were no mediation effect of self-regulatory driving behavior was found between health and functional abilities, self-rated abilities and driving confidence and aggressive violation, ordinary violation, error and lapses scores of older drivers.

Table 10

Chi-Square Test of Association - Comparison of Old and Young Drivers on Driving Self- Regulation Items

Source	*Old Drivers Yes*	*Old Drivers No*	*Young Drivers Yes*	*Young Drivers No*	χ^2	Φ
1- During the past year, have you moved to a new location?	10	109	44	94	21.22**	.00
2- During the past year, have you begun a regular exercise program or fitness routine?	33	86	69	69	13.23**	.00
3- During the past year, have you bought a different car?	14	105	41	97	12.23**	.00
4- During the past year, have you reduced the amount of driving you do in any way?	47	72	30	108	9.60**	.00
5- Do you try to avoid driving at night?	58	61	20	118	35.45**	.00
6- At intersections where there is no right turn arrow, do you try to avoid making right turns across oncoming traffic?	108	11	100	38	13.85**	.00
7- Do you try to avoid driving in bad weather?	82	37	48	90	29.76**	.00
8- Do you try to avoid driving on busy roads?	64	55	51	87	7.31**	.00
9- Do you try to avoid driving in unfamiliar areas?	70	49	33	105	32.42**	.00
10- Do you avoid driving alone?	14	105	6	132	4.89*	.02
11- Do you try to avoid driving at night in bad weather?	97	22	65	73	32.47**	.00
12- Do you try to avoid driving in rush hour traffic?	78	41	64	74	9.49**	.00
13- Do you try to avoid driving on the freeway?*	11	108	4	134	4.68*	.03

Note. * $p<.05$; ** $p<.01$.

Table 10 (continued)

Analysis of Covariance Summary- Comparison of Old and Young Drivers on Driving Self- Regulation Items

Source	*Old Drivers Yes*	*Old Drivers No*	*Young Drivers Yes*	*Young Drivers No*	$\chi 2$	Φ
14- Do you try to avoid reversing?	32	87	25	113	2.85	.09
15- While driving, do you try to avoid chatting with passengers?	84	35	27	111	67.79**	.00
16- While driving, do you try to avoid eating?	108	11	81	57	33.75**	.00
17- While driving, do you try to avoid reading a road map?	92	27	67	71	22.40**	.00
18- While driving, do you try to avoid changing the radio stations?	55	64	13	125	44.46**	.00
19- While driving, do you try to avoid talking on a mobile phone?	110	9	77	61	43.28**	.00
20-While driving, do you try to avoid personal grooming?	110	9	120	18	2.04	.15
21- Do you usually plan your trip ahead of time, including writing down your route?	95	24	95	43	4.00*	.04
22- Do you usually make a practice run ahead of time to become familiar with your route?	27	92	24	114	1.27	.28
23- Do you reduce your overall travel by combining several trips into a single outing?	69	50	68	70	1.63	.16
24- Do you now leave greater distances between your car and the car ahead of you than you used to?	66	53	37	101	21.84**	.00
25- Do you bring along a passenger specifically to help you navigate?	34	85	57	81	4.53*	.03

Note. * $p<.05$; ** $p<.01$.

Table 11

Analysis of Covariance Summary- Comparison of Old and Young Driver Behavior Questionnaire

Source	*Old Drivers Mean*	*Young Drivers Mean*	*F*	*Partial Eta Squared*
Aggressive Violation	.77	1.42	30.82**	.11
Ordinary Violation	.49	1.13	60.27**	.24
Error	.56	.68	2.80	.11
Lapses	.62	.72	2.67	.07

Note. * *p*<.05; ** *p*<.01. *Adjusted mean scores are used.*

Same procedures were applied for younger driver cases. Functioning, mobility, driving confidence ability, navigation ability, vision ability, situational confidence, general confidence strategical level of driving self-regulatory behavior, and tactical level of self-regulatory behavior that were determined by factor analysis before, were added to younger driver model test while examining the proposed model with DBQ subscales separately.

The proposed models for younger drivers were tested as a full mediation model to be able to see all direct and indirect effect on DBQ subscales. Contrary to what was expected, there was only one mediation relation found for younger drivers. The only significant path predicting lapses scores was the oncoming from strategical self-regulation directly and situational confidence predicting significantly strategical self-regulation behaviors that was in turn the direct effect of situational confidence on lapses scores of younger drivers.

The relationship between lapses and situational confidence mediated by driving strategical self-regulatory behavior was tested by mediation analyses as well. As for testing this mediation, the steps described by Baron and Kenny (1986) were followed.

All the regressions were done by controlling last year mileage of the participants and there were no significant effect of last year mileage of the participants found in each analysis. In the first regression, the relationship between lapses and situational confidence were checked. While, last year mileage of the participants have no effect on the lapses scores on the participants, it was found that situational confidence was significantly predicted lapses scores (R^2 = .21, F(2,132) = 18.23, p < .001), which means the participants whose feel less situational confidence reported more lapses scores (β = -.47, t = -6.02, p <. 001). In the second regression, situational confidence and strategical self-regulation path was examined and the result was significant (R^2 = .19, F(2,132) = 16.00, p < .001). It means that the participants who reported more situational confidence showed less strategical self-regulatory behavior in traffic (β = -.37, t = -4.79, p < .001). In the third regression, the effect of strategical self-regulation on lapses were screened and the result was significant (R^2 = .13, F(2, 132) = 10.54, p < .001). It was found that the participants who used more strategical self-regulation in traffic scored more on lapses scores as well (β = .37, t = 4.57, p < .001). In the last step, situational confidence and strategical self-regulation was entered both to see the effect on lapses scores of the participants and the effect of situational confidence on lapses scores were significant after controlling the effect of strategical self-regulation behavior (R^2 = .25, F(3,132) = 15.28, p < .001). The result of the final analysis showed that the mediation effect was partial. For the last step, Sobel test was performed. The result of Sobel Test was also significant with the value of 0.88 (p < .05).

3.5 Exploratory Analysis about the Pathways between Study Variables

The proposed models were not found in the previous analyses therefore to see the relationships between variables were examined via hierarchical regression analysis for older and younger driver samples separately.

3.5.1 Aberrant Driver Behaviors and Self-Regulatory Driving Behaviors Examination

In this section, aggressive violations, ordinary violations, errors and lapses variables were tested separately to examining the possible effect of self-regulatory behaviors on aberrant driver behaviors. Firstly, older driver sample were tested and then younger driver sample were examined.

For the first analysis, aggressive violation scores and self-regulation behaviors of the older drivers were tested via hierarchical regression for older driver sample. The last year mileage of the participants were controlled and for the second step strategical and tactical self-regulation were entered the analyses. The result showed that neither strategical self-regulation nor tactical self-regulation were predicted aggressive violation of the older drivers significantly. In the second analyses, ordinary violation scores were evaluated. After controlling last year mileage of the participants, strategical self-regulation and tactical self-regulation were entered the analyses and the result was significant (R^2 = .09, F(3,112) = 4.09, p < .01). It was found that strategical self-regulation (β = .20, t = 2.21, p <.05) and tactical self-regulation (β = -.26, t = -2.96, p <.005) predicted ordinary violation scores of older drivers significantly and who scored higher on strategical and lower on tactical self-regulation was reported higher ordinary violations. In the next analysis, error scores were assessed. After strategical self-regulations and tactical self-regulations were entered the analyses, the results were found to be significant (R^2 = .10, F(3,112) = 4.27, p<.01) with controlling last year mileage of the participants. When the unique effects were examined, it was found that errors score of the participants were predicted positively by strategical self-regulatory behaviors (β = .28, t = 3.00, p <.005) that is higher strategical self-regulatory means higher error scores and there was no unique effect was found for tactical self-regulation. The results of the hierarchical regression analyses were similar with errors for lapses scores. It was found that strategical and tactical self-regulations were significantly predicted lapses scores of older drivers (R^2 = .18, F(3,112) = 8.64, p < .001), however only strategical self-regulation was significantly predicted lapses scores of older drivers after controlling last year mileage of the participants. Higher strategical self-regulation means higher lapses scores of older drivers (β = .39, t = 4.38, p <.001). All the values and results can be seen in table 12.1.

Younger driver' aberrant behaviors and self-regulatory driving behaviors were also examined. As older drivers, last year mileage of the participants was controlled in each analysis as first step. After the analyses, it was found that strategical and tactical driving self-regulatory behaviors significantly predicted younger drivers' aggressive violation scores (R^2 = .11, F(3,132) = 5.43, p < .005). When the unique effects were examined, there were no strategical self-regulation unique effect was found and it was found that the more tactical self-regulatory means less aggressive violations for younger drivers (β = -.28, t = -3.17, p < .005). In addition to this result, younger drivers' ordinary violation was found to be significant when strategical and tactical self-regulation were entered the analysis (R^2 = .30, F(3,132) = 19.43, p < .001). The unique effect examination showed that, while there were no strategical self-regulation unique effect, the drivers who engaged in more tactical self-regulation was found to scored less in ordinary violation questions (β = -.51, t = -6.61, p < .001). Errors score were also checked with regression analysis and the results showed that both strategical and tactical driving self-regulatory behaviors were predicted errors in traffic (R^2 = .13, F(3,132) = 6.97, p < .001).

It was found that while strategical level was positively predicted errors scores (β = .33, t = 3.88, p < .001), tactical level was negatively predicted errors scores of younger drivers (β = -.26, t = -3.07, p < .005). It means younger drivers with more strategical self-regulation engaged in more errors and more tactical self-regulation engaged in fewer errors. Last examination was lapses and self-regulatory behaviors of younger drivers in this part, and it was found that both strategical and tactical self-regulations significantly predicted lapses scores for younger drivers (R^2 = .18, F(3,132) = 10.21, p < .001).

Table 12.1

Hierarchical Multiple Regression Analysis for Older Drivers Predicting Aggressive Violation, Ordinary Violation, Errors and Lapses

	Dependent Variables							
	Aggressive Violation		Ordinary Violation		Errors		Lapses	
Predictor	*ΔR²*	*β*	*ΔR²*	*β*	*ΔR²*	*β*	*ΔR²*	*β*
Step1	.00		.00		.03		.04*	
Last Year Mileage		-.30		-.04		-.17		-.21*
Step2	.04		.09**		.07		.14**	
Strategical Self-Regulation		.15		.20*		.28**		.39**
Tactical Self-Regulation		.18		-.26**		-.05		-.24
Total R^2	.04		.09		.10		.18	

Note. * *p*<.05; ** *p*<.01

The unique effect examination showed that strategical self-regulation positively predicted lapses scores (β = .42, t = 5.15, p < .001), and tactical self-regulation negatively predicted lapses scores of younger drivers (β = -.26, t = -3.16, p < .005). The younger drivers who engaged in more strategical self-regulation and less tactical self-regulation were found to show more lapses in traffic. (see table 12.2).

3.5.2 Self- Regulatory Behaviors, Health and Functional Abilities, Self-Rated Driving Abilities, and Driving Confidence Examination

In this section, strategical and tactical driving self-regulatory behaviors were tested separately to examining the possible effect of health and functional abilities, self-rated abilities, driving confidence on self-regulatory behaviors. Firstly, older driver sample were tested and then younger driver sample were examined.

Table 12.2

Hierarchical Multiple Regression Analysis for Younger Drivers Predicting Aggressive Violation, Ordinary Violation, Errors and Lapses

	Dependent Variables							
	Aggressive Violation		Ordinary Violation		Errors		Lapses	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step1	.04*		.07**		.00		.00	
Last Year Mileage		.20*		.27**		.08		-.03
Step2	.06**		.23**		.13**		.18**	
Strategical Self-Regulation		.06		.10		.33**		.42**
Tactical Self-Regulation		-.28**		-.51**		-.26**		-.26**
Total R^2	.11		.30		.13		.18	

Note. * p<.05; ** p<.01

The pathways from health and functional abilities, self-rated abilities, driving confidence to self-regulatory behaviors were tested by controlling last year mileage of the older participants. It was found that the total effect of the variables were found to be significant (R^2 = .35, F(5,110) = 12.08, p < .001). When the unique effects were screened, it was seen that self-rated driving abilities and negative feelings of confidence were significantly predicted strategical self-regulatory behaviors of older drivers The results showed that participants with lower self-rated abilities (β = -.24, t = -2.15, p < .05) and lower negative feelings of confidence (β = -.19, t = -2.12, p < .05) engaged in more strategical self-regulatory driving behaviors. In addition to these results, it was found that any of these variables were not predicted tactical self-regulatory behaviors for older drivers. All the values and results can be seen in table 13.1.

Same analyses were performed for younger drivers, as well. For strategical self-regulation, total effect of variables that were added in this part was found to be significant (R^2 = .36, F(8,127) = 9.10, p < .001).

Table 13.1

Hierarchical Multiple Regression Analysis for Older Drivers Predicting Strategical and Tactical Self-Regulation

	Dependent Variables			
	Strategical Self-Regulation		Tactical Self-Regulation	
Predictor	ΔR^2	β	ΔR^2	β
Step1	.07*		.00	
Last Year Mileage		.27**		-.29
Step2	.27**		.05	
Health and Functional Abilities		-.18		-.05
Self-Rated Driving Abilities		-.11		.12
Negative Feelings of Confidence		-.19*		.09
Positive Feelings of Confidence		-.24*		-.24
Total R^2	.35		.06	

Note. * p<.05; ** p<.01

The unique effects revealed that only general confidence was found to be significantly predictors for young drivers The participants whose scores were higher in general confidence found to scored less in strategical self-regulatory behaviors in traffic (β = -.36, t = -4.05, p < .001). For the second examination was done for tactical level and while total effect of the variables were found to be significant after controlling last year mileage of the participants, none of the variables that are related to health and functional abilities, self-rated abilities and driving confidence were found to be significantly related to tactical self-regulatory driving behaviors for young drivers (R^2 =.18, F(8,127) = 3.54, p < .005). All the values and results can be seen in table 13.2.

3.5.3 Aberrant Driver Behaviors, Health and Functional Abilities, Self-Rated Driving Abilities, and Driving Confidence Examination

In this section, aggressive violations, ordinary violations, errors and lapses variables were tested separately to examining the possible effect of health and functional abilities, self-rated abilities, driving confidence on self-regulatory behaviors. Firstly, older driver sample were tested and then younger driver sample were examined.

Table 13.2
Hierarchical Multiple Regression Analysis for Younger Drivers Predicting Strategical and Tactical Self-Regulation

	Dependent Variables			
	Strategical Self-Regulation		Tactical Self-Regulation	
Predictor	*ΔR²*	*B*	*ΔR²*	*β*
Step1	.05**		.08**	
Last Year Mileage		-.23**		-.26**
Step2	.31**		.09**	
Functioning		-.17		.08
Mobility		-.02		.02
Driving Cognitive Abilities		-.09		-.23
Navigation Abilities		-.05		-.00
Vision Abilities		.16		-.05
Situational Confidence		-.16		.09
General Confidence		-.36**		.18
Total R²	.36		.18	

Note. * p<.05; ** p<.01

The pathways from health and functional abilities, self-rated abilities, driving confidence to aberrant driver behaviors were tested via hierarchical regression by controlling last year mileage of older participants. For aggressive violation the result was not significant and for ordinary violations the result was significant but none of the variables were entered the analysis predicted significantly aggressive violations of older drivers (R^2 = .10, F(5,110) = 2.67, p < .05). For errors scores, the total effect of the variables were significant after controlling last year mileage of the participants (R^2 =.29, F(5,110) = 9.25, p < .001). However, after unique effect examination it was found that only negative feelings of confidence significantly predicted error scores of older drivers sample Older participants who scored more negative feelings of confidence engaged in less errors in traffic (β = -.31, t = -3.36, p < .005). In the last analyses, all the variables total effects were found to be significant (R^2 = .44, F(5,110) = 17.80, p < .001). It was found that lapses scores of the participants were significantly predicted by health and functional abilities, self-rated abilities, and negative feelings of confidence According to results, the participants whose health and functional abilities scores were high showed less lapses (β = -.31, t = -3.58, p < .001), who has high negative feelings of confidence showed less lapses (β = -.32, t = -3.87, p < .001) and whose self-rated abilities were high showed less lapses scores in traffic (β = -.21, t = -1.98, p < .05). All the values and results can be seen in table 14.1.

The same analyses were run for younger drivers and last year mileages of younger drivers were controlled. After adding health and functional abilities, self-rated abilities, driving confidence factors to the analysis, the result was found to be significant for aggressive violations (R^2 = .11, F(8,127) = 2.04, p < .05). The unique effects of variables on aggressive violations were examined and it was found that only driving cognitive abilities significantly predicted aggressive violations scores of younger drivers (β = .33, t = 2.69, p < .01). The younger drivers who reported better driving cognitive abilities, engaged in more aggressive violations in traffic. For the second aberrant behavior examination, ordinary violation analysis were run by adding the health and functional, self-rated abilities and confidence factors and the result was found to be significant after controlling last year mileage (R^2 = .14, F(8,127) = 2.75, p < .01).

However, there were no unique effect was found for the separate variables. Errors scores of younger drivers were also examined and the total effect of the variables that were mentioned above was found to be significant (R^2 = .22, F(8,127) = 4.64, p < .001).

Table 14.1

Hierarchical Multiple Regression Analysis for Older Drivers Predicting Aggressive Violation, Ordinary Violation, Errors and Lapses

	Dependent Variables							
	Aggressive Violation		Ordinary Violation		Errors		Lapses	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step1	.00		.00		.03		.04*	
Last Year Mileage		-.30		-.04		-.17		-.21*
Step2	.06		.10*		.26**		.40**	
Health and Functional Abilities		.04		-.11		-.19		-.31**
Self-Rated Driving Abilities		-.25		-.17		-.18		-.21*
Negative Feelings of Confidence		.02		-.16		-.31**		-.32**
Positive Feelings of Confidence		-.08		.03		-.00		-.01
Total R^2	.06		.10		.29		.44	

Note. * p<.05; ** p<.01

After this step, the unique effect of the variables was screened and it was found that errors were predicted only by situational confidence for younger drivers (β = -.27, t = -2.92, p < .005). The younger participants who reported better situational confidence reported fewer errors in the traffic. For the last lapses were examined and after adding the factors that are related to health and functional, self-rated abilities and confidence, the result was found to be significant after controlling last year mileage (R^2 = .31, F(8,127) = 7.36, p < .001). After the unique effects of the variables examined, it was seen that functioning and situational confidence predicted lapses significantly. Younger drivers whose functioning were better reported less lapses (β = -.25, t = -2.61, p < .05) and the participants who reported more situational confidence, engaged less lapses in traffic (β = -.33, t = -3.87, p < .001). All the values and results can be seen in table 14.2.

At the end of this part, all significant results for variables of older and younger drivers are presented as figures. The significant relationships between variables that are related to older drivers self-regulatory practices mechanism is presented in Figure 4.1. and the significant relationships between variables that are related to younger drivers self-regulatory practices mechanism is presented in Figure 4.2.

Table 14.2
Hierarchical Multiple Regression Analysis for Younger Drivers Predicting Aggressive Violation, Ordinary Violation, Errors and Lapses

	Dependent Variables							
	Aggressive Violation		Ordinary Violation		Errors		Lapses	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step1	.04*		.07**		.00		.00	
Last Year Mileage		.20*		.27**		.08		-.03
Step2	.07*		.07		.21**		.31**	
Functioning		.08		-.08		-.13		-.25*
Mobility		-.12		-.12		-.05		-.08
Driving Cognitive Abilities		.33**		.10		-.11		-.07
Navigation Abilities		-.04		-.02		.07		-.00
Vision Abilities		-.13		-.16		-.03		.02
Situational Confidence		-.07		-.01		-.27**		-.33**
General Confidence		-.11		-.11		-.07		-.06
Total R^2	.11		.14		.22		.31	

Note. * p<.05; ** p<.01

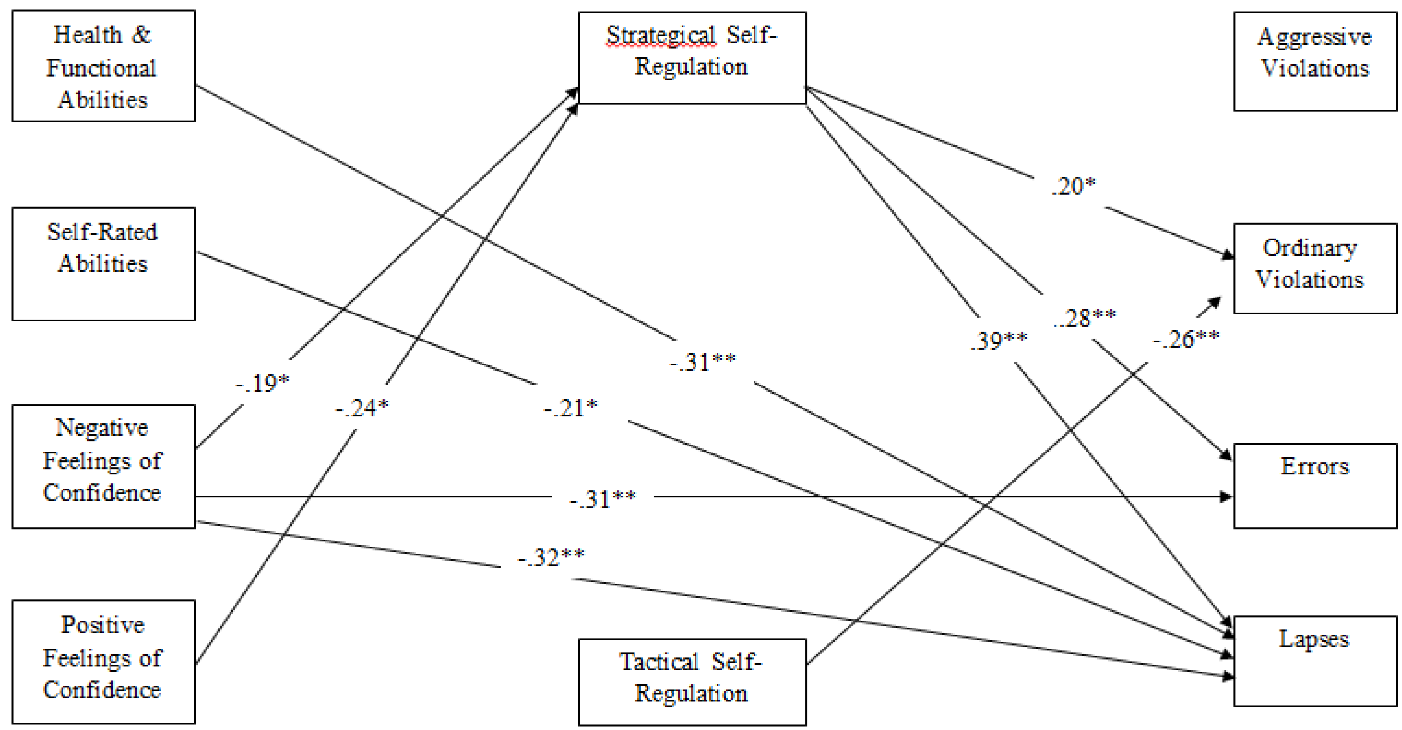

Figure 9.1 Summary of Hierarchical Multiple Regression Analysis of Older Drivers' Mechanism

Note. Only the significant results are presented with β values.

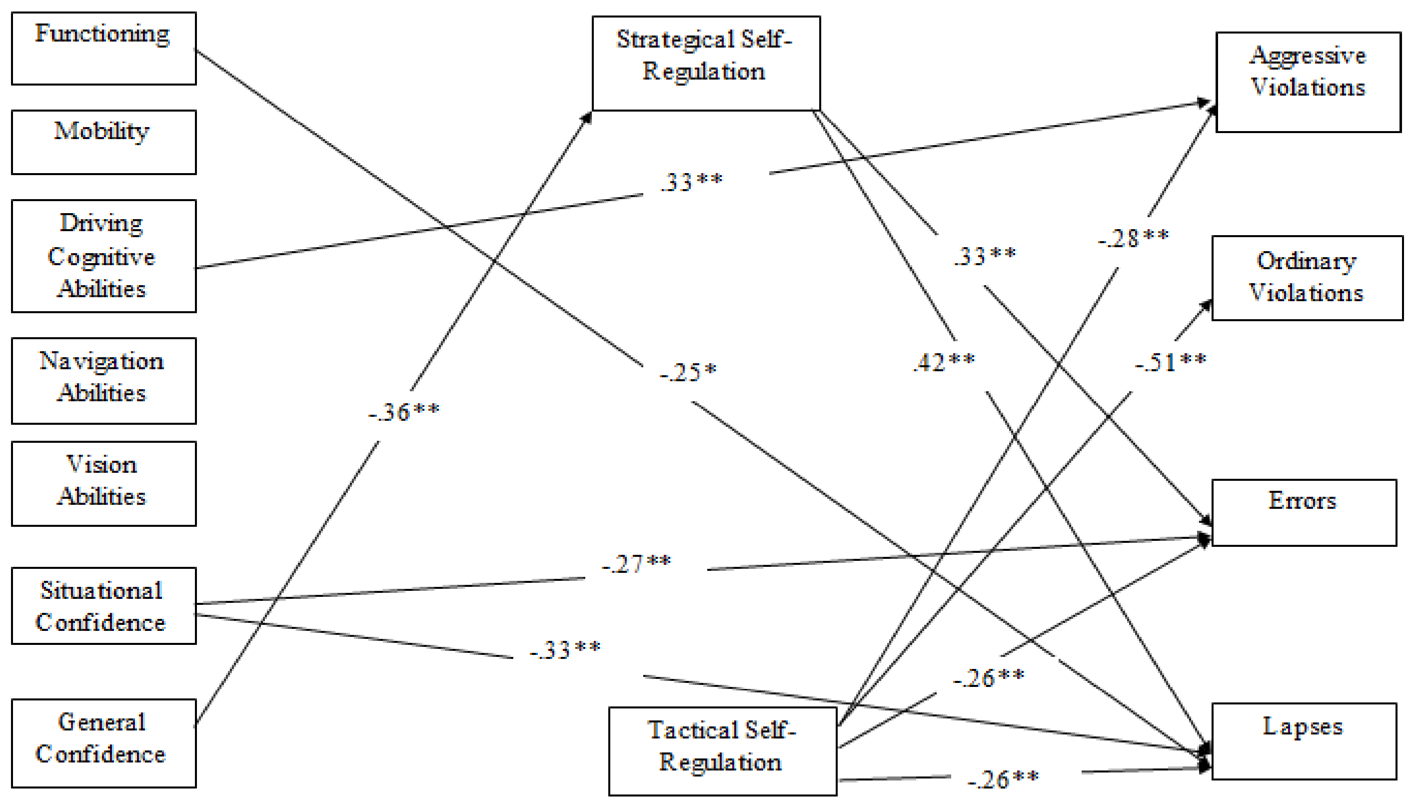

Figure 9.2 Summary of Hierarchical Multiple Regression Analysis of Younger Drivers' Mechanism

Note. Only the significant results are presented with β values.

CHAPTER IV

DISCUSSION

4.1 Overview

In the current study, it is aimed to investigate older and younger drivers' behavioral mechanism especially for understanding the role of self-regulatory driving practices among older and younger drivers within in the framework Contextual Model of Self-Regulatoy Driving Practices. Before testing the proposed model including health and functional abilities, self-rated driving abilities, driving confidence, self-regulatory driving practices and aberrant driver behaviors, adaptation of the scales and factor structure of the scales for Turkish population were checked. In addition to them, comparisons of the study variables and the items of the scales were made in order to understand the differences of older and younger drivers' behavioral mechanisms working. After that, the behavioral mechanism and possible relationships between components were examined for old and young drivers separately.

In the following section, factor structure examinations, general findings about behavioral mechanism of older and younger drivers, the comparisons of the variables for old and young drivers and the relationships between variables of older and younger drivers are discussed separately. Subsequently, the possible practical implications, expected contributions, limitations about the study and suggestions for future research are presented.

4.2 Discussion of the Factor Structure Examinations

In the present study, the scales that used to measure health and functional abilities, self-rated driving abilities, driving confidence and self-regulatory driving practices have not been used in Turkish sample and young drivers before. Therefore, for adaptations of these scales, factor structure examinations were done for old and young driver population separately. In this section, main findings about the factor structures of the scales are discussed.

4.2.1 Discussion of the Findings Concerning Factor Structure of Health and Functional Abilities for Safe Driving Scale

The factor structure examination of Health and Functional Abilities Scale were examined firstly, for older driver population and one factor was founded as the original study (Molnar et al., 2013). The original scale was developed for older drivers and this result supports the original studies factor structure for Turkish old driver population as well.

In younger driver sample, the factor structure examination of health and functional abilities suggests the scale as two factors for Turkish young drivers. The items that are related with driving and functioning are grouped as one factor, which was named as functioning, and the other items that are related with general mobility and general health are grouped as the other factor that was named as mobility factor for further analysis. Before this study, health and functional abilities scale has not been used to investigate younger drivers, therefore further examinations for younger drivers should be done in order to get extra information about the factor structure of this scale for younger drivers.

4.2.2 Discussion of the Findings Concerning Factor Structure of Self-Rated Driving Ability Scale

Similar to factor structure examination of Heath and Functional Abilities Scale, for Self-Rated Driving Abilities Scale, factor structure examination were done for older drivers first. The examination supports the original factor structure for older drivers. This scale was also developed for older drivers and Turkish older drivers trend were found as similar to previous studies that is expected (Parker et al., 2001).

Contrary to older drivers, the factor structure examination for young Turkish drivers shows that the items were grouped as three for this age group. The contents of the items suggest that driving related cognitive abilities, navigational abilities and vision abilities are clearly separated from each other in young driver sample. This separation might be because younger drivers might be more aware of their driving abilities than older drivers might. This awareness might be related with their experience level or related with their developmental trend. Being less experienced might increase their awareness about distinct critical driving abilities. Moreover, because of they do not experience decline in several abilities like older drivers, the separation of the abilities might be easier for this group. What is surprising of this factor separation is in younger driver sample, there is a new ability type found named as navigational. This new ability type might be due to the wider usage of in-vehicle technologies like navigation machine in younger population. Studies about navigational systems show that there are several safety benefits of this in-vehicle technology for older and younger drivers (May, Ross, & Osman, 2005). Therefore, this finding might support the importance of the usage and acceptance of in-vehicle technologies for near future.

4.2.3 Discussion of the Findings Concerning Factor Structure of Driving Confidence Scale

In the original Driving Confidence Scale, the factor structure was found as one for older driver population (Parker et al., 2001). On the contrary, to original study, in this study the examination suggest two factor solutions for older drivers. Interestingly, the items which examine confidence levels of the participants by using nervousness expressions and confidence expressions were separated from each other even after the reversed items were rotated. There might be an effect of negative or positive expressions inside the items on the responses of confidence questions or confidence levels of the older participants; however, for testing this possible effect further detailed studies should be conducted.

The factor structure examination of Driving Confidence Scale for younger were investigated for this study which was unexamined similar to the other scales that factor examination was made for this study. There were two factors found named as situational confidence and general confidence. The items that aimed to measure the confidence level of the participants via examining feelings about the specific driving situations and general feelings about driving comfort and confidence were separated from each other for young Turkish driver sample. The reason of this separation might be related with overconfidence concept of the younger drivers. When the items investigate the confidence level by using specific situational clue, participants might rate the items with respect to their real performance and their real feelings about the specific driving conditions. On the other hand, younger participants might overestimate their performance level that might separate confidence level in general driving conditions and specific driving conditions for younger drivers.

4.2.4 Discussion of the Findings Concerning Factor Structure of Revised Version of Advanced Driving Decisions and Patterns of Travel Scale

Similar to previous scales that were discussed, this scale was also developed for measuring self-regulatory driving practices of older drivers (Molnar et al., 2009). For this study, original scale was revised, shortened and adapted into Turkish. Firstly, factor structure examination of the scales was made for older driver sample. It was found that items are grouped as two factors and the contents of these groups showed that items related with strategical self-regulation and tactical self-regulation were separated from each other which is proposed. However, similar to original study, there are so few participants reported life-goal self-regulation and life-goal level was not found as a factor. Molnar and her colleagues state that life-goal level decisions are related to most aspects of person's life and individuals that feel functionally intact might not be ready to face with this kind of decisions and they states that items should be re-explored (Molnar et al., 2013). In addition to this interpretation, in Turkish older driver population, life-goal level items might be dropped because of cultural and economic conditions of this age group. In Turkey, expectations of older drivers and expectations about older drivers might be different; therefore, buying new car, moving new home or starting exercise might not reflect life-goal s for this age group. Therefore, items should be re-explored not only for older driver population but also for Turkish driver population and possible additions should be done.

In addition to, drop of life-goal levels items, some of strategical level items were also dropped (e.g. making practice before trip, planning trip and route, combining several trips etc.) The reason of these drops might be related with older drivers could drive familiar and restricted areas which they would not need to use these strategies. Moreover, driving freeway item may be dropped because of there is no freeway in neighborhood for the most of the older drivers that was selected for this study. In addition to them, participants are male and retired; they might not need personal grooming while driving, so this item dropped also.

Factor examination of younger drivers shows similar result with older driver group. In this group, strategical and tactical self-regulatory driving practices grouped as separate factors which might support the validity of Michon hierarchical point of view for investigating self-regulatory driving practices of younger drivers as well. In addition to this finding, life-goal level were not found as separate factor and similar to older drivers, whole life-goal level items were needed to dropped because of cross-loads and only a few young participants reported life-goal self-regulation. The reason might be that nearly all young drivers are university students and they are at least 21 years old which means generally they have been studied for three years in the university. Therefore, the proportion for moving new location might be so low because of this demographic trend. Moreover, as it mentioned before they are university student and buying a new car might be low because of economic conditions. Therefore, for young drivers, life-goal level items should be re-explored and new items should be developed to investigate decisions of this level.

Similar to older drivers, some strategical items were needed to be dropped in this level. Strategical self-regulation decisions are mostly related with before trip decisions and they need higher-order decisional mechanism (Molnar, et al., 2013). Drivers might think that driving is a daily activity and might not prefer before trip strategies. However, to understand the trend, strategical self-regulation items should be also re-explored and more studies should be examine this level items for older and younger driver population to understand the reason of the cross-loads and drops.

4.3 Discussion of the Findings Concerning Comparison of Old and Young Drivers

Before testing the proposed models for older and younger drivers, to get more detailed information about behavioral mechanisms of these age groups, comparisons were done for each variable. Due to the fact that factor structures of the scales were found as different for each group, the comparisons were done item by item. The comparisons were done by controlling last year mileage in order to eliminate exposure effects.

The first comparison was done for last 3 year accidents number, and the result shows that younger drivers experience more accidents than older drivers after controlling last year mileage of the participants. The previous studies about accidents number and age show that there is a U-shaped relation between age and crash number which support the idea that younger and older drivers crash rate were higher than other age groups (McGwin, & Brown, 1999). However, some studies discussed that these findings might be because of low mileage bias that older drivers generally restrict their driving and have less mileage than the other age group. It is known that drivers with more kilometers driven typically have lower crash rate per kilometer than drivers with low mileage (Langford, Methorst, & Hakamies-Blomqviest, 2006). Therefore, researchers state that driver aging actually does not cause higher accidents rates (Hakamies-Blomqvist, Raitanen, O'Neill, 2002). This current study finding might a proof for these previous findings because after controlling last year mileage older drivers' accidents number was found as significantly lower than younger group.

After, comparison of accident numbers between groups, health and functional abilities were compared. As it mentioned before the comparisons were done item by item. In general, analyses show that younger drivers rated themselves significantly healthier than older drivers, which were expected, and this different trend between two age groups support normal aging processes and general priori. The only exception was the item "Your ability to driver safely compared to other drivers your age" and mean score of older and younger drivers were not found as significantly different. This item might be related to other factors such as personality therefore in order to understand possible confounding variables related to this item, more information is needed.

Self-rated driving abilities items comparisons show similar trend with health and functional abilities. Except for 3 items, younger drivers rated themselves significantly better than older drivers. This finding was expected but contrast to literature. In the literature, some studies state that older drivers perceive their driving abilities better than younger drivers (Groeger, & Brown, 1989). However, in the literature, self-rated abilities were found closely related with confidence and overconfidence is more common in younger group (Marottoli & Richardson, 1998; Parker, Macdonald, Sutcliffe, & Rabbit, 2001¸Gregersen, & Bjuruf, 1996). With the light of this information, younger drivers were expected to rated themselves better than older drivers which was found in the current study. As it mentioned before, for 3 items (seeing clearly bright light, recognizing attention wanders, and reverse parking), significant differences between age group could not be found. These actions might be difficult in their nature therefore; aging might not be only factor that is related with these items.

Driving confidence comparisons show that younger drivers were reported themselves more confident than older drivers for various driving conditions. This finding is parallel with previous findings. For example, similar to this current study, Matthews and Moran found younger drivers' confidence level higher than older drivers (1986). In addition to this finding, for feeling nervous when overtaking, feeling nervous when negotiating large-roundabout and feeling stress while driving items, there were no significant found between older and younger driver population. There could be other factors additionally to last year mileage and age effects. Therefore in order to examining these items in detail, more information could be needed.

All items related with self-regulatory driving behaviors were also checked. It was found that for whole life goal level items, younger drivers reported more yes and less no than older drivers which means younger drivers' life-goal changes were more than older. This finding might support the interpretations of the researchers who developed this scale and conduct the original study. They mentioned that individuals that feel functionally intact might not be ready for the decisions in life-goal level because these decisions are related to most aspects of person's life (Molnar et al., 2013). Therefore, while for younger drivers, life-goal level decisions could be easy and meaningful, for elderly they could be difficult to decide. Moreover, the variables such as expectations from life, family life, or economic conditions could affect the proportion of the adoption of life-goal level strategies. After this result, it should be reported again that life-goal level items should be re-explored not only for Turkish sample but also for international studies to find detailed result about this level. For strategical and tactical level items, older drivers reported more self-regulatory driving behaviors than younger drivers that were expected. Self-regulatory driving behavior topic was generally studied with older drivers because it was stated that these strategies could compensate several inadequacies related with driving and generally older drivers adopt this strategies higher than other drivers groups (Molnar, & Eby, 2009; Molnar, Eby, Kartje, & Louis, 2010; Motak, Gabaude, Bougeant, & Huet, 2014). The possible safety benefits will be discussed later but it should be said that older was reported higher strategical and tactical self-regulatory behaviors than younger drivers which was generally accepted and unexamined before. Only for 2 items, significant differences could not be found; they are related to avoiding reversing and personal grooming. For reversing item, the result might be related with task nature and this task could be automated for most of the drivers. In addition to it, significant differences might not be found for personal grooming item because of the participants were male and not need personal grooming while driving.

Lastly, DBQ comparisons support the previous study findings (Özkan, Lajunen, & Summala, 2006; Parker, McDonald, Rabbitt, & Sutcliffe, 2000). It was found that younger drivers reported significantly higher aggressive and ordinary violations than older drivers. However, the significant differences between groups could not be found for errors and violations, which were found in these previous studies as well. Not finding significant group differences for error and lapses might be because of reporting errors and lapses could be more difficult than reporting violations because error and lapses are intentional acts and drivers might not be aware of them as they realize their violations.

All of the comparisons result support that older and younger drivers were distinct driver groups in traffic and they have different behavioral trend. Generally, younger drivers rated themselves healthier, more skillful and confident than older drivers while driving however; they reported more violations than older drivers. In addition to them, findings support that older drivers uses self-regulatory driving behaviors except for life-goal level strategies. These findings generally support the previous findings and support the idea that behavioral mechanism of these age groups could be different from each other because underlying motivators' workings different from each other as well.

4.4 Discussion of the Findings Concerning Proposed Model for Old and Young Drivers

As it mentioned before same model including distal factors (health and functional abilities, self-rated driving abilities, and driving confidence), self-regulatory driving practices and proximal factors (aberrant driving behaviors) was proposed in order to examine behavioral mechanism of old and young driver. However, they are distinct driver groups and they have different behavioral trend in traffic therefore, it was expected that even the proposed model was same; the working of the mechanisms might be different for older and younger group. In the next part, firstly, the findings concerning path model testing are discussed after that the relationships between variables for older and younger drivers are discussed separately.

4.4.1 Discussion of the Path Model Testing

Firstly, for testing mediation effect of self-regulatory driving practices between distal and proximal factors, older driver sample were examined. Contrast to proposed model, there were no mediation effect of self-regulatory driving practices between factors of health and functional abilities, self-rated driving abilities and driving confidence and aberrant driver behaviors found for older drivers. For interpretation of these findings, turning contextual mediated model could be helpful. Because, place of self-regulatory driving behaviors in the model might be different. Previous studies support the relationship between health and functional abilities, self-rated driving abilities and driving confidence, however, Rimmö and Hakamies-Blomqvist (2002) did not find any relationship with self-imposed driving limitation and violation and mistakes (Lyman, McGwin, & Sims, 2001; Baldock et al., 2006; Charlton et al., 2003). These previous findings and current study findings might be brought the question of “Could self-regulatory driving practices proximal factors, too?” Whereas there are conflicting results about self-regulatory driving practices and crash (e.g. while Raedt and Ponjaert-Kristoffersen (2000) reported that drivers that compensate their driving cause less accident than who do not compensate, Ross and her colleagues (2009) suggested that self-regulation among older drivers is an insufficient compensatory strategies since they found self-regulators are twice more likely to be involved crash than non-regulators), re-placing the factors and re-examining of the mechanism should be helpful. Self-regulatory driving behaviors include acts of the drivers and they might be proximal factors as aberrant driver behaviors. There might be direct relationship between crash involvement and self-regulatory behaviors. Therefore, this relationship should be studied in order to understand the self-regulatory driving behaviors and possible factors directly or indirectly related with crash involvement of older drivers.

Proposed model of younger drivers were also examined to understand self-regulatory driving practices role for this group. After distal factors, self-regulatory driving behaviors and proximal factors were entered the analyses for testing mediation effect, one mediation effect of self-regulatory driving practices could be found. Further analyses to investigate this relationship show that there was partial mediation of self-regulatory driving behaviors between lapses and situational confidence. These results support the place of self-regulatory driving behaviors. However, partial mediation finding might suggest the re-examination of possible factors that are related with this mediation except for last year mileage that was controlled for these analyses. While, the expected mediation effect was found, the direction of the relationships was unexpected. Results show that while the relationship between situational confidence and strategical self-regulation was negative, the relationship between strategical self-regulation and lapses scores were positive. This means that the people with low confidence adopt more self-regulatory behaviors, which turn more lapses in traffic. The result was seemed as self-regulatory driving behaviors have adverse effect for lapses scores and safer behaviors in traffic. To understand possible benefits or adverse effects of self-regulatory behaviors detailed findings are discussed related to this relationship in the next part.

4.4.2 Discussion of the Exploratory Analysis about Study Variables

In this study, the proposed model and mediation effect of self-regulatory practices could not be found. However, for understanding mechanism in detailed, further analyses were done. Main findings about aberrant driver behaviors and self-regulatory driving behaviors were same for older and younger drivers. Generally, it can be said that tactical self-regulation predicted aberrant driver behaviors negatively and this was expected to support safety benefits of self-regulatory driving behaviors. However, for strategical self-regulation the prediction was in an unexpected way for older and younger driver population. In addition to these, finding underlying motivations of self-regulatory behaviors could not be found as literature findings provided for older drivers and younger drivers. Lastly, there are some significant prediction of the variables that reflect the characteristics of the age groups on aberrant driver behaviors, however, it should be said more factors should be tested for understanding the motivations behind self-regulatory behaviors and aberrant driver behaviors. In the next section, detailed discussions are presented about possible behavioral mechanism for older and younger drivers.

4.4.2.1 Exploratory Analysis for Older Drivers

The examinations of the relationships between variables were started from aberrant driver behaviors with respect to the proposed model. For older drivers, aggressive violations scores were not predicted by the levels of self-regulatory behaviors. This result could be expected because it is known that violation scores were diminished with the age and the relationship might not be found if the drivers engage in less aggressive violations. (Rimmö, & Hakamies-Blomqvist, 2002). On the other hand, while aggressive violation predictors could not be found. It was found that tactical self-regulation predicted ordinary violations scores of older drivers negatively, which might support tactical self-regulatory driving practices safety benefits. It could be said that for controlling ordinary violations of older drivers, tactical self-regulatory strategies might be supported. Besides these findings, the unexpected findings were found for strategical self-regulatory driving practices. The findings show that older drivers who use strategical self-regulatory practices reported more ordinary violations, more errors and more lapses. This means that using strategical self-regulatory practices might not support safer older drivers on roads that are against the general views about benefits of self-regulatory driving practices. In addition to them, it should be noted that correlation between strategical and tactical self-regulation of older drivers were positive, however, it is understood that the practical effect of this two type of strategies seem as different for older drivers. In summary, it should be said that while tactical self-regulatory driving behaviors could be used for controlling ordinary violations, using strategical self-regulation might end with unexpected results with respect to aberrant driver behaviors of older drivers. In addition to them, generally older drivers use self-regulatory driving practices for compensating their limitations, therefore after this results it should be noted that while encouraging older drivers to use self-regulatory strategies, practitioners should be more careful and more researchers should be done in order to be sure the effects of these strategies.

Second examinations were done for understanding motivational factors underlying self-regulatory driving behaviors of older drivers. Even, general findings are unexpected; they give extra information about the mechanism. In the previous studies it is found that confidence is a good predictor of self-regulatory practices and its effect was found more than decline in abilities and the other factors for older drivers (Baldock, Mathias, McLean, & Berndt, 2006; Charlton, et al., 2006; Devlin, & McGilivray, 2013; Charlton, Oxley, Fildes, Oxley, & Newstead, 2003). This current study supports this finding and for strategical self-regulation, negative feelings of confidence and positive feeling s of confidence found as a negative predictor. This means older drivers with low confidence score engage in more strategical self-regulation. On the other hand, except for these relationships, no significant relationships could be found for tactical and strategical self-regulation. While, the factors were included to this current study with respect to the literature about older driver and self-regulation, the findings show that there could be extra factors behind self-regulatory driving practices. Exploring underlying factors related with strategical self-regulation is important however, after fail to finding positive effects of strategical self-regulatory driving behaviors, finding that tactical self-regulations possible underlying factors could be more critical and practical for supporting mobility and safety of older drivers.

Lastly, examinations were done for health and functional abilities, self-rated driving abilities, confidence and aberrant driver behaviors. For aggressive violations scores and ordinary violations scores of older drivers, there could be no significant predictor found among distal factors. As it mentioned before, failing to find significant findings for violations scores of older drivers were not surprising and this might mean that their violations scores were low or unrelated with their age characteristics. The critical findings of these analyses were found for errors and lapses scores. The findings show that errors scores were negatively predicted by negative feelings of confidence and lapses scores were negatively predicted by health and functional abilities, self-rated abilities and negative feelings of confidence. It was found that while negative feeling of confidence negatively predicted errors. These findings suggest that errors might be related to uncomfortable feelings while lapses scores might be affected by age-related declines, abilities and again uncomfortable feelings. These results support that error and lapses (especially lapses) are related with age characteristics. Due to the fact that errors and lapses are not intended actions and related with performance limits and failures, finding this predictors as significant were already expected for older drivers (Aberg, & Rimmo, 1998; Winter, & Dodou, 2010; Oppenheim, & Shinar, 2011). Therefore, this current study provide underlying mechanism of error and lapses scores of older drivers and provide extra information about why older drivers error and lapses scores has been increasing.

4.4.2.2 Exploratory Analysis for Younger Drivers

In the present study, tactical self-regulatory driving behaviors were found as significant predictor of aggressive violations, ordinary violations, errors and lapses scores. Younger driver who use self-regulatory strategies reported less aberrant driving behaviors. These findings are new for self-regulatory driving behaviors literature and support the idea that self-regulatory strategies are not only related with older drivers. In addition to them, in this study even the mechanism variables were determined with respect to the older driver literature, more significant relationships between variables were found for younger drivers. Before this, there are not enough studies investigated self-regulatory behaviors of younger drivers and the possible benefits of these practices are unexplained. It could be deduced that tactical self-regulatory strategies can used for controlling aberrant behaviors of this group that can decrease the accident involvement rate of this group. Besides the tactical self-regulatory findings, for strategical self-regulation the results were similar to older drivers and found as an unexpected way. It was found that errors and lapses scores were positively predicted by strategical self-regulation. Even, the correlation between tactical and strategical self-regulation was positive, similar or older drivers, practical effects of tactical and strategical self-regulations seems to be different. This result suggests that while older, younger drivers can get benefit from using tactical self-regulation, for strategical self-regulation, researchers and practitioners should be careful. In addition to them, these two levels should be studied separately, while increasing tactical self-regulation, controlling or manipulation strategical self-regulations could be helpful.

Before investigating self-regulatory behaviors effect on aberrant driver behaviors, underlying mechanism of self-regulatory driving behaviors were also examined. After tactical self-regulation negative prediction of aberrant driver behaviors, finding underlying factors should be critical, however, no predictors could be found among distal factors related with younger drivers. Younger drivers motivators for tactical self-regulation might be different from health and functioning, self-rated driving abilities and driving confidence, it should be noted that last year mileage was found as a significant predictor of tactical self-regulation, more mileage predicts less tactical self-regulation, therefore exploring experience related factors might give extra and detailed information about tactical self-regulation of younger drivers. For strategical self-regulation, only general confidence found as a significant predictors and the result show that young drivers with less confidence level, reported more strategical self-regulation. Younger drivers might think that strategical self-regulation makes them safer, therefore they might choose these strategies for increasing their confidence level, however, practical effect of strategical self-regulation might not be related with being safer as the previous findings support and drivers should be aware of these possible negative effects.

In the last step, factors related with health and functional abilities, self-rated driving abilities and driving confidence were examined in order to detect significant predictors of aberrant driver behaviors. Ordinary violation seemed as effected by different factors that are unexamined in this current study. For aggressive violations, driving cognitive abilities were found as a predictor and drivers with high cognitive driving abilities reported more behaviors that are aggressive. Previous studies that focused aggressive violations generally investigate attitudes of the drivers or personality related factors (e.g. Parker, Lajunen, & Stradling, 1998; Lawton et al., 1997) because of they are intended and more related to social environment of the drivers. However, this current study provides different point of view that underlying cognitive mechanism and its working might also have an effect of this risky behaviors. Besides, violation findings, situational confidence was found as predictor for error and lapses. Younger drivers who have less confidence in various driving situation reported more lapses and more errors. Because of their experience in various driving situations was low because of their age and license year, they might be aware of their performance limits and they could make more errors and lapses in the situations that they feel uncomfortable. Lastly, for lapses scores, functioning was also found as predictor that was not surprising. In this study, functioning items were generally related with memory and vision abilities that are related with driving and lapses are known as related to memory failures (Oppenheim, & Shinar, 2011). Therefore, this result might support the previous explanations about lapses and younger drivers with low memory and vision functioning might engage in more lapses scores while driving.

4.5 Contributions and Practical Implications of the Findings

To the researcher's knowledge, this study represents first application of contextual mediated model on self-regulatory driving behaviors and investigation of self-regulatory driving practices for older and younger drivers in the same study. This model frame helps to understand older and younger drivers' behavioral mechanism, also understanding the differences and similarities between these risky driving groups. In addition to them, younger drivers' self-regulatory driving behaviors were unexamined in a systematical way before and with the help of study findings, it is found that self-regulatory driving practices could be used for countermeasure to enhance younger drivers' traffic safety as well.

As a second contribution, for this study ADDAPT Questionnaires which was developed for investigating self-regulatory driving practices of older drivers were adapted and translated into Turkish and the validity of the levels and factor structures were tested for not only Turkish older drivers but also give valuable information about younger drivers' self-regulatory behaviors. These findings support future studies for application of this scale to the younger drivers as well.

In addition to previous contributions, the underlying factors related with older drivers self-regulatory driving practices were re-test and also possible factors that were related with younger drivers' self-regulatory behaviors were investigated which was unexplained in the literature before. These findings provide valuable information about how to support self-regulatory behaviors of younger and older drivers and give a chance to understand the critical factors related with older and younger driver groups separately. Moreover, in order to investigate underlying mechanism of self-regulatory behaviors, in addition to ADDAPT Scale, Health and Functional Abilities for Safe Driving Scale, Self-Rated Driving Ability Scale, Driving Confidence Scale and Advanced Driving Decisions and Patterns of Travel

Scale were adapted to Turkish and used for not only older drivers but also younger drivers and their validity for younger drivers were also supported for the first time.

The most important contribution is the findings show that self-regulatory driving behaviors might not be always related with safer performance. In the literature, self-regulatory driving behaviors are generally assumed as a strategy for minimizing the risk for crash and it is assumed that drivers who fail to self-regulate their driving might have higher accident involvement (Charlton et al., 2003). However, while there are lots of studies about underlying factors about self-regulatory behaviors of older drivers and mechanism of self-regulatory behaviors (e.g. Molnar, et al., 2003; Donorfio, et al., 2008), the effects of self-regulatory behaviors on safety of the drivers are generally unexplained. In this study, self-regulatory driving behaviors were examined in order to understand their relationship between safer performance of older and younger drivers for the first time to researchers'' knowledge. To investigate safety effects of self-regulatory driving behaviors, their relation with aberrant driver behaviors were tested and findings show that for older and younger drivers, only tactical self-regulatory driving behaviors are related with safer performance in traffic. These results are important because, self-regulatory strategies are recommended behaviors for older drivers and younger drivers might use them in order to be safer and the practices with negative effect make them more vulnerable for accident involvement. Findings of this study suggest that before recommended strategical self-regulation, ones should be aware of these adverse effects.

This study was primarily conducted for enhance safety and mobility of older and younger divers and self-regulatory driving practices were investigated to understand how they can be used for this purposes. The result of the studies can be used for countermeasure development for older and younger drivers and controlling their aberrant behaviors. Moreover, the study results also can be used to re-examination for inaccurate applications based on priori beliefs. Especially for younger drivers tactical self-regulation can be a good target for controlling risky behaviors and performance limits of this group. Education and media campaigns could be shaped for suggesting tactical self-regulatory strategies by supporting motivational factors behind them. In addition to them, both for older and younger drivers, while supporting tactical self-regulation, controlling and manipulating strategical self-regulation should be helpful. The study findings suggest that for these study participants, strategical self-regulation has been working differently and before trip decisions have adverse effects, therefore decisions during driving could be enhanced by specific countermeasures. Lastly, it should be noted that investigations about behavioral mechanisms of older and younger drivers indicate that they are distinct driver groups with different dynamics and need different countermeasures even their accident liability triggered by similar motivational factors and could be controlled by same factors.

4.6 Limitations of the Study and Suggestions for Future Research

The current study has some limitations. First of all, participants of this study were males and this makes the findings only generalizable for male older and younger drivers. It was known that female divers' self-regulatory driving practices are different from males and they generally adopt more self-regulatory driving practices than males (Gwther, & Holland, 2012). For future studies, inclusion female drivers and other age groups could give more information about self-regulatory driving practices of general population.

Secondly, for older drivers it is know that health conditions especially that are related with cognitive functioning are very important for driving abilities, skills and awareness about their performance (O'Neil, & Dobbs, 2004). In order to control, the possible confounding effects of age-related cognitive declines, health and functional abilities were used in this study. However, detailed medical screening could be more helpful to exclude the drivers' who are not suitable for driving and not suitable for self-reported driving behaviors. Furthermore, if medical screening could be done in this study, age range of older drivers might be not restricted as 75 and more older drivers behavioral mechanism could be tested. Therefore, in the future studies medical screening should be used for controlling any confounding effect of medical conditions of the participants.

Lastly, younger participants were usually university student and their educational level is high. This might affect their awareness level about their performance and they might use self-regulatory strategies more than general younger population. Therefore, future studies should select younger participants with different level of education.

In future studies, investigating and finding other possible motivator factors underlying self-regulatory driving behaviors for younger drivers should be helpful in order to enhance their driving performance. Especially, both for older and younger drivers' tactical self-regulatory behaviors should be studies in detail and factors related with these practices should be explored. In addition to them, understanding the reason of adverse effect of strategical self-regulation, more studies should be applied before recommend these level decisions. Moreover, life-goal decisions might be important part of driving self-regulation, this level item should be re-explored, more items and cultural specific items should be added to understand this level decisions and effects of them. Lastly, the relationship between aberrant driver behaviors and self-regulatory driving behaviors should be re-tested in order to be sure about performance effect of self-regulation. Lastly, self-regulatory behaviors might be directly related with crash involvement rate of the drivers and in order to get more information about safety effects of self-regulatory driving practices, more studies should be done for investigating direct effect of self-regulatory driving behaviors on accident involvement.

Older and younger drivers accident trend have important mobility and safety consequences. The world has been aging and new drivers have been increasing every day. They have both strengths and weaknesses, strengths can be used for controlling weaknesses as self-regulatory driving practices provide us.

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APPENDICES

Appendix A: Ethical Permissions

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
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Gönderilen : Doç. Dr. Türker Özkan
Psikoloji Bölümü

Gönderen : Prof. Dr. Canan Özgen
IAK Başkanı

İlgi : Etik Onayı

Danışmanlığını yapmış olduğunuz Psikoloji Bölümü öğrencisi Derya Azık'ın "Driving Confidence, Self -Rated Ability, Self-Regulation Behavior, and Driving Behavior Questionnaire Relationship Among Young and Old Drivers / Yaşlı ve Genç Sürücülerde Trafikte Kendine Güven, Beceri Değerlendirmesi, Öz Düzenleyici Davranışlar ve Sürücü Davranışları Anketi Arasındaki İlişki" isimli araştırması "İnsan Araştırmaları Komitesi" tarafından uygun görülerek gerekli onay verilmiştir.

Bilgilerinize saygılarımla sunarım.

Etik Komite Onayı

Uygundur

08/04/2014

Prof.Dr. Canan Özgen
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Appendix B: Informed Consent Form for Participants

Gönüllü Katılım Formu

Bu araştırma ODTÜ Trafik ve Ulaşım Psikolojisi Bölümü öğrencisi Derya Azık tarafından tez çalışması için yürütülmektedir. Çalışmanın amacı, farklı yaş gruplarındaki sürücülerin trafikteki öz düzenleyici davranışlarını uygulanan anketlerle araştırmaktır. Çalışmada, kimlik belirleyici hiçbir bilgi istenmemektedir. Anket formları gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir; elde edilecek bilgiler sadece bilimsel yayımlarda kullanılacaktır.

Çalışma genel olarak kişisel rahatsızlık verecek bir etkileşim içermemektedir. Ancak, katılım sırasında her hangi bir nedenden ötürü kendinizi rahatsız hissederseniz çalışmayı bırakmakta serbestsiniz. Çalışmanın sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için ODTÜ Psikoloji Bölümü öğretim üyelerinden Doç. Dr. Türker Özkan (Oda: B123; Tel: 0312 210 5118; E-posta: ozturker@metu.edu.tr) veya öğrencilerinden Derya Azık (Oda: BZ08; Tel: 0312 210 31 54; E-posta: deryaazik@gmail.com) ile iletişim kurabilirsiniz.

Bu çalışmaya tamamen gönüllü olarak katılıyorum ve istediğim zaman yarıda kesip çıkabileceğimi biliyorum. Verdiğim bilgilerin bilimsel amaçlı yayımlarda kullanılmasını kabul ediyorum. (Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyad Tarih İmza

----/----/-----

Appendix C: Demographic Information Form

Lütfen, aşağıdaki soruları size göre doğru olan seçeneği işaretleyerek veya doğru cevabı yazarak cevaplayınız. Seçenekler arasında seçiminizi yaptığınız zaman, lütfen siyah kurşun kalem kullanarak dairenin içerisini karalayınız.

1. Yaşınız:__________ 2. Cinsiyetiniz **O** Kadın **O** Erkek

3. Eğitim düzeyiniz nedir?

O İlkokul **O** Ortaokul **O** Lise **O** Ön Lisans **O** Lisans **O** Yüksek lisans **O** Doktora

4. Yaşadığınız yerleşim birimini belirtiniz.

O Köy **O** Kasaba **O** İlçe **O** Şehir **O** Büyükşehir

5. Ne kadar süredir ehliyet sahibisiniz**?** __________________yıl

6. **Geçen yıl** kaç km araç kullandınız**?**__________________________ Km

7. **Ehliyetinizi aldığınızdan bu yana** kaç km araç kullandınız? ____________________ Km

8. En sık kullandığınız araç türü: ________________________

9. **Son üç yıl içerisinde** sürücü olarak başınızdan geçen kaza sayısı (en ufak çarpışmaları dahi sayarak) kaçtır? __________________

10. **Son üç yıl içerisinde,** sürücü olarak başınızdan geçen **aktif kaza** (sizin bir araca yayaya veya nesneye çarptığınız kazalar) sayısı kaçtır? __________________

11. **Son üç yıl içerisinde,** sürücü olarak başınızdan geçen **pasif kaza** (bir başka araç sürücüsünün size çarptığı kazalar) sayısı kaçtır? _________________

Appendix D: Health and Functional Abilities for Safe Driving Scale

Genel Sağlık Durumu Anketi

Aşağıdaki durumları genel olarak nasıl değerlendirirsiniz? **Aşağıda verilen her bir madde için sizden istenen verilen durumların her biri için kendi değerlendirmenizi belirtmenizdir.** Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap aralığı: **1= Zayıf, 7= Çok iyi**							
	1 Zayıf	**2**	**3**	**4**	**5**	**6**	**7 Çok iyi**
1) Genel sağlık durumunuz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
2) 1 kilometrelik mesafeyi yürüme beceriniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
3) Merdivenleri ikişer ikişer çıkma beceriniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**

Aşağıdaki durumları güvenli araç kullanmanız açısından değerlendirirsiniz? **Aşağıda verilen her bir madde için sizden istenen verilen durumların her biri için kendi değerlendirmenizi belirtmenizdir.** Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap aralığı: **1= Zayıf, 7= Çok iyi**							
	1 Zayıf	**2**	**3**	**4**	**5**	**6**	**7 Çok iyi**
4) Gündüz görme yetiniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**

5) Gece görme yetiniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
6) Bir şeyleri hatırlama beceriniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
7) Aynı anda birden çok şeye odaklanma beceriniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
8) Gücünüz, esnekliğiniz ve genel hareketliliğiniz	**O**	**O**	**O**	**O**	**O**	**O**	**O**
9) Yaşıtlarınızla karşılaştırdığınızda güvenli araç kullanma becerinizi nasıl değerlendiriyorsunuz?	**O**	**O**	**O**	**O**	**O**	**O**	**O**

Appendix E: Self-Rated Driving Abilities Scale

Sürüş Beceri Değerlendirme Anketi

Aşağıda verilen her bir madde için sizden istenen verilen sürüş koşullarındaki becerinizi değerlendirmenizdir.
Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap seçenekleri:

1= Çok Zayıf 2= Zayıf 3=Yeterli 4= İyi 5= Çok İyi

	1 Çok zayıf	**2 Zayıf**	**3 Yeterli**	**4 İyi**	**5 Çok iyi**
1) Trafik işaretlerini anlayabilmek	O	O	O	O	O
2) Trafikteki boşlukları değerlendirebilmek	O	O	O	O	O
3) Araçları, yayaları ve benzeri şeyleri göz ucuyla fark edebilmek	O	O	O	O	O
4) Işığın az olduğu durumlarda net bir şekilde görebilmek	O	O	O	O	O
5) Parlak ışıklı durumlarda ne bir şekilde görebilmek	O	O	O	O	O
6) Trafikte hızlı karar verebilmek	O	O	O	O	O
7) Trafikte hızlı tepki verebilmek	O	O	O	O	O
8) Tanıdık olmayan bir yerde yolu bulabilmek	O	O	O	O	O
9) Önceden bir kere gidilmiş yolu daha sonra hatırlayıp bulabilmek	O	O	O	O	O
10) Uzun yolda araç kullanırken uyanık/ ayık kalabilmek	O	O	O	O	O
11) Dikkatinizin dağıldığını fark edebilmek	O	O	O	O	O
12) Akan trafik hızını değerlendirebilmek	O	O	O	O	O
13) Aynı anda iki ayrı şeye dikkatinizi verebilmek	O	O	O	O	O
14) Sınırlı bir alana geri geri park edebilmek	O	O	O	O	O

Appendix F: Driving Confidence Scale

Sürüş Özgüveni Anketi

Aşağıda verilen her bir madde için sizden istenen verilen durumların her birinde çoğunlukla ne derecede gerginlik hissettiğinizi belirtmenizdir.
Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap seçenekleri:

1=Hiç 2= Biraz 3= Kısmen 4= Çok 5= Aşırı Derecede 6= Uygun Değil

	1 Hiç	**2 Biraz**	**3 Kısmen**	**4 Çok**	**5 Aşırı Derecede**	**6 Uygun Değil**
1) Sollama yaparken	**O**	**O**	**O**	**O**	**O**	**O**
2) Sağa dönüş yaparken	**O**	**O**	**O**	**O**	**O**	**O**
3) Küçük bir dönel kavşaktan dönüş yaparken	**O**	**O**	**O**	**O**	**O**	**O**
4) Geniş bir dönel kavşaktan dönüş yaparken	**O**	**O**	**O**	**O**	**O**	**O**
5) Otobana giriş yaparken	**O**	**O**	**O**	**O**	**O**	**O**
6) Otobanda şerit değiştirirken	**O**	**O**	**O**	**O**	**O**	**O**
7) Yoğun trafikte araç kullanırken	**O**	**O**	**O**	**O**	**O**	**O**

Aşağıda verilen her bir durumda sizden istenen araç kullanırken oluşabilecek bazı hislerin, sizin tarafınızdan çoğunlukla ne ölçüde deneyimlendiğini belirtmenizdir.
Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap seçenekleri

1=Hiç 2= Biraz 3= Kısmen 4= Çok 5= Aşırı Derecede 6= Uygun Değil

	1 Hiç	**2 Biraz**	**3 Kısmen**	**4 Çok**	**5 Aşırı Derecede**	**6 Uygun Değil**

8) Araç kullanırken kendinizi genelde ne kadar rahat hissedersiniz?	**O**	**O**	**O**	**O**	**O**	**O**
9) Araç kullanırken kendinizi genelde ne kadar stresli hissedersiniz?	**O**	**O**	**O**	**O**	**O**	**O**
10) Araç kullanırken kendinize ne derecede güvenirsiniz?	**O**	**O**	**O**	**O**	**O**	**O**
11) Araç kullanırken ani ve tehlikeli bir durumla karşılaştığınızda ne derecede telaşlanırsınız?	**O**	**O**	**O**	**O**	**O**	**O**
12) Araç kullanırken ani gelişen ve size düşünmek için az zaman bırakan durumlarda ne derecede sakin kalabilirsiniz?	**O**	**O**	**O**	**O**	**O**	**O**

Appendix G: Revised Version of Advanced Driving Decisions and Patterns of Travel Scale

Trafikte Öz Düzenleyici Davranışlar Anketi

Lütfen aşağıdaki soruları size göre <u>doğru olan seçeneği veya seçenekleri</u> işaretleyerek cevaplayınız. Değerlendirmelerinizi geçtiğimiz yıl boyunca kendinizin araç kullanma davranışlarından ne hatırlıyorsanız onları temel alarak yapınız.

1) Geçtiğimiz 1 yıl içinde yeni bir yere taşındınız mı?	Evet **O**	Hayır **O**
2) Geçtiğimiz 1 yıl içinde herhangi bir düzenli egzersiz ya da spor aktivitesine başladınız mı?	Evet **O**	Hayır **O**
3) Geçtiğimiz 1 yıl içinde yeni bir araç satın aldınız mı?	Evet **O**	Hayır **O**
4) Geçtiğimiz 1 yıl içinde araç kullanma miktarınızı azalttınız mı?	Evet **O**	Hayır **O**

Eğer 4. Soruya cevabınız EVET ise "4a ve 4b" numaralı soruları size en uygun olan seçeneği ya da seçenekleri işaretleyerek cevaplayınız. Size uygun olmayan seçeneği boş bırakınız. Eğer 4. Soruya cevabınız HAYIR ise 5.sorudan devam edebilirsiniz.

4a) Araç kullanma miktarınızı nasıl azalttınız?	
Haftada rutin olarak araç kullanılan gün sayısını azaltarak	**O**
Haftada rutin olarak yaptığınız seyahat sayısnı azaltarak	**O**
Haftalık katedilen kilometre miktarını azaltarak	**O**
Seyahatlerinizin mesafesini azaltarak	**O**
4b) Araç kullanma miktarınızı düşürme sebebiniz ya da sebepleriniz nelerdir?	
Gündüz görme güçlüğü çekmek	**O**

Gece görme güçlüğü çekmek	O
Bir şeyleri hatırlamakta güçlük çekmek	O
Aynı anda birden çok şeye odaklanmakta zorlanma	O
Gücünüzde, esnekliğinizde ve genel hareketliliğinizde zayıflama	O
Her gün araç kullanılması durumunda rahat hissetmeme	O
Her gün araç kullanılması durumunda güvende hissetmeme	O
Mali sebepler (petrol fiyatları, vb.)	O
Çevresel sebepler (egzoz gazı emisyonu, vb.)	O
Her gün araç kullanmaya ihtiyaç duymama	O
Diğer sebepler, lütfen belirtiniz. ___________________________________	

5) Gece araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
6) Sağa dönüş yapmanın yasak olduğu bir kavşakta, akan trafikte sağa dönüş yapmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
7) Kötü hava koşullarında araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
8) Trafiğin yoğun olduğu ortamlarda araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
9) Bilmediğiniz yerlerde araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
10) Yalnızken araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
11) Hava koşullarının kötü olduğu gecelerde araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
12) Trafiğin yoğun olduğu saatlerde araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
13) Otobanda araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
14) Geri geri araç kullanmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
15) Araç kullanırken yolcularla sohbet etmekten kaçınır mısınız?	Evet **O**	Hayır **O**

16) Araç kullanırken yemek yemekten kaçınır mısınız?	Evet **O**	Hayır **O**
17) Araç kullanırken yol haritasına bakmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
18) Araç kullanırken radyo kanalını değiştirmektan kaçınır mısınız?	Evet **O**	Hayır **O**
19) Araç kullanırken cep telefonuyla konuşmaktan kaçınır mısınız?	Evet **O**	Hayır **O**
20) Araç kullanırken kişisel bakım yapmaktan kaçınır mısınız? (Makyaj yapmak, tıraş olmak, vb.)	Evet **O**	Hayır **O**
21) Genelde seyahate çıkmadan bir süre önce seyahat planı yapar mısınız – güzergâhınızı yazmak buna dâhil?	Evet **O**	Hayır **O**
22) Genelde bir güzergâha alışmak için bir süre pratik yapar mısınız?	Evet **O**	Hayır **O**
23) Birkaç seyahatinizi birleştirip tek seyahat haline getirerek toplam yolculuğunuzu azaltır mısınız?	Evet **O**	Hayır **O**
24) Kendi aracınız ve takip ettiğiniz araç arasındaki mesafe şu an, geçmişte bıraktığınız mesafeden daha fazla mı?	Evet **O**	Hayır **O**
25) Size yol göstermede yardımcı olması için yanınıza yolcu alır mısınız?	Evet **O**	Hayır **O**

Appendix H: Driver Behavior Questionnaire

Araç Kullanma Tarzı Anketi

Lütfen, aşağıdaki soruları size göre doğru olan seçeneği işaretleyerek veya doğru cevabı yazarak cevaplayınız. Seçenekler arasında seçiminizi yaptığınız zaman, lütfen siyah kurşun kalem kullanarak aşağıda gösterildiği şekilde dairenin içerisini karalayınız.

Aşağıda verilen durumların her birini ne sıklıkta yaparsınız?

Aşağıda verilen her bir madde için sizden istenen bu tür şeylerin sizin başınıza NE SIKLIKLA geldiğini belirtmenizdir. Değerlendirmelerinizi geçtiğimiz yıl boyunca kendinizin araç kullanma davranışlarından ne hatırlıyorsanız onları temel alarak yapınız. Lütfen değerlendirmelerinizi size göre doğru olan seçeneği karalayarak belirtiniz. Her bir soru için cevap seçenekleri:
1= Hiç bir zaman 2= Nadiren 3= Bazen 4= Oldukça sık 5= Sık sık 6= Neredeyse her zaman

		1	2	3	4	5	6
1.	Geri geri giderken önceden fark etmediğiniz bir şeye çarpmak	O	O	O	O	O	O
2.	A yönüne gitmek amacıyla yola çıkmışken kendinizi daha alışkın olduğunuz B yönüne doğru araç kullanırken bulmak	O	O	O	O	O	O
3.	Yasal alkol sınırlarının üzerinde alkollü olduğunuzdan şüphelenseniz de araç kullanmak	O	O	O	O	O	O
4.	Dönel kavşakta dönüş istikametinize uygun olmayan şeridi kullanmak	O	O	O	O	O	O
5.	Anayoldan sola dönmek için kuyrukta beklerken, anayol trafiğine dikkat etmekten neredeyse öndeki araca çarpacak duruma gelmek	O	O	O	O	O	O
6.	Anayoldan bir sokağa dönerken karşıdan karşıya geçen yayaları fark edememek	O	O	O	O	O	O
7.	Başka bir sürücüye kızgınlığınızı belirtmek için korna çalmak	O	O	O	O	O	O
8.	Bir aracı sollarken ya da şerit değiştirirken dikiz aynasından yolu kontrol etmemek	O	O	O	O	O	O
9.	Kaygan bir yolda ani fren veya patinaj yapmak	O	O	O	O	O	O

10.	Kavşağa çok hızlı girip geçiş hakkı olan aracı durmak zorunda bırakmak	O	O	O	O	O	O
11.	Şehir içi yollarda hız sınırını aşmak	O	O	O	O	O	O
12.	Sinyali kullanmayı niyet ederken silecekleri çalıştırmak	O	O	O	O	O	O
13.	Sağa dönerken yanınızdan geçen bir bisiklet ya da araca neredeyse çarpmak	O	O	O	O	O	O
14.	“Yol ver” işaretini kaçırıp, geçiş hakkı olan araçlarla çarpışacak duruma gelmek	O	O	O	O	O	O
15.	Trafik ışıklarında üçüncü vitesle kalkış yapmaya çalışmak	O	O	O	O	O	O
16.	Sola dönüş sinyali veren bir aracın sinyalini fark etmeyip onu sollamaya çalışmak	O	O	O	O	O	O
17.	Trafikte sinirlendiğiniz bir sürücüyü takip edip ona haddini bildirmeye çalışmak	O	O	O	O	O	O
18.	Otoyolda ileride kapanacak bir şeritte son ana kadar ilerlemek	O	O	O	O	O	O
19.	Aracınızı park alanında nereye bıraktığınızı unutmak	O	O	O	O	O	O
20.	Solda yavaş giden bir aracın sağından geçmek	O	O	O	O	O	O
21.	Trafik ışığında en hızlı hareket eden araç olmak için yandaki araçlarla yarışmak	O	O	O	O	O	O
22.	Trafik işaretlerini yanlış anlamak ve kavşakta yanlış yöne dönmek	O	O	O	O	O	O
23.	Acil bir durumda duramayacak kadar, öndeki aracı yakın takip etmek	O	O	O	O	O	O
24.	Trafik ışıkları sizin yönünüze kırmızıya döndüğü halde kavşaktan geçmek	O	O	O	O	O	O
25.	Bazı tip sürücülere kızgın olmak (illet olmak) ve bu kızgınlığı bir şekilde onlara göstermek	O	O	O	O	O	O
26.	Seyahat etmekte olduğunuz yolu tam olarak hatırlamadığınızı fark etmek	O	O	O	O	O	O
27.	Sollama yaparken karşıdan gelen aracın hızını olduğundan daha yavaş tahmin etmek	O	O	O	O	O	O
28.	Otobanda hız limitlerini dikkate almamak	O	O	O	O	O	O

Appendix I: Turkish Summary

Trafik kazaları, dünyaca ölümlerin başlıca sebeplerinden biridir ve her yıl ortalama 1.24 milyon insan trafik kazaları nedeniyle hayatlarını kaybetmektedirler (WHO, 2013). Trafik kazalarını kontrol altına almak için problem sistematik bir bakış açısıyla yaklaşmak yararlı olabilir.

Literatürde genel olarak yaşlı ve genç sürücülerin kazaya karışma oranlarının fazla olduğu bilinmektedir (Porter, 2011; Ryan, Legge, ve Rosman, 1998). Kazaya karışmanın yanı sıra, bu iki riskli grup kazaya sebebiyet verme konusunda da ilk iki sıradadırlar (Williams, ve Shabanova, 2003). Bunların yanında dünyanın yaşlandığı gerçeği ve trafik kazası sebebiyle meydana gelen genç ölümlerin artması, potansiyel tehlikelerin kontrol altına alınması gerekliliğini daha da artırmaktadır (United Nations, 2009; Elvik, 2010).

Yaşlı sürücüler, araba kullandıkları kilometre başına en yüksek kaza oranına sahip gruptur, bunun yanında kaza sonunda ağır yaralanmalar da en çok bu grupta görülmektedir (Hakamies-Blomqvist, Wiklund, Henrikson, 2005). Yaralanmaların ciddi olması yaşa bağlı hassaslıktan ileri gelirken, kazalar da genellikle görsel, bilişsel ve fiziksel problemlere atfedilmektedir. Bilindiği üzere yaş arttıkça, bireylerin yetilerinde ve sağlıkların da kötüleşmeler başlamaktadır ve yaşa bağlı bu özellikler kişilerin araba kullanma yetilerini olumsuz yönde etkilemektedir (Carter, 2006; Shanmugaratman, Kass, ve Arruda, 2010; Freund, ve Smith, 2011). Genç sürücülerin de diğer sürücü gruplarından 5-10 kata kadar fazla kazaya karışmaktadırlar (Elvik, 2010, OECD, 2006). Bu sürücü grubu araç kullanmayı yeni öğrendikleri için ve tam olarak zihinsel ve bedensel olarak olgunlaşamadıkları için, araç kullanmak için kritik önem taşıyan üst düzey bilişsel yetilere henüz tam olarak sahip değillerdir (Deery, 1999). Bunların yanında henüz ergen oldukları için çok fazla riskli davranış içinde bulunmaktadırlar (Clarke, Ward, ve Truman, 2005). Yaşlı ve genç sürüler farklı özelliklere sahip olsalar ve farklı nedenler kazaya karışma oranlarını etkilese de, trafik kazalarını daha iyi anlamak için bu problem daha geniş bir bakış açısından bakmak daha faydalı olabilir.

Trafik psikolojisi kaynaklarında, kaza sebepleri genel olarak 3 genel kategori de sınıflandırılabilir. Bunlar insan, araç ve çevre faktörüdür (Evans, 2004). Bu üç faktör içinde kaza oranlarını en çok etkileyen faktör insandır ve sıralama çevre ve araç olarak devam etmektedir (Treat ve ark., 1979). İnsan faktörleri de, 2 temel kategori de incelenmektedir. Bunlar da sürücülük becerileri ve sürücü davranışları olarak sınıflandırılmaktadır (Özkan, Lajunen, ve Summala, 2006). Sürücü becerileri, bilgi işlem süreçlerini ve motor becerileri içerirken, sürücü davranışları, sürücünün inaçlarını, düşüncelerini, genel motivasyonlarını ve alışkanlıklarının yansımasıdır (Elander, West, ve French, 1993). Bu iki faktörün de trafik kazalarıyla ilişkisi vardır ve öğrenme sürecinden sonar bu iki faktör birbiriyle etkileşim halindedir (Lajunen, ve Özkan, 2011, Özkan, 2006). Ancak, kişilerin seçimleri, kişilerin performans yetersizliklerini kullanmak için de kullanılabileceği için araç kullanmayı öğrenme periyodu tamamlandıktan sonra, sürücü davranışlarının, performanstan daha önemli bir etkiye sahip olduğu söylenilebilir (Lajunen, 1997; Evans, 1996).

Kazalarla olan yakın ilişkisi nedeniyle sürücü davranışları, trafik psikolojisinde sıklıkla araştırılan bir konudur . Son zamanlarda kaza ilişkilerini modellerle inceleyen araştırmacılardan birisi de Sümer'dir ve modellinde kazaya sebebiyet veren faktörler sırasıyla işlenmektedir (2003) Modeli daha ayrıntılı anlatacak olursak, öncelikle model üç ana başlıktan oluşmaktadır. Uzak faktörler, yakın faktörler ve kaza. Uzak faktörler, bireylerin genel yatkınlıklarını kapsamaktadır. Bunların içinde kültürel faktörler, demografik faktörler, kişilik faktörleri, bilişsel faktörler ve kişinin inançları gibi içerikler bulunmaktadır. Bu faktörler kazayla dolaylı yoldan ilintilidir ve yakın faktörler üzerinden bir ilişkisi vardır. Yakın faktörler ise daha günlük sürüş pratikleriyle alakalıdır ve hızlı araç kullanma, ihlal yapma, alkollü araç kullanma gibi davranışlar bu faktörün altındalardır be bu faktör kazalarla direk bir ilişki halindedir (Sümer, 2003). Kazaları modellerle incelemek, daha sistematik ilerleme ve daha çok bilgi sağlamaktadır ve farklı grupların ve farklı kaza tiplerinin altında yatan sebepler ve bu sebeplerin ilişkileri birbirinden farklıdır. Bu sebeple, özel grupları özel modellerle incelemek, o grupları anlamak ve o gruplara özel çözümler üretmek için güzel bir teknik olabilir (Lajunen, 1997). Bu nedenle, bu çalışmanın bundan sonraki kısmında yaşlı ve genç sürücüleri güvenli ve güvenli olmayan davranışları bağlamsal model çerçevesinde işlenmiştir.

Güvenli araç kullanmak için yoldan gelen bilgileri doğru bir şekilde algılamak ve anlamlandırmak kritik önem taşımaktadır. Ancak, daha önce de belirtildiği gibi yaş arttıkça, araç kullanmak için kritik öneme sahip bazı yetilerde azalmalar gözlemlenmektedir ve bunların başında fiziksel, görsel ve bilişsel yetiler gelmektedir (Eby ve ark., 1998, Owsley, 2004). Örneğin, fiziksel yetilerinde problem olan yaşlılar için aracı şeritte tutma, vites değiştirme hatta freni kontrol etmek bile zor hale gelmektedir (Owsley, 2004; Shanmugratnam, Kass, ve Arruda, 2010). Bunun yanında, görme yetisi araç kullanmanın temelini oluşturduğu için en ufak görme problem bile çeşitli yol koşullarında araç kullanmayı imkansız hale getirebilmektedir (Ball ve ark., 1993; Owsley ve ark., 1998). Bunlara ek olarak, bilişsel olarak problem yaşayan yaşlıların kazaya karışma oranları diğer yaşıtlarına göre daha fazladır ve bu yaşlılar çevreden gelen bilgileri doğru anlamlandırma ve bunlara uygun doğru karar ve tepki verebilmekte problemler yaşamaktadırlar (Shinar, 2007; Stutts, Stewart, ve Martell, 1998). Yaşa bağlı bu özelliklerin hepsi genel sağlık durumu faktörü altında toplanabilir.

Yaşa bağlı yetilerde azalma, kişilerin araç kullanma yetilerini de negatif etkilemektedir ve bu nedenle yaşlı sürücülerin karıştığı kaza türleri diğer yol sürücülerinden farklıdır (Hakamies-Blomqvist, 2004). Bu grubun kazaya karışma oranları ve kaza tipleri farklı olsa da, bu grubun kazalarını kontrol altına almak için farkındalıkları kritik önem taşımaktadır. Yaşa bağlı yetilerde kötüleşmeyi ve araç kullanma performanslarındaki kötüleşmeyi fark ederlerse bu duruma göre kendilerini adapte edebilmektedirler. Bu nedenle beceri değerlendirmeleri kritik önem taşımaktadır (Horswill ve ark., 2013). Gerçekçi beceri değerlendirmelerinin yanı sıra, gerçekçi öz güven de trafik güvenlikleri ve farkındalıkları için kritik önem taşımaktadır. Çalışmalar, gerçek yeti seviyesinin yansımasından fazla ve gerçekçi olmayan öz güven seviyesine sahip yaşlıların daha çok kazaya karıştıklarını ortaya koymaktadır (Wood, Lacherez, ve Anstey, 2013). Bu genel faktörlerin hepsi, kazaya dolaylı yoldan sebebiyet veren faktörlerdir ve yaşlı sürücüler için uzak faktörler başlığı altında toplanılabilir.

Literatürde genç sürücülerin kazaya neden olan özellikleri genel olarak 2 başlık altında toplanmaktadır: yaşa bağlı faktörler, henüz olgun olmama ve riskli davranışları tercih etme gibi ve deneyimsizlik yetersiz araç kullanma kabiliyeti (Shinar, 2007). Bazı yetilerin henüz olgunlaşamaması, beyin gelişimlerinin henüz tamamlanmamış olmasıyla alakalandırılmaktadır. Örneğin dürtüsel davranışları, davranışlarının sonuçlarını gerçekçi olarak değerlendirememeleri, düzgün bir şekilde sürüş planı yapamamaları, olgunlaşmamış beyin fonksiyonlarıyla alakalıdır (Glendon, 2011; Huang, ve Winston, 2011; Steinberg, 2005; Paus, 2005). Bilişsel olgunlaşmanın yanında, genç sürücüler sosyal ve davranışsal açıdan da hala gelişmektedirler. Kim olduklarını anlamaya çalışma, kendi yetilerini ve kabiliyetlerini keşfetme, kendi sınırlarını da test etme isteği doğurmaktadır ve bu istek diğer alanlar da olduğu gibi trafikte de problemlere ve riskli davranışlara sebebiyet vermektedir (Lam, 2003; Williams, 2003; Keatig, ve Halpern-felsher, 2008; Shope, ve Bingham, 2008).

Genç sürücüler için deneyimsizlik de kazaya sebebiyet veren önemli faktörlerden biridir (Shinar, 2007). Her ne kadar, temel araç kullanma yetilerinin kolayca öğrenildiği bilinse de üst düzey algısal ve bilişsel yetiler sadece deneyimle gelişmektedir (Derry, 1999; Huang, ve Winston, 2011). Yaşlı sürücüler de olduğu gibi bu yetiler kadar yetilerin farkında olmak kritik önem taşımaktadır, çünkü eğer kişi eksikliklerinin farkındaysa bunları telafi edebilecek yöntemleri uygulayabilir (Hatakka ve ark., 2002). Bunların yanında gençleri riskli davranışlara iten bir başka önemli sebepte aşırı özgüvendir ve gerçekçi olmayan öz-güven gerçekçi olmayan risk algısıyla, gerçekçi olmayan risk algısı da genç sürücüler için kazaya sebebiyet veren en önemli etmenlerden biridir (Gregersen, 1996). Yaşlı sürücüler de olduğu gibi genç sürücülerde de bu genel faktörlerin hepsi, yaşlarının karakteristiğini yansıtmaktadır ve kazayla dolaylı yoldan ilintili faktörlerdir.

Yaşlı sürücüler literatürü dikkat ile incelendiğinde özellikle bu grup için modelin sadece uzak ve yakın faktörlerden oluşmayabileceği ve arada bir bağlamsal bir faktör olabileceğini ortaya koymaktadır ve bu faktör öz-düzenleyici trafik davranışlarıdır. Öz-düzenleyici davranışlar, bireyin kendini güvenli veya rahat hissetmediği durumlarda, o durumdan kaçınması ya da sürüşünü bu duruma göre uyarlaması olarak tanımlanır ve genel olarak yaşlı sürücü literatüründe yaşa bağlı yeti ve kabiliyet azalmalarını kontrol altında tutmak için uygulanan bir baş etme yöntemi olarak işlenmektedir (Molnar, ve Eby, 2009). Daha çok yaşlı sürücüler tarafından tercih edilmesine rağmen, son yıllarda yapılan çalışmalar gençler tarafından da kullanıldığını ortaya koymaktadır (Naumann, Dellinger, ve Kresnow, 2011). Bu bağlam da genel grup özellikleri ve kazayla doğrudan ilişkili olan faktörlerin arasında bu stratejilerin yaşlı ve genç sürücüler için araştırılması faydalı olabilir.

Öz-düzenleyici davranışlar, üç başlık altında incelenebilir. Bunlardan ilk ikisi stratejik ve taktiksel öz-düzenleyici davranışlar olup, Michon'ın (1985) hiyerarşisinden uyarlanmıştır. Son faktör işe hayat-amacı faktörü olup Keskinen'in modelinden (2011) uyarlanmıştır (Eby ve ark., 2009). Stratejik öz-düzenleyici davranışlar üst seviye kararları, planları ve stratejileri barındırır. Yolculuk planı, rota seçimi, yolculuğun kazançları ve kayıpları gibi, yolculuk öncesi planları içermektedir. Taktiksel öz-düzenleyici davranışlar ise sürüş esnasında o anki etkilere göre şekillenen kararlardır. Hız ayarlaması, takip mesafesi, engellerden kaçınma, araç içi dikkat dağıtıcılardan kaçınma gibi davranışlar bu faktöre aittir. Son seviye hayat amacı ise sürücünün kalıcı özelliklerinin trafiğe yansıması olarak betimlenebilir. Kişinin genel seçimlerinin, motivasyonlarının ve inançlarının trafik ortamına yansıması ve bu kişisel özelliklerin trafikte yönlendirdiği kararlarıdır (Molnar, 2013). Yaş, cinsiyet, fonksiyonel aksaklıklar, sağlık durumu, görme yetisi, bilişsel faktörler, yetilerle alakalı farkındalık, öz-güven, geçmiş kaza sayısı, trafikte hissedilen stres, azalmış sürüş ihtiyacı, ikinci sürücü imkanı, toplu taşıma olanakları gibi faktörler öz-düzenleyici davranışları etkileyen etmenler olarak sıralanabilir (Charlton, ve ark., 2006; Hakamies-Blomqvist, ve Wahlström, 1998).Kişisel özellikler ve bu kişisel özellikleri kontrol altında tutmaya yarayacak öz-düzenleyici davranışları inceledikten sonra bunların sapkın sürücü davranışlarıyla olan ilişkisini incelemek, kazaları anlamak ve engellemek açısından önemli olabilir.

Sapkın sürücü davranışları ilk olarak iki genel başlık altında incelenmiştir bunlar ihlaller ve hatalardır. Bu iki davranış arasında kesin bir çizgi olup ihlaller kasten tehlike içeren ortamlarda güvenlik için gerekli davranışları göstermemek olarak tanımlanırken, hatalar planlanmadan yapılan sürücülük ya da performans yanlışlıkları olarak tanımlanabilir (Reason, 1990). Bu iki davranışın altında yatan etmenler de birbirinden çok farklıdır. Örneğin, hatalar genel olarak bilişsel süreç ve performans sınırlarının yansıması olup kasıt içermezken, ihlaller kişinin alışkanlıklarının ve seçimlerinin yansıması olup, kasıtlı yapılan davranışlardır (Oppenheim, & Shinar). Bu genel gruplamalardan sonra çalışmalar ihlallerin ikiye ayrılabileceğini ortaya koymuştur ve ihlaller saldırgan amaç ile işlenilenler ve sıradan kural ihlalleri adı altında incelenmeye başlanmıştır (Lawton, 1997). Çalışmalar gösteriyor ki yaşlı ve genç sürücüler için de bu sapkın davranışlar önemlidir ve yaşlı sürücüler genel de daha çok hata yaparlar iken genç sürücüler daha çok trafikte ihlal yapmaktadırlar (Özkan, Lajunen, ve Summala, 2006; Parker ve ark., 2000). Ayrıca, literatürde sapkın sürücü davranışlarının kazaya sebebiyet verdiği ortaya konmaktadır ve kazalarla doğrudan ilişki halindedirler (Winter, ve Dodou, 2010).

Çalışmanın genel amaçları şunlardır:

- Yaşlı ve genç sürücülerin genel sağlık durumu, sürüş beceri değerlendirmeleri, sürüş özgüveni, öz-düzenleyici davranışları ve sapkın sürücü davranışları açısından karşılaştırılarak incelenmesi
- Trafikte öz-düzenleyici davranışlar bağlamsal modelinin oluşturulması ve yaşlı ve genç sürücüler için ayrı ayrı test edilmesi
- Genel Sağlık Durumu Anketi, Sürücü Beceri Değerlendirme Anketi, Sürüş Özgüveni Anketi ve Öz-Düzenleyici Davranışlar Anketinin Türkçeye ve Türk verisine uyarlanması ve faktör dağılımının genç ve yaşlı sürücüler için incelenmesi

Çalışmaya toplam 258 aktif erkek sürücü katılmıştır. Bunların120'si yaşlı sürücü ve 138'I genç sürücüdür. Yaşlı sürücülerin yaş aralığı 60-75 olarak belirlenirken, genç sürücüler için ise en az 3 yıldır ehliyet sahibi olup, en az 3000 kilometre araç kullanmış olma şartı konulmuştur. Data toplanmasına başlamadan önce Genel Sağlık Durumu Anketi (Molnar et al., 2013), Sürücü Beceri Değerlendirme Anketi ve Sürüş Özgüveni Anketi'nin (Parker et al., 2001) ve Trafikte Öz Düzenleyici Davranışlar Anketi (Molnar et al., 2013) Türkçeye çevrilmiş, uyarlamaları yapılmıştır. Bunlara ek olarak Türkçe uyarlamasının Lajunen ve Özkan (2004) tarafından yapıldığı Sürücü Davranışları Anketi de (SDA) çalışmaya dâhil edilmesine kara verilmiştir. Datalar toplanmadan önce gerekli izinler alınmış ve daha sonra veri Balıkesir, İstanbul ve Ankara'da yaşayan sürücülerden anketler toplanmıştır. Anketler önce yaşlı sürücülerden, daha sonra da genç sürücülerden toplanmıştır.

Analizler, Türk verisinde ilk defa kullanılan Genel Sağlık Durumu Anketi, Sürücü Beceri Değerlendirme Anketi ve Sürüş Özgüveni Anketi'nin ve Trafikte Öz Düzenleyici Davranışlar Anketlerinin yaşlı ve genç sürücüler için faktör yapılarının test edilmesiyle başlamıştır. Sonuçlara göre Genel Sağlık Durumu Anketi, yaşlı sürücülerde orijinal çalışma da olduğu gibi tek faktör yapısında bulunurken, genç sürücüler için maddeler fonksiyonel ve hareketlilik olarak gruplanmıştır. Beceri Değerlendirme Anketinde de yaşlı sürücüler tek faktör yapısını desteklerken, gençlerde bilişsel kabiliyetler, yön bulma ile alakalı kabiliyetler ve görme yetileri olarak sınıflanmıştır. Sürüş Özgüveni Anketi ise yaşlılar da iki ayrı faktörden oluşmaktadır ve rahat ve güvenli olmayan durumların sorulduğu maddeler ile rahat ve güvende hissedilen durumların sorulduğu sorular iyi his içerikli özgüven ve kötü his içerikli özgüven olarak gruplanmıştır. Genç sürücüler için yine faktör yapısı 2 bulunmuştur ama maddeler genel durum özgüveni ve belirli durum özgüveni olarak gruplanmıştır. Son olarak mini uyarlamasının uygulandığı Trafikte Öz-Düzenleyici Davranışlar anketinde işe her iki grupta da hayat amacı seviyesi maddeleri ve faktörü düşerken, iki grupta da stratejik ve taktiksel seviye davranışları grup olarak bulunmuştur. Aynı anketlerin, farklı faktör yapılarıyla işlemesi bu iki grubun davranış mekanizmalarının farklı olduğunu kanıtlamış ve öz-düzenleyici davranış modelleri işleyişinin de farklı olabileceğinin sinyalini vermiştir.

Faktör analizinden sonra iki grup arasındaki farkları ve benzerlikleri, ortaya atılan modeli test etmeden önce daha ayrıntılı araştırmak için değişkenleri ölçen her anketteki yaşlı ve genç sürücülerin değerlendirmeleri karşılaştırılmıştır. Faktör yapıları farklı olduğu için karşılaştırmalar, madde madde ANCOVA ile test edilmiştir. Öz-düzenleyici davranışlar anketi evet hayır seçeneklerinden oluştuğu için, bu anketin testi Ki-Kare Analizi ile yapılmıştır ve son olarak Sürücü Davranışları Anketi geçerlilik ve güvenirliği daha önce test edildiği için bu ankette karşılaştırma daha önce test edilmiş faktör yapısına göre yapılmıştır.

Sonuçlar şöyledir. Genç sürücülerin son 3 yıl kaza sayısı, yaşlı sürücülerin kaza sayılarından anlamlı derecede yüksek bulunmuştur. Bunun yanında, genel sağlık durumu, beceri değerlendirme ve sürüş özgüveni anketlerinde de genç sürücüler yaşlı sürücülerden anlamlı olarak daha yüksek puanlara sahiplerdir. Genel olarak genç sürücüler kendilerini yaşlılara oranla daha sağlıklı, daha becerili ve daha özgüvenli olarak görmektedirler. Bunlara ek olarak, öz-düzenleyici davranışların karşılaştırmasına göre hayat amaçlı öz-düzenleyici davranışlar haricindeki maddelerde genel olarak yaşlı sürücüler genç sürücülerden daha çok öz-düzenleme stratejilerini kullandıklarını rapor etmişlerdir. Hayat amaçlı davranışların gençler de daha çok görülmesinin nedeni, fonksiyonel aksaklıklar yaşayan insanlar için hayat dair kararlar vermenin zor olmasından kaynaklanabilir bunlara ek olarak yaşlıların kültürel olarak hayattan bekledikleri ve toplumun onlardan beklentisi bu seviye kararlarını almalarına engel oluşturabilir (Molnar, ve ark., 2013). Sonuç olarak faktör analizinde de bu maddelerin daha çok düştüğünü hesaba katarsak bu seviyenin maddelerini gelecek çalışmalar da tekrar gözden geçirip madde eklenmesi yapmak yaralı olabilir. Son olarak sapkın davranışlar karşılaştırması, bundan önce yapılan çalışmaları destekleyen nitelikte sonuçlar bulmuştur ve genç sürücüler yaşlı sürücülere oranla anlamlı derecede daha fazla agresif ve sıradan ihlal rapor etmişlerdir (Özkan, Lajunen, ve Summala, 2006; Parker ve ark., 2000).

Grup karşılaştırmaları yapıldıktan sonra, bu çalışma da önerilen Trafikteki Öz-Düzenleyici Davranışlar Bağlamsal Modeli test edilmeye başlanmıştır. Sonuçlara göre yaşlı sürücüler için öz-düzenleyici davranışların bağlamsal etkisi bulunulamamasına karşın genç sürücüler için duruma bağlı özgüven, stratejik öz-düzenleyici davranışlar ve ihmaller arasında kısmi bağlamsal ilişki bulunmuştur ancak bu etki beklenenin tersi yönündedir.

Bu analizlerden sonra değişkenler arasındaki ilişkileri daha ayrıntılı anlayabilmek için hiyerarşik regresyon analizleri genç ve yaşlı sürücüler için ayrı ayrı yapılmıştır. Yaşlı sürücülerde öz-düzenleyici davranışlar saldırgan ihlalleri yordamamıştır, bunun nedeni bu tür ihlallerin yaşın artmasıyla azalması olabilir (Rimmö, ve Hakamies-Blomqvist, 2002). Agresif ihlali yordayan bir öz-düzenleyici seviye bulunamazken, sıradan ihlallerin taktiksel öz-düzenleyici davranışlar tarafından negatif yönde yordandığı bulunmuştur. Bu sonuca göre taktiksel öz-düzenleyici davranışlar, sıradan ihlalleri kontrol altında almak için kullanılabilecek stratejiler arasında görünmektedir. Bunların yanında öz-düzenleyici davranışların güvenliğin tersi yönünde bazı sonuçlara neden olabileceğini ortaya koyan bazı sonuçlarda bulunmuştur. Yaşlı sürücüler için stratejik öz-düzenleyici davranışı daha çok benimseme, daha yüksek hata ve ihmal puanlarıyla ilintili bulunmuştur. Bu sonuçlar, taktiksel ve stratejik öz-düzenleyici davranışlar birbirleriyle pozitif ilişki de bulunmalarına karşın, pratikteki işleyişlerinin farklı olabileceğini akıllara getirmektedir. Öz-düzenleyici davranış ve sapkın davranış ilişki incelemesinden sonra, öz-düzenleyici davranışların altında yatan faktörler araştırmıştır. Yaşlı sürücüler için öz-güvenin stratejik öz-düzenleyici davranışları anlamlı olarak yordaması haricinde anlamlı bir ilişki bulunamamıştır. Bu sonuç, öz-düzenleyici davranışların altında yatan sebeplerin daha çok araştırılması gerekliliğini ortaya koymaktadır. Bunlar yanında genel sağlık durumu, beceri değerlendirme ve sürüş özgüveni, sapkın sürücü davranışlarıyla olan ilişkisi açısından test edilmiştir ve hata ve ihmaller için genel sağlık durumu, beceri değerlendirme ve kötü hislerle alakalı olan özgüvenin bu iki sapkın davranışı negatif bir biçimde yordadığı bulunmuştur.

Aynı analizler, genç sürücüler için de yapılmıştır. Gençler için taktiksel öz-düzenleyici davranışlar bütün sapkın sürücü davranışları negatif yordadığı bulunmuştur ve bu trafik güvenliği açısından önemli bir bulgudur. Bu sonuçlar, genç sürücülerin sapkın davranışlarının bu yolla kontrol edilebileceğini desteklemektedir. Fakat stratejik öz-düzenleyici davranışlar için sonuçlar yaşlı sürücüler de olduğu gibi beklenmedik yöndedir ve hata ve ihmal pozitif yordanmaktadır. Bu sonuçlar öz-düzenleyici davranışları önerirken dikkatli davranılması gerektiğini vurgular niteliktedir. Bu aşamadan sonra öz-düzenleyici davranışların altında yatan etmenler araştırılmıştır ve taktiksel öz-düzenleyici davranışları yordayan faktörler bulunamamıştır ancak taktiksel öz-düzenleyici davranışların olası faydalarını desteklemek için bu seviyeyi etkileyen faktörleri bulmak kritiktir. Bunun yanında stratejik öz-düzenleyici davranışları genel durum özgüveninin ters yönde yordadığı bulunmuştur. Son adım olarak, sapkın sürücü davranışları ve altında yatan olası yaş ile alakalı faktörler araştırılmıştır. Sonuçlara göre saldırgan ihlalleri, sürüş ile alakalı bilişsel faktörlerin pozitif olarak yordadığı bulunmuştur. Bunların yanında duruma bağlı özgüven ise hata ve ihmal oranlarını negatif olarak yordayan değişkenler olarak bulunmuştur. Son olarak ihmal skorlarını negatif olarak yordayan bir başka faktör ise hareketlilik hali olarak bulunmuştur

Çalışma bulgularına göre, çalışmanın olası katkıları şu şekilde sıralanabilir. Öncelikle bu çalışmada ortaya yeni bir model atılmış ve test edilmiştir ve öz-düzenleyici davranışların bir mekanizma içinde bu kadar ayrıntılı genç ve yaşlı sürücüler için aynı zamanda ölçümler yapıp karşılaştırma imkânları sağlayan ilk çalışma niteliğindedir. Bunun yanında Sürücü Davranışları Anketi dışında kalan bütün anketler bu çalışma için Türkçe ’ye çevrilmiş, adapte edilmiş ve Türk verisine ve genç sürücü grubuna kazandırılmıştır. Bunların yanında ilk defa genç sürücülerin öz-düzenleyici davranış mekanizmasıyla ilgili bilgiler edinme fırsatı sunmuştur. Son olarak ve en önemli sonuç, öz-düzenleyici davranışların her zaman trafik güvenliğini destekler nitelikte olmayabileceği ve bu pratikleri yol kullanıcılarına önerirken dikkatli olunması gerektiği ortaya konmuştur. Bu çalışma sonuçlarına göre yaşlı ve genç sürücülerin hem genel hareketlilik hali hem de yol güvenliklerinin nasıl sağlana bilineceğine dair ayrıntılı bilgiler edinilmiştir.

Çalışmayı kısıtlayan bazı etmenler vardır. Örneğin, katılımcıların hepsi erkektir, ancak bilindiği üzere kadın sürücüler de öz-düzenleyici davranışları benimsemektedirler ve onların mekanizması erkeklerden daha farklıdır bu açıdan bundan sonraki çalışmalar için bu grubu da çalışmaya eklemek yararlı olabilir. Bunlara ek olarak, yaşlı sürücülerin sağlık taramasından geçirilmesi daha güvenilir sonuçlar elde edilmesi yararlı olabilir. Son olarak genç sürücülerin geneli üniversite öğrencisidir ve eğitim seviyeleri yüksektir bu sebeple daha geniş örneklemden genç sürücü verisi toplanması faydalı olabilir.

Gelecek çalışmalarda öz-düzenleyici davranış seviyeleri tekrar gözden geçirilmeli ve özellikle hayat amacıyla ilgili maddelere yeni maddeler eklenmelidir. Bunun yanında özellikle taktiksel öz-düzenleyici davranışların altında yatan diğer olası sebepler bu davranışı desteklemek adına ayrıntılı bir şekilde araştırılmalıdır. Son olarak öz-düzenleyici faktörlerin modeldeki yeri değiştirilerek aracı değişken yerine kazalarla doğrudan ilişkisinin test edilmesi modeldeki yerini güncellemek için yararlı olabilir.

Appendix J: Tez Fotokopisi İzin Formu

ENSTİTÜ

Fen Bilimleri Enstitüsü

Sosyal Bilimler Enstitüsü

Uygulamalı Matematik Enstitüsü

Enformatik Enstitüsü

Deniz Bilimleri Enstitüsü

YAZARIN

Soyadı : Azık

Adı : Derya

Bölümü : Trafik ve Ulaşım Psikolojisi

TEZİN ADI : SELF-REGULATORY DRIVING PRACTICES OF OLD AND YOUNG DRIVERS

TEZİN TÜRÜ : Yüksek Lisans Doktora

1. Tezimin tamamından kaynak gösterilmek şartıyla fotokopi alınabilir.
2. Tezimin içindekiler sayfası, özet, indeks sayfalarından ve/veya bir bölümünden kaynak gösterilmek şartıyla fotokopi alınabilir.
3. Tezimden bir bir (1) yıl süreyle fotokopi alınamaz.

TEZİN KÜTÜPHANEYE TESLİM TARİHİ