THE RELATIONSHIP BETWEEN THE HEALTH BELIEF MODEL CONSTURCTS AND DRIVER BEHAVIORS: MEDIATING ROLE OF DRIVING SKILLS

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ABSTRACT

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MEDIATING ROLE OF DRIVING SKILLS

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The aim of the present study is to examine the relationship between driver behaviors (emphasized violations), the Health Belief Model (HBM) constructs, and driver skills. Although the HBM is a widely used model in health settings, there are very few studies investigating the model at traffic settings. In the present study a total of 505 drivers (217 female, 288 male) whose mean age was 27 participated. The Driver Behavior Questionnaire was used to measure driver behaviors; that is, violations within the scope of the present study. The Driver Skill Inventory was used to measure self-reported driver skills. The HBM Scale which is adapted for speed behaviors within the content of the present study was used to collect data about the HBM constructs. Bivariate Correlations and Hierarchical Regression Analyses were conducted to examine the relationship between study variables. Mediation Analyses were conducted to investigate the mediator role of driving skills on the relationship between the HBM constructs and driver behaviors. Results showed that perceptual-motor and safety skills mediate the relationship between only perceived barriers and total overall violations, aggressive and ordinary violations, and speeding used in the study. This

means the changes perceived barriers and driver skills associated with changes in driver behavior (i.e., violations) negatively. In addition, safety skills were found to be a stronger mediator in that relationship as compared to perceptual-motor skills. Evaluations of results, implications, limitations of the current study, and possible suggestions for future studies were discussed in the light of related literature.

Keywords: the health belief model, driver behaviors, driver skills, speeding, perceived barriers

ÖZ

SAĞLIK İNANÇ MODELİ VE

SÜRÜCÜ DAVRANIŞLARI ARASINDAKİ İLİŞKİ:

SÜRÜCÜ BECERİLERİNİN ARACI ROLÜ

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Bu çalışmanın amacı sürücü davranışları (ihlaller), Sağlık İnanç Modeli bileşenleri ve sürücü becerileri arasındaki ilişkiyi açıklamaktır. SİM sağlık alanında yaygın olarak kullanılmasına rağmen modelin trafik bağlamında kullanıldığı sadece birkaç çalışma bulunmaktadır. Yaş ortalamaları 27 olan 505 (217 kadın, 288 erkek) sürücü çalışmaya katılmıştır. Sürücü Davranışları Ölçeği ihlaller açısından sürücü davranışlarını inceleyebilmek için kullanılmıştır. Sürücü Becerileri Envanteri sürücü becerilerini inceleyebilmek için kullanılmıştır. Hız davranışları için uyarlanan Sağlık İnanç Modeli ise sürücü davranışları ve modelin arasındaki ilişkiyi açıklamak için kullanılmıştır. Korelasyon ve Hiyerarşik Regresyon Analizleri çalışılan değişkenler arasındaki ilişkileri incelemek için yapılmıştır. Buna ek olarak, Aracılık Analizleri ise Sağlık İnanç Modeli bileşenleri ve sürücü davranışlarının arasındaki ilişkide sürücü becerilerinin aracılık rolünü incelemek için yapılmıştır. Sonuçlar, bu çalışmada kullanılan bütün ihlal tipleri ile yalnızca algılanan engeller arasındaki ilişkide hem güvenlik becerilerinin hem de algı-motor becerilerinin aracılık rolü olduğunu göstermiştir. Bu demek oluyor ki; algılanan engellerdeki ve sürücü becerilerindeki

değişiklikler, bu çalışma kapsamındaki sürücü davranışlarının değişimi ile ters yönde ilişkilidir. Buna ek olarak, bu ilişki için güvenlik becerileri daha güçlü bir aracılık değişkeni olarak bulunmuştur. Bu demek oluyor ki; güvenlik becerileri bu ilişki için daha iyi güçlü bir yordayıcıdır. Bu çalışmanın sonuçları, olası katkıları ve kısıtlayıcı faktörleri ve gelecek çalışmalar için öneriler ilgili literatür ışığında tartışılmıştır.

Anahtar kelimler: sağlık inanç modeli, sürücü davranışları, sürücü becerileri, hız limitlerine uyma, algılanan engeller

To my lovely husband and my dear family…

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INTRODUCTION

1.1.General Introduction

Road traffic accidents are major public health problem at national, regional, and global levels. According to World Health Organization (WHO) statistics, approximately 1.2 million people are killed throughout the world each year because of traffic accidents, and more people are suffering from non-fatal injuries (2002). In addition, the cost of road traffic accidents is proposed to be 518 billion US dollars, which is equal to 3% of Gross Domestic Product worldwide (WHO, 2013). These statistics continue to increase annually rather than decrease. The main reasons of the traffic accidents leading to injuries or deaths are road safety problems. To decrease the occurrence and the severity of accidents, improving road safety is an effective way (Qiu et al., 2014). Some road safety problems seem to be more difficult to solve than others. One of them is the high risk of accidents involving young drivers (Elvik, 2010). Moreover, other road safety problem persisting over time is the high risk of injury run by unprotected road users such as pedestrians, riders, and cyclists. Furthermore, speeding behavior is another road safety problem; although, as Elvik (2010) indicated, most of the drivers do not see speeding as a problem. In fact, due to improved roads and better cars, the frequency of exceeding speed limits is increasing (Elvik, 2010).

The value of human life and health should be more important than the material consequences of traffic accidents. "Vision Zero", which is introduced by the Swedish Parliament (1997), is one of the important efforts to increase the value of human life (Draft Bill, 1997). This project give attention to the value of human life and health by reducing the number of deaths and serious injuries. It was emphasized in the project that a physical injury that the victim will not recover from in a reasonable time and might entail lifelong consequences for the person afflicted (Swedish Road Administration, 2006). That is, the injuries, resulting from road traffic accidents, can affect the value of human life and health negatively. So, traffic accidents can be

accounted as a threat for healthy human life. Therefore, to increase the value of human life and health by reducing the injuries due to traffic accidents, it is necessary to investigate these issues together.

1.2.Human Factors in Driving: Driver Behaviors and Driver Skills

To investigate the causes of traffic accidents, risk factors related to a large percentages of traffic accidents should be determined. According to studies conducted in the USA, 57% of the traffic accidents had occurred due to road users (Oppenheim & Shinar, 2011). The same article also mentioned that the cumulative values of the studies carried out in the United Kingdom indicated that the road users were responsible for the 65% of traffic accidents (Oppenheim & Shinar, 2011). That is, more than half of the traffic accidents happened due to the factors related to road users. In addition, when investigating the combination of road users and other contributors that affect road users' accident risk, the values about accidents risk increase 94% for the USA and 95% for the United Kingdom (Oppenheim & Shinar, 2011).

While the causes of the accidents are being investigated, and the risk factors underlying traffic accidents are identified, driver behaviors/style and driver skill/performance should be explained separately. Driver behaviors were identified as the ways drivers choose to drive whereas driver skills consist of information processing and motor skills, and safety skills, that can be developed with practice and training (Elander et al., 1993). In a basic sense, driver behaviors mean what drivers "usually do" in traffic context. On the other hand, driver skills are identified as what drivers "can do".

1.2.1. Driver Behaviors

Thinking the contribution of human factors, it is essential to emphasize the distinction between "errors" and "violations". These two main types of aberrant behaviors at traffic settings were differentiated by Reason, Manstead, Stradling, Baxter, and Campbell (1990). Errors were defined as "the failure of planned actions to achieve their intended consequences" whereas violations were identified as "deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system" (Reason, Manstead, Stradling, Baxter & Campbell, 1990, pp.1316). There are different types of errors. Slips and lapses are referred as the failure of attention and memory (Lucidi, Giannini, Sgalla, Mallia, Devoto, &

Reichmann, 2010). For example, "locking yourself out of your car with the keys still inside" was accounted as an example of slips, according to Reason et al. (1990) whereas "having no clear recollection of the road during travel" was an example of lapses. For slips, person has an intention; however, the actions led by this intention are not proceed as planned (Reason, 1990). Moreover, for lapses, person miss actions due to failure of memory and/or attention (Reason, 1990). On the other hand, for errors, although the action did proceed as planned, the action did not achieve desired end (Reason, 1990).

The differentiation between the aberrant driver behaviors mentioned above provided base for the development of the Manchester Driver Behavior Questionnaire (the DBQ; Reason et al., 1990). The DBQ related studies evidenced that errors, violations, and slips and lapses are four empirically distinct types of behavior. Winter and Dodou indicated that, the DBQ, with its different versions, was used by around 200 studies (2010). So, it is possible to tell that the DBQ is one of the most commonly used self-report measurement for aberrant driver behaviors (Wåhlberg, Dorn, & Kline, 2011).

Different studies with the DBQ included factor analyzing it. First, Reason et al. (1990) found that the DBQ comprised of three factors; deliberate violation, dangerous error, and "silly" errors. Later, three-factor structure of the DBQ was consistent over time (Parker et al., 1995). Later, the study of Rimmö (2002) resulted in a four factor solution; violations, errors, slips and lapses. The DBQ was adopted in Turkish by Lajunen, Sümer, and Özkan (2003) as the original three- or four factor (errors, lapses, aggressive and ordinary violations). Özkan, Lajunen and Summala (2006) conducted a study in order to investigate time-across stability of the DBQ factor structure. The result of this study indicated that two-factor structure (i.e., errors and violations) showed better time-across stability, compared to four-factor structure. As a result, the overall results showed that the number of the factors might change from study to study; however, the content of the factors supported the main differentiation of errors and violations.

In the current study, only the violations factor of the DBQ was included because some studies indicated that violations can be accounted as a determining factor of risky behavior on traffic, compared to other factors of driver behaviors; errors, slips and lapses. For example, the recent studies showed that violations are stronger predictors of injuries and deaths due to accident involvement (Rowe et al., 2015;

Elliott, Baughan, & Sexton, 2007; Freeman, & Rakotonirainy, 2015). Another reason of using only violations in the present study is that violations are intentional actions. As mentioned in the previous, violations have an intention whereas errors, slips and lapses are either unintended action or failure of memory. Ajzen (1991) indicated that beliefs, subjective norms, and attitudes determine intentional behavior, so only violations were used in the present study.

1.2.1.1.Violations

Violations are deliberate actions in traffic context. Lawton et al. (1997) extended the DBQ and split the violation scale into two as aggressive and ordinary violations. Aggressive violations were defined as hostile behavior toward another road users or driving in an aggressive manner (Sullman, Meadows, & Pajo, 2002). For example, being frustrated with another driver and give chase with the intention of giving him or her a piece of your mind is accounted as aggressive violation. On the other hand, ordinary violations identified as doing deliberate violations without an aggressive aim (Dimmer, & Parker, 1999). To illustrate, disregarding the speed limits on a motorway is accounted as an ordinary violation.

There are different types of violations; speeding, seat-belt violation, red light or stop sign violations, driving without a valid driver's license, distracted driving related violations (e.g. using cell-phones), driving under the influence of alcohol or drugs, overtaking, etc. Most studies being conducted all over the world demonstrated that there is a strong relationship between traffic violations and road accident involvement (e.g., Begg, & Gulliver, 2008; Williams et al., 2006). For example, in China, traffic violations are seen as one of the major risk factors of traffic accidents; and if violations could be decreased or prevented successfully, the rate of injuries and fatalities would be decreased (Zhang, Yau, & Chen, 2013). On the other hand, in Turkey, the results of a study conducted by Alver, Demirel, and Mutlu (2014) indicated that speeding and seat belt violations are the most common traffic violations. The same study also showed that the presence of an older relative or parents in the car reduce the possibility of committing violations (Alver, Demirel, & Mutlu, 2014).

As it can be seen from the results of the previous studies (e.g., Bogstrand et al., 2015; WHO, 2004; Williams, Kyrychenko, & Retting, 2006) speeding has a critical role in traffic safety among and as compared to other types of violations. For this reason, in the present study, speed violations were given more study attention.

1.2.1.1.1. Speeding Behavior

Speeding behavior has been accounted as the most important driving behavior factor associated with safety, as compared to the other type of violations such as red light or seat-belt violation (Elvik et al., 2004; Lajunen, 1997). In other words, it is important that speeding should be investigated specifically. The results of most studies examined that there is a relationship between speeding behaviors and accident involvement (e.g. Carsten & Tate, 2005; Cooper, 1997). The frequencies of errors and violations have cross-cultural differences; however, speeding behaviors did not show any cross-cultural differences (Özkan, Lajunen, & Summala, 2006). For example, the study which was conducted in Norway indicated that the cause of 71% of accidents was speeding (Bogstrand et al., 2015). In addition, in Sweden, approximately 50% of drivers violated speed limits rules (Haglund, & Åberg, 2002). Therefore, speeding is a factor that should be studied in order to decrease the severity of injuries or deaths and to promote health behaviors. For example, Elvik found that if speeding behaviors were dropped, approximately 25% of the number of the fatalities, almost 18% of the number of serious injuries, nearly 10% of the number of slight injuries could be decreased.

There are different predictors for speeding. One of the factors being related to speeding is peer pressure. To test this, a survey was conducted by Horvath, Lewis, and Watson (2012) and administered to 398 drivers. In this survey, two different conditions were formed: identification of a passenger and type of pressure as active or passive. Identification of passenger (ID) means that if passengers have close relationship with drivers like friends; this is high level ID whereas for low level ID, passengers have distant relation with drivers such as friends of friends. On the other hand, type of pressure means that if passengers encourage driver to speed verbally, this is an active pressure while if passengers are silent, this is a passive pressure. The results of this study showed that the strongest feeling of passenger pressure was observed on low ID and active pressure condition. Also, the findings indicated that high ID participants scored higher on intentions to speed compared to the low ID ones. This means that young drivers have stronger intention to speed when their passengers who apply active pressure are their friends. Another factor associated with speeding is demographic characteristics such as age and sex. It was found that young and male drivers have a tendency to speeding (Williams, Kyrychenko, & Retting, 2006). However, to prevent or reduce speeding, demographic factors such as age and sex cannot be manipulated.

Therefore, the attitudes, values, and motivation underlying the intention to speed should be defined in order to reduce or prevent it (Lawton et al., 1997). For example, salient and effective enforcement is a motivating factor to reduce speeding. For example, if drivers know that when they commit a violation they will be stopped immediately and punished by the police that enforcement would be effective (Shinar, 2007). Another strategy of prevention of speeding is that by using mass media campaign, drivers could experience mere-exposure effect; which refers to create positive attitudes toward novel stimuli due to repeated exposure (Zajonc, 1968). Like mentioned above, attitude is one of the underlying factors on exceeding speed limits (Cestac, Paran, & Delhomme, 2011). If mere exposure effect leads to change attitudes from negative to positive for obeying speed limits, increase in probability of obeying speed limits could be occurred. Furthermore, fear appeal is another attitude change technique. Fear is an undesirable emotional state while fear appeals are persuasive messages conducted to bring about a change in a behavior to prevent unwanted consequences (Maloney, Lapinksi, & Witte, 2011). Therefore, speed behavior can be prevented or reduced by using public spots containing fear.

1.2.2. Driver Skills

Driver skills compose of safety skills and information processing and motor skills, which developed by experience such as practice and training (Elander et al., 1993). The distinction between technical driver skills, which consist of quick and fluent vehicle control, and defensive driving skills, that include anticipatory accident avoidance skills, was made by Spolander (1983). Spolander developed a self-report measure in order to investigate those dimensions of skills. In this instrument, according to 13 situations in traffic context, drivers were asked to evaluate and rate themselves as comparing with "an average driver". Because of the spreading belief that drivers were likely to overestimate their driving skills when compared to the average driver (Brown, & Groeger, 1988; Delhomme, 1991), Hatakka et al.(1992) adapted this external reference with an internal one; drivers were asked to evaluate their own skills in different aspect of driving skills. Afterwards, Lajunen and Summala (1995) extended the work on driver skills by developing the Driver Skill Inventory (DSI); they concluded that as the DSI has two factors of perceptual-motor and safety skills.

1.2.2.1.Perceptual-motor Skills

The perceptual motor skills, as mentioned above, composed of information processing and motor skills (Lajunen & Summala, 1995). These skills can be developed by training and practice. In addition, for novice drivers, additional training can be caused overestimation for their driving skills, so this may increase the likelihood of accidents (Gregersen, 1996). On the other hand, if driver training focuses on only developing perceptual-motor skills, the inaccurate belief, which was good drivers means good vehicle control, can spread (Sümer, Özkan, & Lajunen, 2006). Reverse parking in a narrow gap can be accounted as an example for perceptual-motor skills.

The perceptual-motor skills were found as being positively related to traffic accidents, according to the results of the study conducted by Özkan and Lajunen (2006). Moreover, it was proposed that unless high levels of perceptual-motor skills are accompanied by high level of safety skills, they can bring about a risk factor for accident (Sümer, Özkan, & Lajunen, 2006). In addition to accident involvement, the perceptual-motor skills positively correlated with speeding, mileage, penalties, and positive attitude to driving (Lajunen et al., 1998). This means that increase in perceptual-motor skills related to increase in speeding behaviors, positive feeling about driving, and the number of tickets. In addition, because perceptual-motor skills can be developed by training and practice, increase in life-time mileage related to increase in these skills.

The perceptual-motor skills related to some personality factors. For example, the results of the study conducted by Lajunen and Summala (1995) indicated that skill-oriented people showed aggressive driving more easily when situations in traffic did not meet their expectations. In addition, the same study results showed that the perceptual-motor skills positively correlated with the sense of self-esteem (Lajunen, & Summala, 1995). This means due to self-assessed measurement, belief about having high perceptual-motor skills associated with high self-esteem. Therefore, it may be inferred that drivers who believe they have high perceptual-motor skills may not feel at risk in traffic or not notice how serious consequences of negative traffic conditions can be.

1.2.2.2.Safety Skills

Safety skills were identified as motives that consists of both transient motivational and more permanent personality characteristics and attitudes toward safety (Lajunen, & Summala, 1995). "Keeping sufficient following distance" can be accounted as an example of safety skills. Like perceptual-motor skills, there is a relationship between safety skills and accident involvement. Most studies about this issues showed that drivers had a tendency to overestimate their safety skills when compare themselves with other drivers (Walton, & Bathurst, 1998; Walton, 1999; Harré, & Sibley, 2007). This can be named self-enhancement bias, the tendency to take whole responsibility for their success without any external factors; therefore, this brings about biased risk perception which cause high levels of risk acceptance (Deery, 1999; Groeger, & Brown, 1989). Moreover, safety skills negatively related aberrant driving behaviors such as violations (Sümer, & Özkan, 2002).

Safety skills were found to be related to some personality and individual related characteristics. The results of the study conducted by Lajunen et al. (1998) showed that safety skills negatively correlated with speeding behaviors, aggressive driving, and Type-A behaviors. Speeding behavior, mentioned above, was accounted as a violation; therefore, decrease in safety skills can be related to increase in speeding behaviors. In addition, increase in safety skills can be related to decrease in aggressive driving, which were identified as when drivers commit a combination of moving traffic violations so as to endanger other persons or property by The National Highway Traffic Safety Administration (2000). Another support for this suggestion about the relationship between safety skills and aggression was given by Sümer et al. (2006) who indicated that low level of safety skills related to high level of hostile and aggressive feeling. On the contrary, high level of safety skills provides drivers to know their limitations and deficiency, and makes them interest in their own behaviors instead of other road users' behaviors that can be related to the feeling of aggression and revenge (Sümer et al., 2006). Moreover, increase in safety skills are related to decrease in Type-A behaviors of time urgency, impatience, and hostility (Nabi et al., 2004).

As it was emphasized above, in the DSI, drivers were asked to assess their driving skills in terms of weakness and strength under two dimensions (i.e., perceptual-motor and safety skills) to be evaluated in traffic context. The DSI was used to evaluate driving skills in many different populations. There are some minor cross-cultural differences in terms of driving skills. For example, the results of the study comparing

Finnish and Australian drivers indicated that Australian drivers are less safety-oriented compared to Finnish drivers (Lajunen et al., 1998). However, despite some differences across cultures, previous studies demonstrated that there are some similarities between cultures and countries. To illustrate, the study carried out among British, Dutch, Finnish, Greek, Iranian, and Turkish drivers by Özkan et al. (2006) indicated that the DSI factor structures are almost the same in different cultures.

1.2.3. The Relationship between Driver Behaviors and Driver Skills

As it was emphasized in the previous sections, driver behaviors and driver skills are two important measures in traffic literature to understand the human factors in relation to driving safety. The DBQ and the DSI are the most frequently used self-report measures of aberrant driver behaviors and driver skills, respectively. The literature showed that these two critical human factors variables are related to each other. For example, safety skills were associated with ability not to perform violations while perceptual-motor skills were associated with ability to drive in an error-free manner (Martinussen, Møller, & Prato, 2014). The results of many studies indicated that the drivers who rated themselves as high in perceptual-motor skills have a tendency to drive riskier because they think they have enough ability to handle the situation (Martinussen, Møller, & Prato, 2014; Gregersen, 1996; Sümer et al., 2006). On the other hand, drivers who reported high safety skills have a tendency to have lower frequencies of violations, and errors (Martinussen, Møller, & Prato, 2014).

Sümer et al. (2006) indicated that there is an asymmetric relationship between driver behaviors and skills. This study indicated that perceptual-motor skills were positively, safety skills were negatively related to aberrant driver behaviors. Additionally, to emphasize the asymmetric relationship, it was stressed that especially, the combination of high level of perceptual-motor skills and low level of safety skills might end up with the riskiest group for violations (e.g., speeding). In this study, the drivers with low levels of perceptual-motor skills and high levels of safety skills reported the least speeding.

1.3.Individual Related Factors in Driving: Age, Sex, and Exposure

In addition to the relationship between driver behaviors and driver skills, the relationships between these human factors variables and some individual variables, like age, sex, and exposure, have taken significant attention in the literature. . For

example, driver behaviors and skills were studied in relation to age and sex (Carroll, 1973; Deery, 1999; Laapotti, 2003); attitudes and motives (Elander et al., 1993); personality characteristics such as Type-A personality (Lajunen et., 1998), sensation seeking (Brown, 1995), aggression (Sümer, Özkan, & Lajunen, 2006); exposure (Lajunen, & Summala, 1995; Corfitsen, 1993); and fatigue (Liu, & Wu, 2009; May, & Baldwin, 2009).

Among those variables, the most predominant demographic variables of age, sex, and exposure are included into the scope of the present study. The mentioned variables were consistently found as being related to the human factors of driving. As a result of this fact, in many studies they were included as the main variables or the control variables while some other relationships are tested (see, Reason et al., 1990; Parker et al., 2000; Öz, Özkan, Lajunen, 2014). In the following section, information on those variables was provided.

1.3.1. Age

Driver's age is a strong predictor of hazardous driving. The riskiest age group is young drivers in terms of accident involvement, although all age groups suffered from traffic accidents (Carroll, 1973; Özkan, & Lajunen, 2006; Elvik, 2010). For example, teenage drivers who are 16 to 20 years old showed riskier accident related driving behaviors, as compared to the drivers who are 25 to 45 years old (Rhodes, & Pivik, 2011). Elvik (2010) indicated that young drivers have higher accidents rate and their injury rates are 5-10 times higher than the safest group of drivers. The results of the study conducted by Martinussen, Møller, and Prato (2014) indicated that age significantly correlated with violations, errors, and lapses. In other words, doing error and lapses, and committing violation increases with age. Moreover, the effects of peer pressure about speeding behaviors showed variations at the ages from 18 to 28 (Møller, & Haustein, 2014).

To examine age differences in driving skills Andrews and Westerman (2012) conducted a study and compared young and old drivers by using driving simulators. The results showed that cognitive abilities are predictors of driving skills adults. In addition, another study about the relationship between driver skills and age showed that older drivers had more social tolerance and rule-abiding approach than younger drivers across different countries (Özkan et al., 2006). Furthermore, perceptual-motor skills were negatively correlated with age; as age increases, self-reported perceptual-

motor skills decrease (Martinussen, Møller, & Prato, 2014).Overestimation of the self-reported driving skills is another problem of young drivers. Mynttinen et al. (2009) indicated that 40% of young drivers evaluated themselves better than the evaluations that their driving license educators made for them. Being a young driver is also related to some other individual related problems. For instance, sensation-seeking and driver anger were found as a stronger predictors for young drivers in accident involvement as compared to the older drivers (Cestac, Paran, & Delhomme, 2010; Dahlen, & White, 2006; Delhomme, Chaurand, & Paran, 2012).

1.3.2. Sex

When investigating the effects of sex on traffic safety, male drivers have shown lower traffic safety behaviors compared to female drivers (González-Iglesias, Gómez-Fraguela, & Luengo-Martin, 2012; Rhodes, & Pivik, 2011; Jiménez-Mejías, et al., 2014). For example, being a male driver was related to higher number of traffic accidents in Greece and Iran (Özkan et al., 2006). In addition, male drivers have a tendency to take risks in traffic (Deery, 1999), and drive more aggressively (Jonah, 1990). Supporting this, literature shows that sex is significantly correlated with violations, errors, and lapses. Male drivers make errors and commit violations more frequently than females; on the other hand, female drivers do lapses more frequently than male drivers. For example, male drivers also violate seat-belts rules more frequently than females (Jonah, & Dawson, 1987; Martinussen, Møller & Prato, 2014). To examine sex differences in driver skills, the results of the study conducted by Martinussen, Møller, and Prato (2014) was mentioned. The results indicated that male drivers have stronger perceptual-motor skills as compared to female drivers; while stronger safety skills were reported by female drivers as compared to the male ones.

1.3.3. Exposure

Exposure were defined as "the degree to which a driver exposes himself to traffic and to the probability of being involved in an accident" (Özkan, & Lajunen, 2006, pp. 270). It consists of both quantity and quality of driving (Laapotti, 2003). The former was identified as the amount of driving while the latter was defined as weather and road conditions, time of driving, passengers, the purpose of driving etc. Exposure was defined as annual mileage in the present study. Annual mileage was positively correlated with the number of traffic accidents (Özkan et al., 2006); such that, accident

involvement increases with annual mileage (Poulter et al., 2008; Rodríguez et al., 2003).

The literature reports relationship between driver behaviors, skills and annual mileage. For example, annual mileage was found to be significantly correlated with traffic fines (Lourens, Vissers, & Jessurun, 1999). In other words, committing violation and taking traffic ticket increase with annual mileage. In addition, Reason et al. (1990) indicated that annual mileage was related to the frequency of dangerous violations. Similarly, Tseng et al. (2016) demonstrated that exposure was a predictor factor of speeding tickets, violations and accidents.

Concerning the relationship between driver skills and exposure literature provides meaningful results. For example, the study conducted by Öz, Özkan, and Lajunen (2013) indicated that annual mileage has significantly positive correlation with safety skills. In addition, experienced drivers evaluate their perceptual-motor skills as higher than inexperienced drivers. However, they rated their safety skills as lower than inexperienced ones (Lajunen & Summala, 1995). This can be supported by the zero-risk model of Näätänen and Summala (1976). The model argues that increasing driving experience and exposure to traffic conditions can lead to decrease in the sense of subjective risk; that is related to decrease concern for safety.

1.4.The Health Belief Model

In 1950s, the Health Belief Model (HBM) was originally developed by social psychologists in U.S. Public Health Services (Rosenstock, 1974a) to predict health-promoting behaviors. In other words, the aim of the construction of the model is to explain and predict a variety of behaviors related to positive health outcomes (Rosenstock, 1966). Later, the model was extended in order to investigate people's reactions to symptoms (Kirscht, 1974).

This model has two main dimensions; perceived threat and behavioral evaluation, and six sub-dimensions under these two main dimensions; perceived severity, perceived susceptibility, perceived benefits, perceived barriers, motivation, and cues to action (see Figure 1).

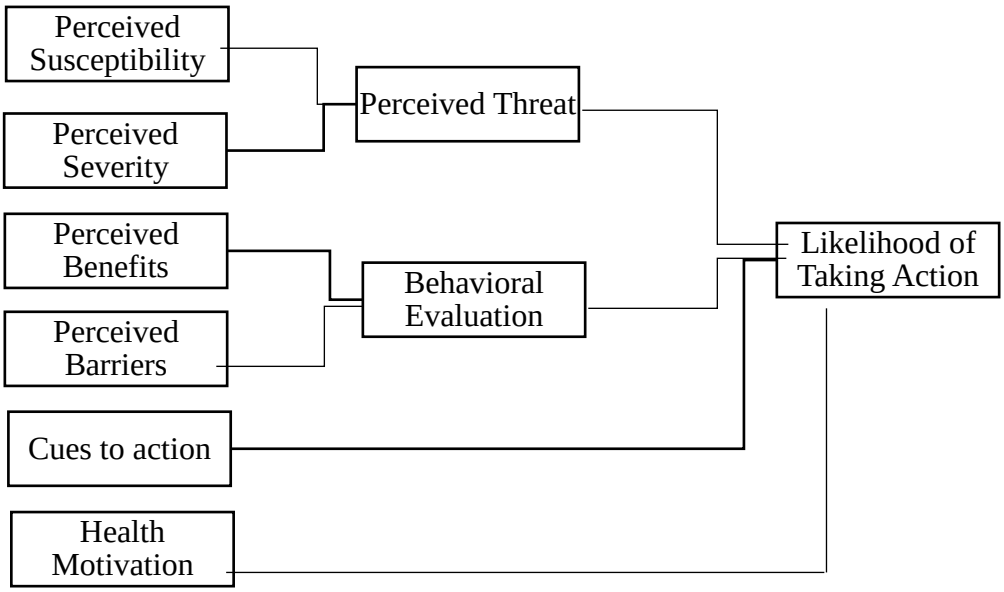

Figure 1. *The Health Belief Model Constructs*

1.4.1. Perceived Threat (Perceived Susceptibility & Perceived Severity)

Perceived threat consists of perceived susceptibility and perceived severity. Perceived susceptibility means "the extent to which the individual feels at risk of being exposed to/ suffering from a condition" (Jones, Smith, & Llewellyn, 2014, pp. 254). In other words, the model proposes that people will act to prevent negative health outcome when the probability of suffering is high. Perceived susceptibility was found to be associated with health behaviors (Janz, & Becker, 1984; Glanz, Rimer, and Viswanath, 2008). Perceived susceptibility was very strong predictor for preventive behaviors (Abraham, & Sheeran, 2005). For example, a person can believe there is a possibility of getting cancer because of smoking, so this belief can influence quitting smoking.

Perceived severity, on the other hand, mentioned by Jones, Smith and Llewellyn (2014, pp. 254) is "beliefs about how serious the condition is and the related consequences of the conditions". In other words, if people perceive strongly high severity of the negative health outcomes, the people will be encouraged to prevent that outcome. These consequences can be medical, clinical and/or social (Champion, & Skinner, 2008). To illustrate, if the person, who smokes two packets of cigarettes in a

day, could die or suffer from lung cancer, this can be accounted as medical and clinical consequences. In addition, if social relations and family life of the person is affected by smoking; for instance if it results in alienation, this can be accounted as a social consequence. Perceived severity was the least strong predictor of clinical use and preventive behavior although it was the strongest predictor of sick-role behavior. (Abraham, & Sheeran, 2005). These two constructs related to individual's perception of conditions or situations or negative health outcomes.

1.4.2. Behavioral Evaluation (Perceived Benefits & Perceived Barriers)

Behavioral evaluation, is formed by perceived benefits of the health-promoting behavior, and perceived barriers which were identified as underlying factors of preventing the execution of the health-promoting behavior. Perceived benefits were identified as "the effectiveness and availability of taking a particular course of action" (Jones, Smith, & Llewellyn, 2014, pp. 254). This means that to increase the likelihood of conducting positive health-promoting behaviors, individuals have to perceive important positive benefits of the behavior. In addition to perceived susceptibility that leads to behavior change, the person's belief related to perceived benefits for reducing the disease threat can be effective (Champion, & Skinner, 2008). Moreover, non-health-related perceptions can also be influential on health related behavioral evaluations. For example, quitting smoking might be providing some people with financial benefits, besides health benefits. In addition, it was found that perceived benefits is most effective in clinical use behaviors (Abraham, & Sheeran, 2005).

Perceived barriers, on the other hand, were defined as "the negative aspects related to following the course of action" (Jones, Smith & Llewellyn, 2014, pp.254). In other words, the model argues that the stronger individuals' perception of the barriers of preventative behaviors, the more they will avoid to act to preventative behaviors. Having negative side effects, resulting in unpleasant feelings, being inconvenient, expensive, and time-consuming can be accounted as perceived barriers of a condition. For example, getting chemotherapy can be perceived as a barrier for treatment of cancer; because it may result in unpleasant feelings and physical disturbance. In addition, to prevent obesity, walking one hour in a day can be perceived as barrier due to being inconvenient for the person. Perceived barriers were the strongest predictor of preventive and sick-role behaviors across all studies and behaviors (Champion, & Skinner, 2008; Abraham, & Sheeran, 2005).

1.4.3. Cues to Action & Motivation

As mentioned by Rosenstock (1966), the HBM also consists of cues to action construct which can be both external (e.g. mass media campaign or advice from support groups) and internal forms (e.g. negative bodily symptoms). Cues to action can be defined as action triggers; with perceived susceptibility and perceived benefits, readiness to take an action could only be activated by other factors such as cues to action (Hochbaum, 1958). The study conducted by Umeh and Rogan-Gibson (2001) indicated that cues to action such as social norms, recommendations from health care professionals or family experiences were not related to reported health behavior. However, another study (Aho, 1979) showed that knowing someone who had suffered from unhealthy behaviors was positively associated with healthy behaviors. In addition to these, cues to action with internal triggers are generally predictive of behavior (King, 1984; Harris, & Lynn, 1985).

In addition to cues to action, motivation is also another construct of the HBM. Motivation means individuals' readiness to be concerned about the health matters in general. Motivation is measured by asking a single question concerning about health (Abraham, & Sheeran, 2005). Most of the related study indicated that there is a small but significant relationship between motivation and health behavior (Ogionwo, 1973; Berkanovich et al., 1981; Champion, 1984; Ali, 2002). This relationship is found to be positively associated (Portnoy, 1980; Thompson et al., 1986). Although motivation construct is not powerful predictor of preventive behaviors or health behaviors, some studies indicated that due to fact that people fail to show much motivation, they have failure to comply with medical advice or to take health-promoting behaviors (Rosenstock, 1966; Janz, & Becker, 1984; Becker, 1985).

These two constructs were not studied by some researchers studying the HBM (Janz, & Becker, 1984; Harrison et al., 1992). One of the reasons of this situation is about the researcher's failure to operationalize these constructs because they may have no clear ready to use definitions applicable to any research field (Abraham, & Sheeran, 2005). Especially, cues to action were operationalized differently study by study. For example, in the study conducted by Grady et al. (1983) cues to action were operationalized as participation in a breast self-examination teaching program; whereas the study conducted by Keesling and Friedman (1987) was mentioned cues to

action as the numbers of family members suffering from breast cancer or any other type of cancer.

1.5.Human Factors in Driving from Perspective of the Health Belief Model

The Health Belief Model (HBM) was developed in order to promote health behavior which had positive outcomes. On the other hand, human factors in driving, that is driver behaviors and skills, were investigated in order to promote traffic safety. In addition, the aim of traffic safety is to reduce the number of deaths, the severity level of injuries, and the number of injured people (Batrakova, & Gredasova, 2016). The mutual aim of the HBM and the studies about human factors in driving is to reduce severity of injuries and promote health behaviors. To our knowledge, there are very small number of studies about the combination of these issues (Fernandes, Hatfield, & Soames Job, 2010; Hatfield, Fernandes, & Soames Job, 2014). These studies are not enough to examine the relationship between the HBM and human factors in driving. In the following sections driver behaviors and driving skills will be mentioned about in relation to the HBM.

1.5.1. The Relationship among Driver Behaviors and the Health Belief Model Constructs

Driver behaviors, especially violations, may be related to the constructs of the HBM. Previous literature show that perceived risk is a potential contributor of risky driving (Cunill et al., 2004; Hatfield, Fernandes & Soames Job, 2014; Smith et al., 2005). For example, the results of the study conducted by Şimşekoğlu et al. (2013) indicated that in Turkey, traffic risk perception was related to only precautionary behaviors like seat belt usage and reducing speed. Those findings are consistent with the HBM arguments. Supposed that people have a tendency to reduce risk by behaving in a protective manner because its perceived benefits are stronger than its perceived barriers. In addition, the HBM model proposed that the more risky a behavior, the less likely a person will do it (Hatfield, Fernandes, & Soames Job, 2014). In the HBM model, perceived susceptibility and perceived severity can be defined as perceived personal risk and consequences of behavior.

In order to reduce risky driving behaviors such as aggressive violations, ordinary violations, and speeding behavior, it can be effective to use the HBM as it has some related constructs. In other words, if perceived severity and perceived

susceptibility of the consequences of risky driving behaviors increase, the tendency of occurrence of those behaviors can be reduced. In addition, due to the fact that as compared to perceived barriers perceived benefits have stronger effects on reducing risky driving, benefits of safe driving can be emphasized.

In the literature, there are very small number of studies used the HBM in traffic context. One of them is the study conducted by Lajunen and Räsänen (2004). Consistent with the literature in health, the results of the study about bicycle helmet usage showed that perceived barriers and cues to action were the strongest predictors of safety related behaviors. Another study was conducted to investigate two-wheel motor vehicle drivers' behaviors and social psychological reasons (Lajunen, & Özkan, 2010). The results of the study showed that decrease in perceived barriers associated with increase in safety equipment usage. In addition, the results of the same study indicated that cues to action have a significantly and negatively correlated with speed violations. Moreover, decrease in perceived severity related to decrease in safety behaviors.

1.5.2. The Relationship among Driver Skills and the Health Belief Model

Driver skills (e.g., perceptual-motor and safety skills) may be related to the constructs of the HBM. To our knowledge, there is no traffic research about the relationship between the constructs of the HBM and driver skills by using the DSI. However, it is possible the existence of a relationship between them. Therefore, in the current study, it is investigated the relationship between the constructs of the HBM and not only driver behavior but also driver skills. Safety skills, as mentioned in the previous sections, were identified as motives toward safety (Lajunen, & Summala, 1995) which might be related to safe driving. Safety motivation and health motivation have some similarities. The mutual aim of these two concepts is to decrease the severity of injuries and promote health behaviors. Although we can say that health motivation is a more comprehensive concept, safety motivation, which is a part of driving skills of drivers, is focusing on more specific traffic context.

In addition to the similarity and potential relationship between safety skills and the HBM content; there are also some similarities between perceptual motor skills and the constructs of the HBM as well. For example, the study conducted by Lajunen et al. (1998) have demonstrated positive relationship between perceptual motor skills and various risky driving behaviors. In addition, as mentioned previous part, risky driving

behaviors have negatively related to perceived risk, which was referred to perceived severity and perceived susceptibility in the HBM. Moreover, many studies have indicated that drivers have a tendency to overestimate their perceptual motor skills when using self-report instruments (Brown and Groeger, 1988; Lajunen et al., 1998; McKenna et al., 1991). This overestimation can be related to decreasing perceived risk (Cunill et al., 2004). The mentioned findings showed that perceptual motor skills might be related to the HBM, especially perceived severity and susceptibility constructs of it.

1.5.3. The Relationship between Driver Behaviors, Driver Skills and the Health Belief Model

In the present study, as mentioned in the previous sections as well, driver behaviors and skills were investigated in relation to the HBM constructs. Many studies demonstrated that there is a relationship between driver behaviors and skills (e.g., Sümer et al., 2006; Martinussen, Møller, & Prato, 2014; Gregersen, 1996). In addition, as both driver behaviors and driver skills are related to the HBM constructs. In the present study, the relationship between these variables is modeled in such a way that driver skills mediate the relationship between HBM constructs and driver behaviors. This type of a relationship was assumed because the main point in the present study was to focus on how safety related on the road behaviors are related to safety or health related aspects of the HBM. The previously evidenced relationships between driver behaviors and skills, potential relationship between the HBM constructs and skills, and the nature of the skill variable in traffic settings made the driver skills variable a mediator in the present study. This way of testing the relationships between variables might be supported by the structure of a previous well known theory as well. The Theory of Planned Behavior (TPB – Ajzen, 1991) mentions that the way to the intended behavior is guided by beliefs about the behavior; attitudes, norms, perceived behavioral control concerning the behavior; and intention, respectively. This logic is very similar to the logic of determining the directions of the relationships and ordering the variables in the present study. That is, the HBM constructs are assumed to be related to the intended driver behaviors (i.e., violations) through driver skills which might reflect the participant's attitudes and perceived behavioral control in their self-report evaluations of driving skills.

1.6.The Purpose of Study

The main aim of present study is to investigate, for the first time, the relationship between the HBM constructs and violations and speeding behavior as driver behaviors through driver skills (i.e., perceptual-motor and safety skills) as mediator variables. As the present study is the first one aiming to investigate the relationship between the mentioned variables, before testing the mentioned mediated relationship, first the following relationships between each constructs of the variables were investigated in detail:

- The relationship between each construct of the HBM and driver behaviors, that is, total overall violations, aggressive violations, ordinary violations, and the frequency of exceeding speed limits.
- The relationship between each construct of the HBM and driver skills, that is, perceptual-motor and safety skills.
- The relationship between driver skills (i.e., perceptual-motor and safety skills) and driver behaviors (i.e., total overall violation, aggressive violation, ordinary violation, and the frequency of exceeding speed limits).
- The relationship between each construct of the HBM and total overall violation, aggressive violation, ordinary violation, and the frequency of exceeding speed limits is mediated by driver skills(i.e., perceptual-motor and safety skills)

CHAPTER II

METHOD

2.1.Participants

The present study involved 505 participants, 217 of whom were female (43%) and 288 of whom were male (57%). The age range of the participants changed between 18 and 68 (M = 27.14, SD = 7.95). All participants have a driving license for at least a year. The range of the number of years of having driving license was between 1 and 37 (M = 6.82, SD = 6.42). In addition, both annual and lifetime kilometers (km/h) were asked. The range for the annual km/h was between 50 to 100,000 km/h (M = 9,222.97, SD = 11,686.55) while the range for lifetime kilometers was between 50 and 2,000,000 km/h (M = 82,117.54, SD = 180,330.89). The range of active accidents was between 0 and 6 (M = .64, SD = .95); while the range of passive accidents was between 0 and 6 (M = .60, SD = .96) in last three years. In addition to these, 19 of the participants (3.8%) had an accident due to exceeding speed limits (see Table 1). Moreover, 289 participants received at least one type of tickets (i.e., speeding, red light, seat belt violation, drunk driving, and any other type) within the last three years. A total of 143 participants (28.3%) reported that they received speeding ticket (see Table 2).

Table 1. *Descriptive Statistics Concerning Demographic Characteristics of the Participants*

	Minimum	**Maximum**	**Mean**	**SD**
Age	18	68	27.14	7.95
Driving experience (years)	1	37	6.82	6.42
Annual mileage (km)	50	100,000	9,222.97	11,686.55
Lifetime mileage (km)	50	2,000,000	82,117.54	180,330.89
Active accidents	0	6	.64	.95
Passive accidents	0	6	.60	.96

Table 2. *Frequency Tables in Terms of Types of Tickets*

Type of Tickets	N	Frequency	Percent (%)
Speeding	505	143	28.3
Red Light	505	62	12.3
Seat-belt	505	15	3.0
Drunk Driving	505	6	1.2
Other	505	63	12.5

Note: Frequency means that the number of people received tickets.

2.2.Procedure

Before starting to collect data, the ethical permission was taken from METU Human Subjects Ethics Committee (HSEC, see Appendix A). Data were collected by using convenience sampling method, a non-probability technique that the subjects were selected due to easy accessibility for the researcher. Some of the participants are students taking the courses offered to non-Psychology students at Psychology Department at the Middle East Technical University. Those student participants were given the chance to earn bonus points by participating to the study. The rest of the participants were recruited via online tools, like sending e-mails to people, distributing the questionnaire link via Facebook and Twitter. The online data was collected via Qualtrics online survey software. The printed version of the questionnaire was distributed to the participants for whom online data collection was not possible.

All participants were informed about the aim of the study. Informed consent was given to all of them (see Appendix B). Participation to the study was voluntary; the participants were informed that they had the right to quit whenever they want or feel disturbed. In addition, participants were assured about confidentially and anonymity.

2.3.Measures

In the current study, four main instruments were used; Demographic Information Form, The Driver Behaviors Questionnaire, The Driver Skill Inventor, and The Health Belief Model Scale.

2.3.1. The Demographic Information Form

At the beginning of the questionnaire the participants were asked to fill out a demographic information form (see Appendix C). Demographic information form includes question about sex, age, the number of years having driving license, annual km, life-time km, the number of active accidents, that is, hitting another road user or an obstacle, the number of passive accidents, that is, being hit by another road user. Also some other detailed violation information was gathered: tickets due to speeding, seat-belt violation, drunk-driving, and red light violation. In addition to this, question about speeding behavior was asked by all participants. This is "How often do you violate speed limits?" With this question, the relationship between the Health Belief Model Scale items and obeying speed limits could be investigated. The last question was asked to find out that which type of road or in which weather conditions cause exceeding speed limits. This question is evaluated over a 6-point Likert Type (1= never, 6 = almost always), and imagining 13 conditions/road types. The last question was taken from a project about the Health Belief Model and two-wheel motor vehicle driver behavior (Lajunen, & Özkan, 2010).

2.3.2. The Driver Behavior Questionnaire

The Driver Behavior Questionnaire (DBQ) was developed by Reason et al. (1990) in order to measure aberrant driver behaviors. Lawton et al. (1997) extended the scale and it was adopted to Turkish by Lajunen and Özkan (2004). The DBQ is a self-report questionnaire includes drivers' violations, errors, slips and lapses (see Table 3 for the sample items). As mentioned in the previous sections, slips and lapses are defined as the failure of attention and memory (Lucidi et al., 2010). Errors are defined that an action does not achieve desired end despite going as planned (Reason et al., 1990). In addition, violations are defined as deliberate disobedience to rules that ensure traffic safety (Reason et al., 1990).

In the current study, only violations items were used because lapses and errors are not included into the scope of the study because of their nature (see Appendix D for violation items). The violations factor of the DBQ consists of eleven items under two types; aggressive violations and ordinary violations. The former includes three items; for example, "become angered by another driver" and "give chase with the intention of giving him or her a piece of your mind". The latter comprised of eight items such as "staying in a motorway lane that you know will be closed ahead until the last minute before forcing your way into the other lane". The eleven items were presented to the participants who were asked to evaluate their frequency within the previous year by using a 6-point Likert type (1 = Never, 6 = Nearly all the time) scale. Lower scores mean that the participants' self-reported violation frequency is low; higher scores mean the frequency of self-reported violations is high. In the present study, violations factor of the DBQ was found to be highly reliable (11 items; $\alpha = .83$). Furthermore, the internal consistency reliability values for aggressive and ordinary violations sub-factors were .68 and .81, respectively.

Table 3. *The Examples of Driver Behavior Questionnaire Items from Original Form in Terms of the Types of Aberrant Behavior*

The type of behavior	**Example**
Slips	In a queue of vehicles turning left on to a main road, pay such close attention to the traffic approaching from the right that you nearly hit the car in front.
Lapses	Attempt to drive away from traffic lights in third gear.
Error	Overtake a single line of stationary or slow-moving vehicles, only to discover that they were queueing to get through a one-lane gap or roadwork lights.
Violation	Drive back from a party, restaurant, or pub, even though you realize that you may be over the legal blood-alcohol limit.

2.3.3. Driver Skill Inventory

The Driver Skill Inventory (DSI) was developed by Lajunen and Summala (1995) were used in order to measure the participants' self-reported perceptual-motor and safety skills orientations. The version used in the current study contains 10 items; 5 perceptual-motor skills items and 5 safety skills items (See Table 4 for the sample DSI items). The scale was adopted to Turkish by Sümer and Özkan (2002).

In the short form of the DSI, which was used in current study as well, ten items were included under two sub-dimensions: perceptual-motor and safety skills. The participants were asked to evaluate the items over a 5-point Likert type scale (1 = definitely weak, 5 = definitely strong). Higher scores on both sub-dimensions mean that participants' perceptual-motor and safety skill orientation is high, low scores mean that this orientation is low. Internal consistency reliability score for the overall DSI was .64. Moreover, these scores for the perceptual-motor and safety skills sub-dimensions were .80 and .67, respectively.

Table 4. *The Examples of Driver Skill Inventory in Terms of Perceptual-Motor and Safety Skills*

Type of skills	**Examples**
Perceptual-motor skills	Fluent lane changing in heavy traffic
Safety skills	Tolerating other drivers' blunders calmly

2.3.4. The Health Belief Model Scale

The Health Belief Model (HBM) Scale was developed in order to promote health behavior (Rosenstock, 1974). Like the model, the scale has six dimensions: Perceived susceptibility, perceived severity, perceived benefits, perceived barriers, motivation and cues to action. Lajunen and Özkan (2010) first administered the scale to Turkish sample.

In the current study, the HBM scale items were adapted to obeying speed limits in their content (see Appendix F). For instance, the original item of "My chances of

getting breast cancer" are great was turned into "My chances of getting injuries from traffic accident due to speeding" are great in this study. Perceived susceptibility consists of five items, perceived severity comprises of eleven items perceived benefits includes six items, perceived barriers includes thirteen items, cues to action consists of eight items, and motivation includes four items (see Table 5). In total, the scale in the present study has 47 items. The participants were asked to evaluate the HBM Scale items over a 5-point Likert Type scale (1= completely disagree, 5 = completely agree). The 5-point Likert type scale used in the cues to action dimensions has a different meaning; 1 means "not important at all", and 5 means "very important" (see Appendix G). Higher scores on all dimensions, expect for perceived barriers, mean higher tendencies to obey speed limits. However, higher scores on perceived barriers demonstrated lower probability to obey speed limits. So, lower scores on perceived barriers and higher scores on the other dimensions stress the probability of obeying speed limits. According to present study, the Cronbach's alphas for all dimensions were measured separately. Table 5 showed alphas for dimensions.

Table 5. *The Health Belief Model Scale Item Examples*

Factor	**Items**	**Item example**	**Alphas**
Susceptibility	5	Probability of having injured in an accident due to exceed speed limits is very high.	.78
Severity	11	My whole life could be changed in an accident due to exceed speed limits.	.86
Benefits	6	Obeying speed limits decreases my risk of being injured in an accident	.84
Barriers	13	Obeying speed limits might be difficult because of not paying attention to speed sign	.86
Cues to action	8	Mass media campaign about obeying speed limits	.84
Motivation	4	Nothing is as important as good health	.79

CHAPTER III

RESULTS

3.1.General Information

In this study, the analyses were explained under three different sections. In the first section, descriptive statistics concerning the variables used in this study were mentioned about. In addition, bivariate and point-biserial correlations were calculated and chi-square tests conducted to test the basic relationships between the variables of interest were explained. In the second section, hierarchical regression analyses were conducted to observe the relationships between the Health Belief Model (HBM) Scale dimensions, the dimensions of the Driver Skill Inventory (DSI), violation variable of the Driver Behavior Questionnaire (DBQ), and the items related to the frequency of obeying speed limits. Finally, in the third section, mediation analyses between the constructs of the HBM, the DSI and the frequency of obeying speed limits were conducted by using the indirect macro of Hayes (2013). All of the analyses in the current study were conducted by using SPSS 22 program.

3.2.Data cleaning and Computing Subscales

Prior to the analyses, data cleaning was done in order to provide clean data set for the accuracy of the results. The cases which were not completely filled out the questionnaire were removed from the data file. After this, only three missing data remained in the dataset; one of them was in age variable, one was in the level of education variable, and last one was in the life-time mileage (km) variable. Minimum and maximum scores were checked for all variables in order to fix incorrect data entries. After this process, the constructs and dimensions of each instruments were computed by calculating the average values of the items belonging to each sub-factor or dimension.

3.3.Descriptive Statistics and Bivariate Correlation Analyses

Means, standard deviations, minimum and maximum scores, range, number of participants and the number of items of variables were presented in Table 6. The bivariate correlations between those variables were also calculated (see Table 7).

Concerning the DBQ factors, the results indicated that participants rated more aggressive violation (M = 2.17, SD = .86) than ordinary violation (M = 1.95, SD = .68). Furthermore, concerning the sub-dimensions of the DSI, the findings indicated that drivers reported stronger perceptual-motor skills (M = 3.91, SD = .67) as compared to their safety skills (M = 3.76, SD = .60). For both sub-dimension of the DSI, self-ratings were above the average.

The descriptive statistics for the constructs of the HBM sub-dimensions were also calculated. The results showed that drivers had high perceived susceptibility (M = 3.72, SD = .82) and perceived severity (M = 3.32, SD = .78) toward traffic accidents due to exceeding speed limits. In addition, the findings indicated that the frequency of obeying speed limits had high perceived benefits (M = 4.19, SD = .78) for drivers. Moreover, participants rated low perceived barriers (M = 2.41, SD = .70) for the frequency of obeying speed limits. Furthermore, participants had high motivation of safety and health (M = 4.50, SD = .66). Finally, drivers thought that to increase the frequency of obeying speed limits, cues to action (M = 3.66, SD = .79) were very important.

In order to determine the relationship among all study variables, Bivariate Correlation analysis was conducted; age, annual km, frequency of obeying speed limits, aggressive violations, ordinary violations, perceptual-motor skills, safety skills, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, motivation and cues to action variables were included in the analysis.

The relationship between age and main variables of the study indicated that age the negatively related to frequency of obeying speed limits (r = -.10, p < .05); aggressive violation (r = -.11, p < .05) and ordinary violation (r = -.15, p < .01); and perceived barriers (r = -.21, p < .01). That is, as age increases, speeding behaviors, aggressive and ordinary violations, and perceived barriers increases as well. On the other hand, age was positively related to perceptual-motor skills (r = .11, p < .01); perceived susceptibility (r = .10, p < .05); perceived benefits (r = .18, p < .01);

motivation (r = .18, p < .01); and cues to action (r = .11, p < .05). That is, as age increases, these variables mentioned decreases as well.

Correlation analyses showed that in addition to age, the other demographic variables and main variables of the study are also related to each other. For instance, annual mileage (km) was positively related to the frequency of obeying speed limits (r = .18, p < .01); ordinary violations (r = .18, p < .01); perceptual-motor skills (r = .36, p < .01). That is, as annual mileage (km) increases, speeding behavior, ordinary violation and perceptual-motor skills increases as well. In addition, annual mileage (km) had a significant and negative relationship with cues to action(r = -.14, p < .01). That is, as annual mileage (km) increases, cues to action decreases as well.

Table 6. *Descriptive Statistics of Variables for All Participants*

Variables	N	Mean	SD	Min	Max	Range
Age	504	27.14	7.95	18	68	50
Education	504	6.09	.72	2	7	5
Experience (years)	505	6.82	6.42	1	37	36
Annual mileage (km)	505	9,222.97	11,686.55	50	100,000	99,950
Agg_vio	505	2.17	.86	1	6	5
Ordinary_vio	505	1.95	.68	1	4.88	3.88
PMS	505	3.91	.67	2	5	3
SS	505	3.76	.60	1.60	5	3.40
Perc. Suscep.	505	3.72	.82	1	5	4
Perc. Severity	505	3.32	.78	1	5	4
Perc. Benefits	505	4.19	.78	1	5	4
Perc. Barriers	505	2.41	.70	1	4.92	3.92
Motivation	505	4.50	.66	1	5	4
CTA	505	3.66	.79	1.25	5	3.75

Note: Education = the level of education, Experience (years) = the number of years of having driving license, Agg_vio = aggressive violation, Ordinary_vio = ordinary violation, PMS = perceptual-motor skills, SS = safety skills, Perc. Suscep. = perceived susceptibility, perc = perceived, CTA = cues to action. Scale values for the scale: Aggressive violation and ordinary violation: 1 = never, 6 = nearly all the time; Perceptual-motor and safety skills: 1 = definitely weak, 5 = definitely strong; Perceived Susceptibility, Perceived Severity, Perceived Benefits, Perceived Barriers, Motivation: 1 =completely disagree, 5 =completely agree; and Cues to Action: 1 = not important at all, 5 = very important.

Table 7. *Correlation Matrix of All Variables*

Variables	# Items	1	2	3	4	5	6	7
1. Age	-	-						
2. Annual Mileage	-	.20**	-					
3. Speeding	1	-.10*	.18**	-				
4. Agg_vio	3	-.11*	.07	.33**	-			
5. Ordinary_vio	8	-.15**	.18**	.66**	.51**	-		
6. SS	5	.15**	-.08	-.52**	-.31**	-.61**	-	
7. PMS	5	.11*	.36**	.32**	.12**	.26**	-.04	-
8. Perc. Suscep.	5	.10*	.00	-.07	.06	-.03	.00	.03
9. Perc. Severity	11	.07	-.03	-.19**	-.02	-.17**	.13**	-.08
10. Perc. Benefits	6	.18**	-.07	-.27**	-.09*	-.29**	.21**	-.06
11. Perc. Barriers	13	-.21**	.08	.46**	.22**	.51**	-.41**	.19**
12. Motivation	4	.18**	-.06	-.20**	-.11*	-.24**	.25**	-.03
13. CTA	8	.11*	-.14**	-.19**	-.07	-.18**	.10*	-.11*

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

Table 7. (*continued)*

Variables	# Items	8	9	10	11	12	13
8. Perc. Suscep.	5	-					
9. Perc. Severity	11	38.**	-				
10. Perc. Benefits	6	.28**	.45**	-			
11. Perc. Barriers	13	-.07	-.19**	-.35**	-		
12. Motivation	4	.14**	.23**	.41**	-.31**	-	
13. CTA	8	.09*	.22**	.16**	-.12**	.26**	-

** Correlation significant at the .05 level (2-Tailed). **Correlation significant at the .01 level (2-Tailed).*
Note: Agg_vio = aggressive violation, Ordinary_vio = ordinary violation, PMS = perceptual-motor skills, SS = safety skills, Perc. Suscep. = perceived susceptibility, perc = perceived, CTA = cues to action.

The findings indicated that the frequency of obeying speed limits had positive relationship with aggressive violation (r = .33, p < .01); ordinary violation (r = .66, p < .01); perceptual-motor skills (r = .32, p < .01); and perceived barriers (r = .46, p < .01). That is, as the frequency of obeying speed limits increases, aggressive and ordinary violation, perceptual-motor skills, and perceived barriers increases as well. On the other hand, the frequency of obeying speed limits was negatively related to safety skills (r = -.52, p < .01); perceived severity (r = -.19, p < .01); perceived benefits (r = -.27, p < .01); motivation (r = -.20, p < .01); and cues to action (r = -.19, p < .01). That is, as speeding behaviors increases, safety skills, perceived severity, perceived benefits, motivation, and cues to action increases as well.

The examination of the DBQ dimensions and other variables of interest provided significant relationship in Bivariate Correlation Analyses. Firstly, aggressive violation was positively related to ordinary violations (r = .51, p < .01); perceptual-motor skills (r = .12, p < .01); perceived barriers (r = .22, p < .01). That is, as aggressive violations increase, ordinary violations, perceptual-motor skills, and perceived barriers increase as well. In addition, aggressive violation was negatively related to safety skills (r = -.31, p < .01); perceived benefits (r = -.09, p < .05) and motivation (r = -.11, p < .05). That is, as aggressive violations increase, these variables mentioned decrease as well. On the other hand, ordinary violation was positively correlated with perceptual-motor skills (r = .26, p < .01); and perceived barriers (r = .51, p < .01). That is, as ordinary violations increase, perceptual-motor skills and perceived barriers increase as well. Moreover, ordinary violation was negatively related to safety skills (r = -.61, p < .01); perceived severity (r = -.17, p < .01); perceived benefits (r = -.29, p < .01), motivation (r = -.24, p < .01), and cues to action (r = -.18, p < .01). That is, as ordinary violations increase, these variables mentioned decrease as well.

The Bivariate Correlation analyses were done in order to determine the relationship between the DSI dimensions and other main variables in the study. The results showed that safety skills had positive correlation with perceived severity (r = .13, p < .01); perceived benefits (r = .21, p < .01); motivation (r = .25, p < .01); and cues to action (r = .10, p < .05). That is, as safety skills increase, these variables mentioned increase as well. On the other hand, safety skills had negative correlation with perceived barriers (r = -.41, p < .01). That is, as safety skills increase, perceived barriers decrease as well. The findings indicated that perceptual motor skills had positive correlation with perceived barriers (r = .19, p < .01) and negative correlation

with cues to action (r = -.11, p < .05). That is, as perceptual-motor skills increase, perceived barriers increase and cues to action decrease as well.

To determine the relationship between the HBM constructs, the Bivariate Correlation analyses were conducted. The findings indicated that perceived susceptibility had positive correlation with perceived severity (r = .38, p < .01); perceived benefits (r = .28, p < .01); motivation (r = .14, p < .01); and cues to action (r = .09, p < .05). In addition, perceived severity had positive relationship with perceived benefits (r = .45, p < .01); motivation (r = .23, p < .01); and cues to action (r = .22, p < .01) whereas it had a negative relationship with perceived barriers (r = -.19, p < .01). Moreover, perceived benefits was also negatively related to perceived barriers (r = .35, p < .01), and positively related to motivation (r = .41, p < .01) and cues to action (r = .16, p < .01). Furthermore, perceived barriers had negative correlation with motivation (r = -.31, p < .01) and cues to action (r = -.12, p < .01). Lastly, motivation was positively correlated with cues to action (r = .26, p < .01).

To examine the relationships between sex/speeding accidents and study variables, the Point-biserial Correlation analyses were conducted (see Table 8). The results showed that sex had negative correlation with the frequency of obeying speed limits (r_{pb} = -.25, p < .01); safety skills (r_{pb} = -.11, p < .05); perceived benefits (r_{pb} = -.11, p < .05), motivation (r_{pb} = -.10, p < .05), and cues to action (r_{pb} = -.13, p < .01). In addition, sex had positive correlation with ordinary violation (r_{pb} = .23, p < .01); perceptual-motor skills (r_{pb} = .35, p < .01); perceived barriers (r_{pb} = .13, p < .01). On the other hand, speeding accidents had negatively related to the frequency of obeying speed limits (r_{pb} = -.33, p < .01); aggressive violation (r_{pb} = -.66, p < .01); safety skills (r_{pb} = -.32, p < .01); and perceived benefits (r_{pb} = -. 46, p < .01). Moreover, speeding accident had positive correlation with ordinary violation (r_{pb} = .52, p < .01); perceived susceptibility (r_{pb} = .19, p < .01), perceived severity (r_{pb} = .27, p < .01), perceived barriers (r_{pb} = .20, p < .01), motivation (r_{pb} = .19, p < .01), and cues to action (r_{pb} = .17, p < .01).

Finally, in order to determine the relationship between two dichotomous variables; sex and speeding accidents, Chi-square analysis was conducted. The results showed (see Table 9) that the relationship between sex and speeding accidents was significant X^2 (1, N = 505) = 3.87, p <.05. This means that males were more likely to have an accident due to speeding than were females.

Table 8. *Point-biserial Correlation Coefficient Score for Sex and Speeding Accidents*

Variables	Sex	Speeding Accidents
1. Speeding	-.25**	-.33**
2. Agg_vio	.07	-.66**
3. Ordinary_vio	.23**	.52**
4. SS	-.11*	-.32**
5. PMS	.35**	.07
6. Perc. Suscep.	.00	.19**
7. Perc. Severity	-.08	.27**
8. Perc. Benefits	-.11*	-.46**
9. Perc. Barriers	.13**	.20**
10. Motivation	-.10*	.19**
11. CTA	-.13**	.17**

*Correlation significant at the .05 level (2-Tailed). **Correlation significant at the .01 level (2-Tailed).*
Note: Agg_vio = aggressive violation, Ordinary_vio = ordinary violation, PMS = perceptual-motor skills, SS = safety skills, Perc. Suscep. = perceived susceptibility, perc = perceived, CTA = cues to action. Female =1, Male=2.

Table 9. *Chi-square Analysis Results for Sex and Accidents Due to Speeding*

Variables	Chi-square	DF*	*p*	N
Sex				
Speeding				
Accidents	3.87	1	.049	505

*DF, degree of freedom.

3.4.The Main analyses: Hierarchical Regression Analyses

In the following sections, the hierarchical regression analyses testing the relationships between the Health Belief Model (HBM) constructs and driver behaviors (for the violations, as a complete sub-factor; aggressive violations, and ordinary

violations different analyses were conducted); the HBM constructs and driver skills; driver behaviors and driver skills, and, lastly, mediating role of driving skills in the relationship between the HBM constructs and driver behaviors were mentioned about.

3.4.1. Investigating the relationships between the HBM Constructs and Driver Behaviors

A hierarchical regression analysis was conducted in order to test whether the HBM constructs are related to the violations factors of driver behaviors. In the hierarchical regression analysis, violations were identified as the dependent variable (DV); and the HBM constructs were the independent variables (IV). In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 10) of the analysis showed that controlled variables contributed significantly to regression model and accounted for 10% variation in violation ($F(3, 500) = 17.57$, $p < .001$, $R^2 = .10$). Introducing the HBM constructs explained an additional 18% of variation in violations $F_{change}(6, 494) = 20.10$, $p < .001$, $R^2 = .27$. The only HBM construct being related to violation was perceived barriers. This construct was found to be positively related to violations; that is, one-unit increase in perceived barriers brings about .39 increase in violations ($\beta = .39$, $p < .001$, 95% CI [.28, .44]).

In the second analysis, a hierarchical regression analysis was conducted in order to test whether the HBM constructs are related to the aggressive violation variables of driver behaviors. In the hierarchical regression analysis, aggressive violations were identified as the DV; and the HBM constructs were IV. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 11) of this regression analysis showed that controlled variables contributed significantly to the regression model, and accounted for 3% variation in aggressive violation ($F(3, 500) = 4.39$, $p = .005$, $R^2 = .03$). ıntroducing the HBM constructs explained and additional 4% of variation in aggressive violation, $F_{change}(6, 494) = 3.79$, $p = .001$, $R^2 = .07$. The only HBM construct being related to aggressive violations was perceived barriers. This construct was found to be positively related to aggressive violations; that is, one-unit increase

in perceived barriers brings about .19 increase in violations (β = .19, p < .001, 95% CI [.11, .34]).

Table 10. *Hierarchical Regression of Driver Behaviors (Violations) on the HBM Constructs*

Variable	β	P	R^2	ΔR^2
Step 1		.000	.10	.10
Age	-.20	.000		
Sex	.18	.000		
Annual mileage	.17	.000		
Step 2		.000	.27	.18
Age	-.09	.036		
Sex	.11	.006		
Annual mileage	.12	.005		
Per. Susceptibility	.07	.110		
Per. Severity	-.02	.619		
Per. Benefits	-.07	.128		
Per. Barriers	.39	.000		
Motivation	-.03	.512		
CTA	-.06	.179		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = violations.

Table 11. *Hierarchical Regression of Aggressive Violations on the HBM Constructs*

Variable	β	*P*	R^2	ΔR^2
Step 1		.005	.03	.03
Age	-.13	.003		
Sex	.07	.148		
Annual mileage	.08	.069		
Step 2		.001	.07	.04
Age	-.09	.065		
Sex	.04	.437		
Annual mileage	.06	.194		
Per. Susceptibility	.08	.081		
Per. Severity	.02	.746		
Per. Benefits	-.02	.704		
Per. Barriers	.19	.000		
Motivation	-.03	.555		
CTA	-.02	.602		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = aggressive violations.

In the third analysis, a hierarchical regression analysis was conducted to examine whether the HBM constructs are related to the ordinary violations variables of driver behaviors. In the hierarchical regression analysis, ordinary violations were defined as the DV; and the HBM constructs were the IV. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 12) of the analysis showed that controlled variables contributed significantly to regression model, and accounted for 11% variation in ordinary violation ($F(3, 500) = 20.44$, $p < .001$, $R^2 = .11$). Introducing the HBM constructs explained an additional 21% of variation in ordinary violations, $F_{change}(6, 494) = 25.50$, $p < .001$, $R^2 = .32$. The only HBM construct being related to ordinary violation was perceived barriers. This construct was found to be positively related to ordinary violations; that is, one-unit increase in perceived barriers brings about .42 increase in ordinary violations ($\beta = .42$, $p < .001$, 95% CI [.33, .49]).

Table 12. *Hierarchical Regression of Ordinary Violations on the HBM Constructs*

Variable	β	*P*	R^2	ΔR^2
Step 1		.000	.11	.11
Age	-.20	.000		
Sex	.20	.000		
Annual mileage	.18	.000		
Step 2		.000	.32	.21
Age	-.07	.070		
Sex	.13	.001		
Annual mileage	.12	.003		
Per. Susceptibility	.05	.232		
Per. Severity	-.04	.396		
Per. Benefits	-.09	.066		
Per. Barriers	.42	.000		
Motivation	-.02	.576		
CTA	-.06	.127		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = ordinary violations.

In the fourth analysis, a hierarchical regression analysis was conducted to test whether the HBM constructs are related to the frequency of obeying speed limits. In the hierarchical regression analysis, the frequency of obeying speed limits was defined as the DV; and the HBM constructs were the IV. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 13) of this regression analysis at the first step examined that controlled variables contributed significantly to regression model, and accounted for 10% variation in the frequency of obeying speed limits ($F(3, 500) = 18.24$, $p < .001$, $R^2 = .10$). Introducing the HBM constructs explained an additional 18% variation in the frequency of obeying speed limits, $F_{change}(6, 494) = 20.81$, $p < .001$, $R^2 = .28$. The one of the HBM constructs being related to the frequency of obeying speed limits was perceived barriers. This construct was found to be positively related to the frequency

of obeying speed limits; that is, one-unit increase in perceived barriers causes .39 increase in the frequency of obeying speed limits (β = .39, p < .001, 95% CI [.39, .61]). Moreover, cues to action negatively relates the frequency of obeying speed limits (β = -.09, p < .05, 95% CI [-.19, -.01]). In other words, one-unit increases in cues to action leads to .09 unit decreases in the frequency of obeying speed limits.

Table 13. *Hierarchical Regression of the Frequency of Obeying Speed Limits on the HBM Constructs*

Variable	***B***	***P***	R^2	ΔR^2
Step 1			.10	.10
Age	-.15	.001		
Sex	.23	.000		
Annual mileage	.16	.000		
Step 2			.28	.18
Age	-.02	.551		
Sex	.16	.000		
Annual mileage	.10	.013		
Per. Susceptibility	.00	.928		
Per. Severity	-.06	.215		
Per. Benefits	-.07	.127		
Per. Barriers	.39	.000		
Motivation	.01	.817		
CTA	-.09	.037		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = the frequency of obeying speed limits.

3.4.2. The regression analysis for the relationship between the constructs of the Health Belief Model and Driver Skills

A hierarchical regression analysis was conducted in order to test whether the HBM constructs are related to safety skills. In the hierarchical regression analysis, safety skills were identified as the DV; and the HBM constructs were IV. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 14) of the analysis showed that controlled variables contributed significantly to regression model, and accounted for 5% variation in safety skills ($F(3, 500) = 7.96$, $p < .001$, $R^2 = .05$). Introducing the HBM constructs explained an additional 15% of variation in safety skills, $F_{change}(6, 494) = 15.10$, $p < .001$, $R^2 = .19$. In addition, perceived barriers were found to be negatively related to safety skills; that is, one-unit increase in perceived barriers brings about .33 unit decreases in safety skills ($\beta = -.33$, $p < .001$, 95% CI [-.36, -.21]). Moreover, motivation was found to be positively relates safety skills ($\beta = .11$, $p < .001$, 95% CI [.02, .19]). In other words, one-unit increases in motivation leads to .11 unit increases in safety skills.

A hierarchical regression analysis was conducted in order to test whether the HBM constructs are related to perceptual-motor skills. In the hierarchical regression, perceptual-motor skills were identified as the DV; and the constructs of the HBM were the IV. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. Later, the constructs of the HBM were entered at the second step as the IVs. The results (see Table 15) of the analysis at the first step showed that controlled variables contributed significantly to regression model, and accounted for 21% variation in perceptual-motor skills ($F(3, 500) = 43.64$, $p < .001$, $R^2 = .21$). Introducing the constructs of the HBM explained an additional 3% of variation in perceptual-motor skills, $F_{change}(6, 494) = 3.11$, $p < .01$, $R^2 = .24$. The only HBM construct being related to perceptual-motor skills was perceived barriers. This construct was found to be positively related to perceptual-motor skills; that is, one-unit increase in perceived barriers brings about .17 unit increases in perceptual-motor skills ($\beta = .17$, $p < .001$, 95% CI [.08, .24]).

Table 14. *Hierarchical Regression of Safety Skills on the HBM Constructs*

Variable	*B*	*P*	R^2	ΔR^2
Step 1		.000	.05	.05
Age	.18	.000		
Sex	-.11	.015		
Annual mileage	-.09	.046		
Step 2		.000	.20	.15
Age	.07	.070		
Sex	-.05	.001		
Annual mileage	-.05	.002		
Per. Susceptibility	-.07	.232		
Per. Severity	.05	.396		
Per. Benefits	.03	.066		
Per. Barriers	-.33	.000		
Motivation	.11	.017		
CTA	.00	.127		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = safety skills.

Table 15. *Hierarchical Regression of Perceptual-motor Skills on the HBM Constructs*

Variable	β	*P*	R^2	ΔR^2
Step 1		.000	.21	.21
Age	.03	.492		
Sex	.28	.000		
Annual mileage	.29	.000		
Step 2		.005	.24	.03
Age	.06	.193		
Sex	.26	.000		
Annual mileage	.28	.000		
Per. Susceptibility	.04	.303		
Per. Severity	-.06	.210		
Per. Benefits	.03	.575		
Per. Barriers	.17	.000		
Motivation	.06	.176		
CTA	-.03	.438		

Note: N = 505; Perc = perceived, CTA = cues to action. Dependent variable = perceptual-motor skills.

3.4.3. The regression analysis for Driver Behavior and Driver Skills

A hierarchical regression analysis was conducted in order to test whether driving skills are related to violation factors of driver behaviors when controlling the constructs of the HBM. In the hierarchical regression analysis, violations were identified as the DV; and driver skills were IVs. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. In addition, to control the possibility of association between the HBM constructs and violations, the HBM constructs were entered in the second step of the analysis. Finally, to test prediction, driver skills such as safety skills and perceptual-motor skills were entered at third step. The results (see Table 16) of the regression analysis indicated that controlled variables contributed significantly to regression model and accounted for 10% variation in violation ($F(3, 500) = 17.57$, $p < .001$, $R^2 = .10$). Introducing the

HBM constructs explained an additional 18% of variation in violations F_{change} (6, 494) = 20.10, $p < .001$, $R^2 = .27$. In addition, driver skills entered in the third step significantly increases the explained variance in violations (F_{change} (2, 492) = 76.08, $p < .001$, $R^2_{change} = .17$). In addition, after controlling the effects of the HBM constructs, safety skills were found to be negatively ($\beta = -.45$, $p < .001$, 95% CI [-.56, -.41]); and perceptual-motor skills were positively related to violations ($\beta = .14$, $p < .001$, 95% CI [.06, .21]). In other words, one-unit increase in safety skills leads to .45 unit decreases in violations. On the other hand, one-unit increases in perceptual-motor skills brings about .14 unit increase in violations.

Table 16. *Hierarchical Regression of Violations on Driver Skills When Controlled the HBM*

Variable	***β***	***p***	R^2	ΔR^2
Step 1		.000	.10	.10
Age	-.20	.000		
Sex	.18	.000		
Annual mileage	.17	.000		
Step 2		.000	.27	.18
Age	-.09	.036		
Sex	.11	.006		
Annual mileage	.12	.005		
Perc. Susceptibility	.07	.110		
Perc. Severity	-.02	.619		
Perc. Benefits	-.10	.108		
Perc. Barriers	.39	.000		
Motivation	-.03	.512		
CTA	-.06	.179		
Step 3		.000	.45	.17
Age	-.06	.084		
Sex	.05	.162		
Annual mileage	.06	.143		

Table 16. (*continued)*

Variable	β	p	R^2	ΔR^2
Perc. Susceptibility	.03	.391		
Perc. Severity	.01	.851		
Perc. Benefits	-.07	.121		
Perc. Barriers	.21	.000		
Motivation	.01	.742		
CTA	-.05	.173		
SS	-.45	.000		
PMS	.14	.000		

Note: N = 505; SS = safety skills, PMS = perceptual-motor skills, Perc = perceived, CTA = cues to action, Dependent variable = violations.

A hierarchical regression analysis was conducted in order to test whether driver skills are related to aggressive violation factors of driver behaviors when controlling the constructs of the HBM. In the hierarchical regression analysis, aggressive violations were identified as the DV; and driver skills were IVs. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. In addition, to control the possibility of association between the HBM constructs and aggressive violations, the HBM constructs were entered in the second step of the analysis. Finally, to test prediction, driver skills were entered at third step. The results (see Table 17) of the regression analysis showed that controlled variables contributed significantly to the regression model and accounted for 3% variation in aggressive violation ($F(3, 500) = 4.39$, $p = .005$, $R^2 = .03$). At the second step, the constructs of the HBM variables explained an additional 4% of variation in aggressive violation, $F_{change}(6, 494) = 3.79$, $p = .001$, $R^2 = .07$. In addition, driver skills entered in the third step significantly increases the explained variance in aggressive violations ($F_{change}(2, 492) = 15.68$, $p < .001$, $R^2_{change} = .06$). In addition, after controlling for the effects of the HBM constructs, safety skills were found to be negatively ($\beta = -.25$, $p < .001$, 95% CI [-.49, -.23]); and perceptual-motor skills were positively related to aggressive violations ($\beta = .10$, $p < .05$, 95% CI [.00, .24]). In other words, one-unit increase in safety skills leads to .25

unit decrease in aggressive violations. On the other hand, one-unit increase in perceptual-motor skills brings about .10 unit increase in aggressive violations.

Table 17. *Hierarchical Regression of Aggressive Violations on Driver Skills When Controlled the HBM*

Variable	β	P	R^2	ΔR^2
Step 1		.005	.03	.03
Age	-.13	.003		
Sex	.07	.148		
Annual mileage	.08	.069		
Step 2		.001	.07	.04
Age	-.09	.065		
Sex	.04	.437		
Annual mileage	.06	.194		
Perc. Susceptibility	.08	.081		
Perc. Severity	.02	.746		
Perc. Benefits	-.02	.704		
Perc. Barriers	.18	.000		
Motivation	-.03	.555		
CTA	-.02	.602		
Step 3		.000	.12	.06
Age	-.07	.106		
Sex	-.01	.967		
Annual mileage	.02	.643		
Perc. Susceptibility	.06	.178		
Perc. Severity	.04	.491		
Perc. Benefits	-.02	.751		
Perc. Barriers	.08	.094		
Motivation	-.01	.886		
CTA	-.02	.653		
SS	-.25	.000		
PMS	.10	.049		

Note: N = 505; SS = safety skills, PMS = perceptual-motor skills, Perc = perceived, CTA = cues to action, Dependent variable = aggressive violations.

A hierarchical regression analysis was conducted in order to test whether driver skills are related to ordinary violation factors of driver behaviors when controlling the constructs of the HBM. In the hierarchical regression analysis, ordinary violations were identified as the DV; and driver skills were IVs. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. In addition, to control the possibility of association between the HBM constructs and ordinary violations, the HBM were entered in the second step. Finally, to test prediction, driver skills were entered at third step. The results (see Table 18) of the analysis indicated that controlled variables contributed significantly to the regression model and accounted for 11% variation in ordinary violation ($F(3, 500) = 20.44$, $p < .001$, $R^2 = .11$). At the second step, the constructs of the HBM variables explained an additional 21% of variation in aggressive violation, $F_{change}(6, 494) = 25.50$, $p < .001$, $R^2 = .32$. In addition, driver skills entered in the third step significantly increases the explained variance in ordinary violations ($F_{change}(2, 492) = 91.56$, $p < .001$, $R^2_{change} = .18$). In addition, after controlling for the effects of the HBM constructs, safety skills were found to be negatively ($\beta = -.47$, $p < .001$, 95% CI [-.61, -.45]); and perceptual-motor skills were positively related to ordinary violations ($\beta = .14$, $p < .001$, 95% CI [.07, .21]). In other words, one-unit increase in safety skills leads to .47 unit decrease in ordinary violations. On the other hand, one-unit increase in perceptual-motor skills brings about .14 unit increase in ordinary violations.

Table 18. *Hierarchical Regression of Ordinary Violations on Driver Skills When Controlled the HBM*

Variable	β	P	R^2	ΔR^2
Step 1			.11	.11
Age	-.20	.000		
Sex	.20	.000		
Annual mileage	.18	.000		
Step 2			.32	.21
Age	-.07	.070		
Sex	.13	.001		
Annual mileage	.12	.002		
Per. Susceptibility	.05	.232		
Per. Severity	-.04	.396		
Per. Benefits	-.09	.066		
Per. Barriers	.42	.000		
Motivation	-.02	.576		
CTA	-.06	.127		
Step 3		.000	.50	.18
Age	-.05	.169		
Sex	.07	.050		
Annual mileage	.06	.084		
Perc. Susceptibility	.01	.733		
Perc. Severity	-.01	.864		
Perc. Benefits	-.08	.052		
Perc. Barriers	.24	.000		
Motivation	.02	.586		
CTA	-.05	.109		
SS	-.47	.000		
PMS	.14	.000		

Note: N = 505; SS = safety skills, PMS = perceptual-motor skills, Perc = perceived, CTA = cues to action, Dependent variable = ordinary violation.

A hierarchical regression analysis was conducted in order to test whether driver skills are related to the frequency of obeying speed limits when controlling the constructs of the HBM. In the hierarchical regression analysis, the frequency of obeying speed limits was identified as the DV; and driver skills were the IVs. In order to control the statistical effects of age, sex, and exposure, these variables were entered in the first step of the analysis. In addition, to control the possibility of association between the HBM constructs and the frequency of obeying speed limits, the HBM constructs were entered in the second step of the analysis. Finally, to test prediction, driver skills were entered at third step. The results (see Table 19) of the regression analysis showed that controlled variables contributed significantly to the regression model and accounted for 10% variation in aggressive violation ($F(3, 500) = 18.24$, $p < .001$, $R^2 = .10$). At the second step, the constructs of the HBM variables explained an additional 18% of variation in aggressive violation, $F_{change}(6, 494) = 20.81$, $p < .001$, $R^2 = .28$. In addition, driver skills entered in the third step significantly increases the explained variance in the frequency of obeying speed limits ($F_{change}(2, 492) = 63.19$, $p < .001$, $R^2_{change} = .15$). In addition, after controlling the effects of the HBM constructs, the frequency of obeying speed limits negatively related to safety skills ($\beta = -.39$, $p < .001$, 95% CI [-.70, -.48]); and positively related to perceptual-motor skills ($\beta = .21$, $p < .001$, 95% CI [.18, .38]). In other words, one-unit increase in safety skills leads to .39 unit decrease in the frequency of obeying speed limits. On the other hand, one-unit increase in perceptual-motor skills brings about .21 unit increase in the frequency of obeying speed limits.

Table 19. *Hierarchical Regression of the Frequency of Obeying Speed Limits on Driver Skills When Controlled the HBM*

Variable	β	*P*	R^2	ΔR^2
Step 1			.10	.10
Age	-.15	.001		
Sex	.23	.000		
Annual mileage	.16	.000		
Step 2			.28	.18
Age	-.02	.551		
Sex	.16	.000		
Annual mileage	.10	.013		
Per. Susceptibility	.00	.928		
Per. Severity	-.06	.215		
Per. Benefits	-.07	.127		
Per. Barriers	.39	.000		
Motivation	.01	.817		
CTA	-.09	.037		
Step 3		.000	.43	.15
Age	-.01	.818		
Sex	.08	.029		
Annual mileage	.03	.500		
Perc. Susceptibility	-.03	.409		
Perc. Severity	-.03	.538		
Perc. Benefits	-.07	.109		
Perc. Barriers	.22	.000		
Motivation	.04	.297		
CTA	-.08	.035		
SS	-.39	.000		
PMS	.21	.000		

Note: N = 505; SS = safety skills, PMS = perceptual-motor skills, Perc = perceived, CTA = cues to action, Dependent variable = the frequency of obeying speed limits.

3.5.Mediation Analyses: A Multiple Mediator Model with two proposed mediators

Mediation analyses were conducted in order to examine whether the relationship between the HBM constructs and driver behaviors is mediated by driver skills. In the previous sections, the relationship between the variables of the mediation model were tested. That is, the value of "c path" in mediation model (see Figure 2 below) was mentioned in the analysis in which Hierarchical Regression of Driver Behaviors on the HBM. In addition, the value of "a path" in mediation model (see Figure 3 below) was mentioned in the analysis in which Hierarchical Regression of Driver Skills on the HBM. Moreover, the value of "b path" in mediation model was mentioned in the analysis in which Hierarchical Regression of Driver Behavior on Driver Skills. Mediation analyses were conducted by using SPSS 22 program and the indirect macro of Hayes (2013). Only the HBM constructs which were found to have a significant relationship with the outcome variables in the previously conducted hierarchical regression analyses were included into the mediation analyses. That is, perceived barriers and cues to action constructs were included into the analyses. Violations, aggressive violations, ordinary violations, and the frequency of obeying speed limits were the driver behaviors that were defined as the DV in the mediation analyses. Perceived barriers were identified as the IV for all DVs, as its relationships with the listed DVs were significant in the previous studies. In addition to perceived barriers, cues to action were identified as the IV for the frequency of obeying speed limits. Driver skills, perceptual-motor and safety skills were treated as the mediator variables in all mediation analyses. Age, sex, and annual mileage were identified as the CVs.

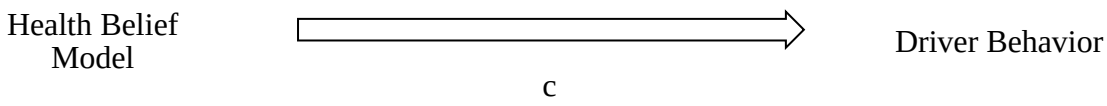

Figure 2. Simple relationship between the Health Belief Model and Driver Behaviors

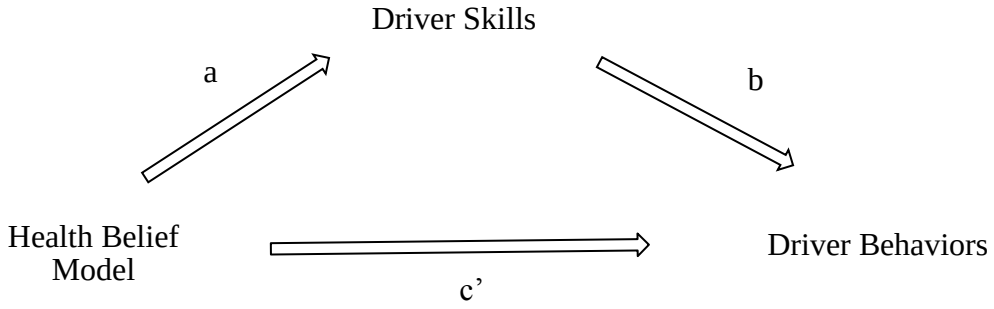

Figure 3. The tested mediating effects of driver skills on the relationship between the Health Belief Model constructs and Violations

The first mediation analysis was conducted by estimating whether the relationship between perceived barriers and violations was mediated by driver skills. According to the result of this analysis perceived barriers explained 18% of variance in safety skills (R^2 = .18, F(4, 499) = 26.60, p < .001) whereas perceived barriers explained 23% of variance in perceptual-motors skills (R^2 = .23, F(4, 499) = 37.00, p < .001). In addition, when adding all predictors, perceived barriers and driver skills, the model was still significant (R^2 = .44, F(6, 497) = 64.84, p < .001). Moreover, the total effect of model (c path) was significant (β = .39, SE = .04, p < .001, 95% CI [.32, .46]). The direct effect of perceived barriers on violations was significant (β = .21, SE = .04, p < .001, 95% CI [.14, .28]. The significance of indirect effect was tested by using bootstrapping procedures. The indirect effects were computed for each 1000 bootstrapped samples, at the 95% confidence interval. The total indirect effect of perceived barriers on violations was significant (β = .18, SE = .03, 95% CI [.13, .23]). The indirect effect for safety skills was (-.32)*(-.49) = .16 (SE = .03, 95% CI [.11, .21]), and for perceptual-motor skills, it was (.15)*(.14) = .02 (SE = .01, 95% CI [.01, .04]. Figure 4 indicated the unstandardized regression coefficients for the relationship among the constructs of the tested mediation model when the DV is violations. When the indirect effect was compared for each mediator variable, safety skills emerged as a significantly stronger mediator in the perceived barriers violations relationships as compared to perceptual-motor skills (β = .14, SE = .03, 95% CI [.09, .19]).

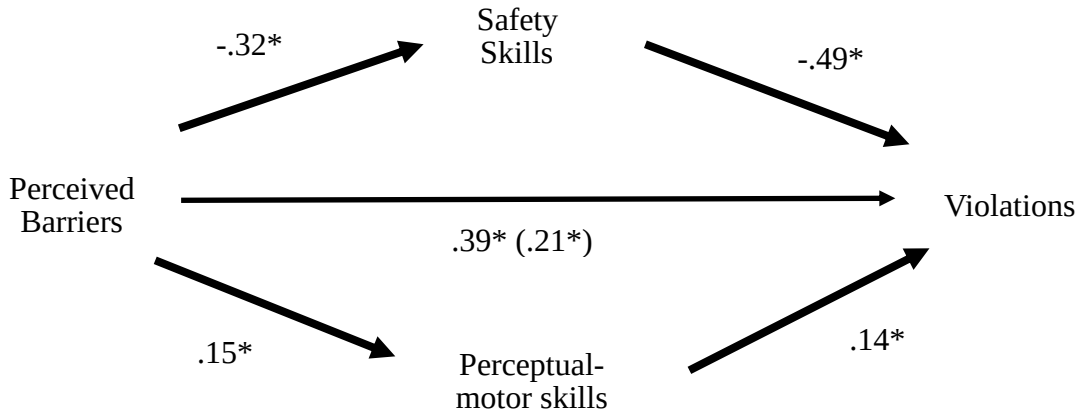

Figure 4. The regression analysis coefficients for the relationship between perceived barriers and violations as mediated by driver skills; perceptual-motor and safety skills.
*$p < .001$.

Second mediation analysis was conducted by estimating whether the relationship between perceived barriers and aggressive violations was mediated by driver skills. As mentioned above, the result of this analysis showed perceived barriers explained 18% of variance in safety skills ($R^2 = .18$, $F(4, 499) = 26.60$, $p < .001$) whereas perceived barriers explained 23% of variance in perceptual-motors skills ($R^2 = .23$, $F(4, 499) = 37.00$, $p < .001$). Furthermore, when adding all predictors, perceived barriers and driver skills, the model still was significant ($R^2 = .12$, $F(6, 497) = 11.13$, $p < .001$). Moreover, the total effect of the model (c path) was significant ($\beta = .24$, $SE = .06$, $p < .001$, 95% CI [.13, .35]). The direct effect of perceived barriers on aggressive violations was not significant ($p = .09$). In other words, when controlled statistical effects of the mediator variables, the direct effect of the perceived barriers on aggressive violation changed from significant to non-significant. Perceptual-motor and safety skills are full mediation on the relationship between perceived barriers and aggressive violation. The significance of indirect effect was tested by using bootstrapping procedures. The indirect effects were computed for each 1000 bootstrapped samples, at the 95% confidence interval. The total indirect effect of perceived barriers on aggressive violations was significant ($\beta = .14$, $SE = .03$, 95% CI [.08, .21]). The indirect effect for safety skills was (-.32)*(-.36) = .12 ($SE = .03$, 95% CI [.07, .19]), and for perceptual-motor skills, it was (.15)*(.12) = .02 ($SE = .01$, 95%

CI [.01, .05]) significant. When the indirect effect was compared for each mediator variable, safety skills emerged as a significantly stronger mediator in the perceived barriers and aggressive violations relationships as compared to perceptual-motor skills (β = .10, *SE* = .03, 95% CI [.05, .16]). Figure 5 indicated that the unstandardized regression analysis coefficients for the relationship among the constructs of the tested mediation model when the DV is the aggressive violation.

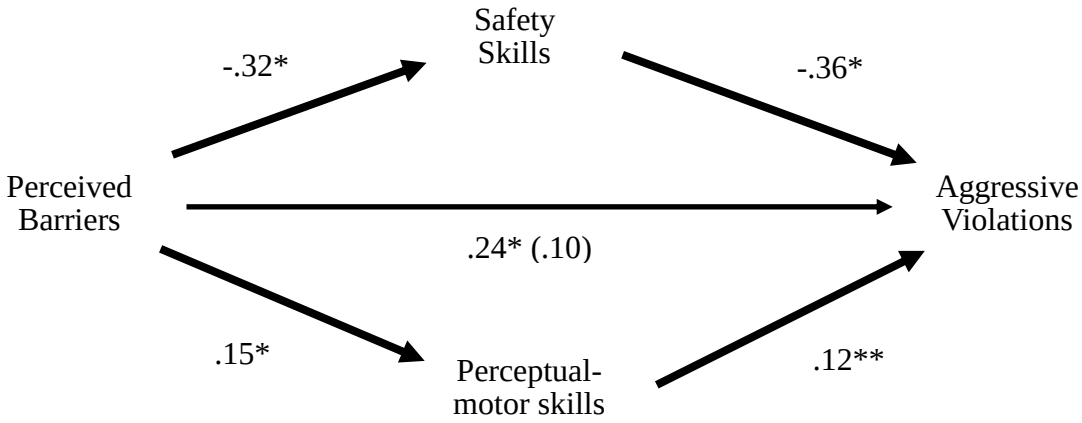

Figure 5. The regression analysis coefficients for the relationship between perceived barriers and aggressive violations as mediated by driver skills; perceptual-motor and safety skills.
*p < .001, **p < .05.

Third mediation analysis was conducted by estimating whether the relationship between perceived barriers and ordinary violations was mediated by driver skills. As mentioned above, the result indicated that perceived barriers explained 18% of variance in safety skills (R^2 = .18, F(4, 499) = 26.60, p < .001) whereas perceived barriers explained 23% of variance in perceptual-motors skills (R^2 = .23, F(4, 499) = 37.00, p < .001).. Moreover, when adding all predictors, perceived barriers and driver skills, the model still was significant (R^2 = .50, F(6, 497) = 81.72, p < .001). Moreover, the total effect of the model (c path) was significant (β = .45, *SE* = .04, p < .001, 95% CI [.37, .52]). The direct effect of perceived barriers on ordinary violations was significant (β = .25, *SE* = .04, p < .001, 95% CI [.18, .32]. The significance of indirect effect was tested by using bootstrapping procedures. The indirect effects were

computed for each 1000 bootstrapped samples, and the 95% confidence interval was computed. The total indirect effect of perceived barriers on ordinary violations was significant (β = .20, *SE* = .03, 95% CI [.14, .25]). The indirect effect for safety skills was (-.32)*(-.54) = .17 (*SE* = .03, 95% CI [.13, .23]), and for perceptual-motor skills, it was (.15)*(.14) = .02 (*SE* = .01, 95% CI [.01, .04]. Figure 6 indicated the unstandardized regression analysis coefficients for the relationship among the constructs of the tested mediation model when the DV is the ordinary violation. When the indirect effects were compared for each mediator variable, safety skills emerged as a significantly stronger mediator in the perceived barriers ordinary violations relationship as compared to perceptual-motor skills (β = .15, *SE* = .03, 95% CI [.10, .21]).

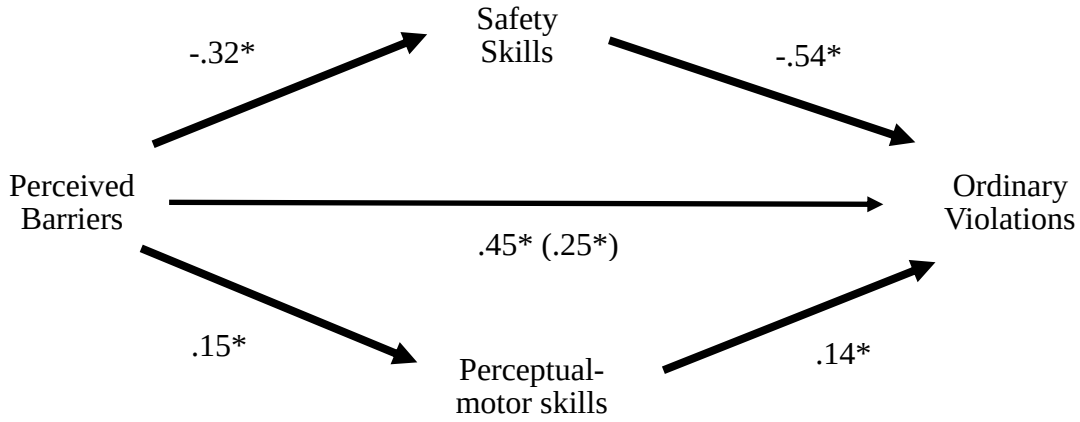

Figure 6. The regression analysis coefficients for the relationship between perceived barriers and ordinary violations as mediated by driver skills; perceptual-motor and safety skills.
*p < .001.

The fourth mediation analysis was conducted by estimating whether the relationship between perceived barriers and the frequency of obeying speed limits was mediated by driver skills. As mentioned above, the result showed that perceived barriers explained 18% of variance in safety skills (R^2 = .18, F(4, 499) = 26.60, p < .001) whereas perceived barriers explained 23% of variance in perceptual-motors skills (R^2 = .23, F(4, 499) = 37.00, p < .001). Moreover, when adding all predictors, perceived barriers and driver skills, the model was still significant (R^2 = .41, F(6, 497)

= 58.40, $p < .001$). Moreover, the total effect of the model (c path) was significant (β = .54, *SE* = .05, $p < .001$, 95% CI [.44, .65]). The direct effect of perceived barriers on the frequency of obeying speed limits was significant (β = .31, *SE* = .05, $p < .001$, 95% CI [.21, .41]. The significance of indirect effect was tested by using bootstrapping procedures. The indirect effects were computed for each 1000 bootstrapped samples, at the 95% confidence interval. The total indirect effect of perceived barriers on the frequency of obeying speed limits was significant (β = .23, *SE* = .03, 95% CI [.17, .30]). The indirect effect for safety skills were (-.32)*(-.59) = .20 (*SE* = .03, 95% CI [.14, .26]), and for perceptual-motor skills were (.15)*(.28) = .04 (*SE* = .01, 95% CI [.02, .08]. Figure 7 indicated that the unstandardized regression analysis coefficients for the relationship between the constructs of the tested mediation model when the DV is the frequency of obeying speed limits. When the indirect effects were compared for each mediator variable, safety skills emerged as a significantly stronger mediator in the perceived barriers and the frequency of obeying speed limits relationship as compared to perceptual-motor skills (β = .15, *SE* = .03, 95% CI [.08, .22]).

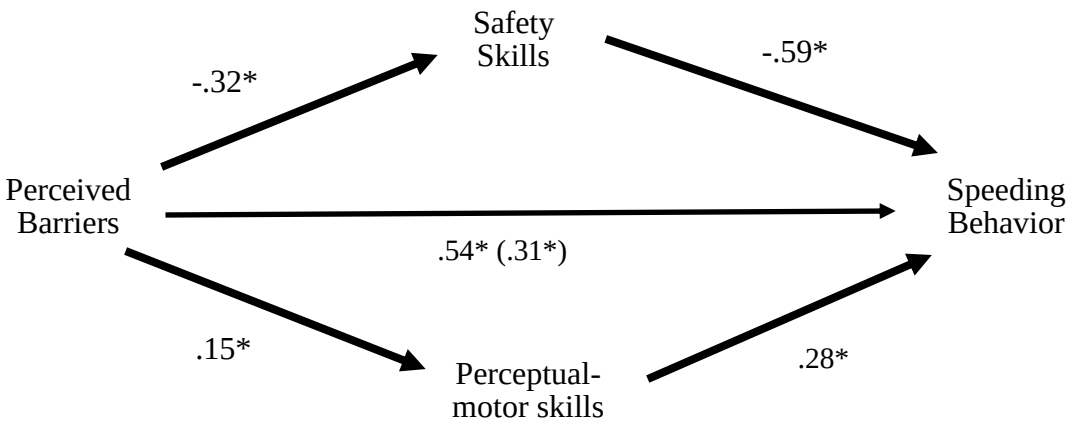

Figure 7. The regression analysis coefficients for the relationship between perceived barriers and the frequency of obeying speed limits as mediated by driver skills; perceptual-motor and safety skills.
*$p < .001$.

Finally, the last mediation analysis was conducted by estimating whether the relationship between cues to action and the frequency of obeying speed limits was mediated by driver skills (See Figure 8). According to the results of this analysis cues to action explained 5% of variance in safety skills (R^2 = .05, F(4, 499) = 6.40, p < .001) whereas they explained 21% of variance in perceptual-motors skills (R^2 = .21, F(4, 499) = 32.90, p < .001). Although the regression model was significant, the relationships between cues to action and either of the driver skills were not significant. In other words, the "a" paths of either perceptual-motor or safety skills were significant. However, when adding all predictors, that is, cues to action and driver skills, the model was significant (R^2 = .38, F(6, 497) = 50.15, p < .001). The total effect of the model (c path) (β = -.15, SE = .05, p < .01, 95% CI [-.25, -.05]), and the direct effect of cues to action on the frequency of obeying speed limits was significant (β = -.11, t(504) = -2.50, , p = .01, 95% CI [-.19, -.02]. The significance of indirect effect was tested by using bootstrapping procedures. The indirect effects were computed for each 1000 bootstrapped samples, at the 95% confidence interval. Either the total indirect effect of cues to action or the indirect effects of perceptual-motor or safety skills were significant.

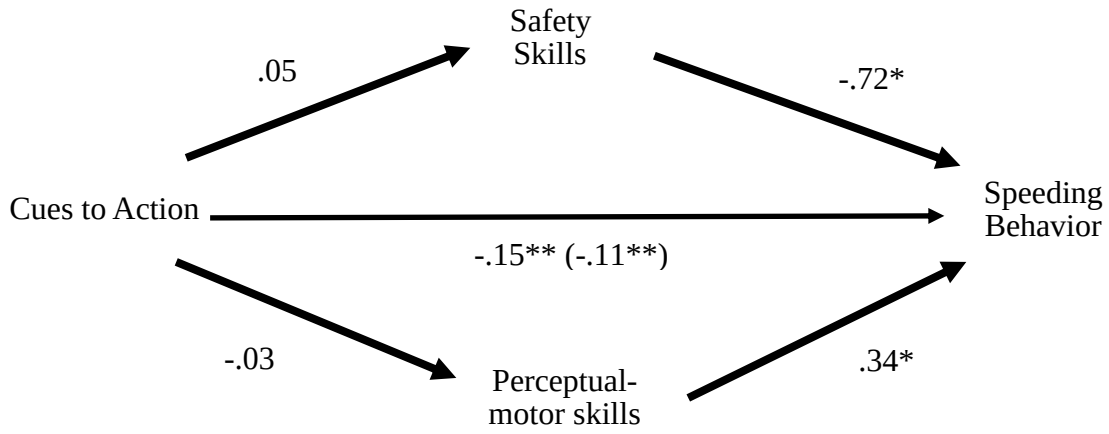

Figure 8. The regression analysis coefficients for the relationship between cues to action and the frequency of obeying speed limits
*p < .001, **p < .01.

CHAPTER IV

DISCUSSION

4.1. General Discussion

The main aim of the current study was to examine the relationship between the HBM constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, motivation, and cues to action) and driver behaviors (total overall violations, aggressive violations, ordinary violations and the frequency of exceeding speed limits) through driver skills (perceptual-motor and safety skills) for the first time in the literature. To our knowledge, there are very few studies investigating the HBM constructs in the traffic context (Fernandes et al., 2010; Hatfield, Fernandes, & Soames Job, 2014). None of the previous investigation attempts tried to check the mediated relationship in the present study.

In this study the HBM was used because most of the traffic studies and the HBM have the same critical underlying goal: encouraging health behaviors and to reduce deaths and injuries or the severity of injuries. While the traffic research tries to achieve this goal by increasing the traffic safety (Elvik, 2010; Qiu et al., 2014), the HBM model tries to find answers to questions like how to increase likelihood of health behaviors or prevent the barriers about health behaviors and predict a variety of behaviors related to positive health outcomes (Rosenstock, 1966). So, combining these two perspectives having the same goal would provide new theoretical and practical contributions. In the literature, there are some attempts to make such contributions. For instance, the study conducted by Fernandes et al. (2010) indicated that there is a relationship between the HBM and driver behaviors, only some specific violations. Although one of the human factors in driving (i.e., driver behaviors) included into the investigations, the other one has not been investigated in relation to the HBM constructs. For this reason, in the present study it was aimed to model the relationships in a way that all human factors in driving would be completely investigated in relation to the HBM constructs.

In the following sections, general findings about the HBM constructs, and the relationships between study variables will be discussed separately. Furthermore, critical remarks, implications of the study and suggestions for future researches are presented.

4.2. Evaluations of the Findings

4.2.1. Evaluations of the Findings on the HBM constructs in traffic safety and speeding context

Before testing the proposed mediation model, to get more detailed information about the HBM, the constructs of the model will be explained separately over their descriptive characteristics.

First, perceived threat was investigated with its constructs of perceived susceptibility (i.e., the extent to which the individual feels at risk of being exposed/suffering from condition), and perceived severity (i.e., beliefs about how serious the condition is and the related consequences of the conditions - Jones, Smith, & Llewellyn, 2014). The results showed that drivers believe that the possibility of negative health outcomes is high in the event of an accident due to exceeding speed limits. In addition, they think that due to speeding behaviors, the consequences of an accident would be more hazardous for their physical or psychological health.

Afterwards, behavioral evaluation was investigated with its constructs of perceived benefits (i.e., the effectiveness and availability of taking a particular course of action) and perceived barriers (i.e., the negative aspects related to following the course of action, - Jones, Smith, & Llewellyn, 2014). Within the content of the present study, the beliefs about prevention of taking speed tickets, feeling safer, and reporting possibility of an injury or accidents could be accounted as perceived benefits for obeying speed limits. In other words, drivers perceive mentioned conditions as perceived benefits. On the other hand, in the present study, the perceiving speeding as time-saving, thinking that there is no police control around, perceived inappropriate speed limits on the roads could be accounted as perceived barriers for obeying speed limits.

Concerning the motivation and cues to action (i.e., external or internal triggers of action- Jones, Smith, & Llewellyn, 2014), the drivers have high safety motivation and health motivation. They also report strong tendency to obey speed limits.

The above mentioned characteristics list the traffic-related, especially speeding related, characteristics of the basic constructs of the HBM. This information is critical as it makes it clear how to exemplify and give meaning to the HBM constructs at traffic settings. The previous studies on the HBM at traffic settings did not focus on these characteristics in detail; although in the HBM literature there are some other studies mentioning about the examples or characteristics of perceptions and behaviors of the HBM constructs at different settings (e.g., the effects of the HBM on cyber-preventive behaviors – Dodel, & Mesch, 2017; the predictors for the way women plan their childbirth based on the HBM – Darsareh, Aghamolaei, Rajaei, Madani, & Zare, 2016; the applicability of the HBM to understand high-risk sexual behavior – Li, Lei, Wang, He, & Williams, 2016).

4.2.2. Evaluations of Bivariate Correlation Analyses

The Bivariate Correlation Analyses were done to examine the relationship between study variables. Age had negative relationships with speeding, aggressive violations, ordinary violations, whereas it had positive relationships with driver skills, and the constructs of the HBM except for perceived barriers; its relationship with perceived barriers was negative. The findings concerning the driver behaviors, skills and age relationships has been evidenced many times by some previous studies (e.g. Elvik, 2010; Martinussen, Møller, & Prato, 2014; Andrews, & Westerman, 2012). Concerning the negative relationship between the perceived barriers and age, it can be said that as the drivers' age increases, their tendency to perceive the listed perceived barriers (e.g., police control, relying on self-driver skills) as barriers for speeding would decrease. Concerning the exposure variable (i.e., annual mileage), there was a negative relationship with cues to action. Moreover, exposure was positively related to speeding, ordinary violations, and perceptual-motor skills. That is, it can be said that as the drivers' annual mileage (km) increases, the tendency to speeding and ordinary violations would increase. In addition, as the drivers' annual mileage increases, their tendency to perceive having higher perceptual-motor skills and to perceive the listed external and internal factors

(being fined due to speeding, safety campaigns about speeding) as speed triggering decrease.

The results showed that aggressive violations were related to the HBM constructs. The frequency of aggressive violations increases when perceived barriers sub-scale scores increase. That is, it can be said that as the frequency of aggressive violations increases, their tendency to perceive the listed perceived barriers (e.g., police control, relying on self-driver skills) as barriers for speeding would increases. In addition, the decreases in aggressive violations were related to the increases in motivation. That is, as the frequency of aggressive violations decreases, motivation (e.g., safety is the most important thing, health is more important than fun) for safety and health would increase. Ordinary violations have positive relationship the perceived barriers; that is as the frequency of ordinary violations increases, their tendency to perceive the listed perceived barriers (e.g., the belief about speeding is time-saving activity, relying on self-driver skills) as barriers for speeding would increase. Moreover, they have negative relationships with perceived severity, perceived benefits, motivation, and cues to action. This means, as the frequency of ordinary violations increase, drivers' perceptions on susceptibility (e.g., the possibility of injuries due to speeding), and their tendency to perceive the listed perceived benefits (e.g., the low possibility of accident due to speeding, feeling safer) would decreases.

The results also showed that the driver skills and the HBM constructs were related to each other. Concerning the safety skills, there was a negative relationship with perceived barriers, and positive relationships with the other constructs of the HBM except for perceived susceptibility. That means, as safety skills increase, their tendency to perceive the listed perceived barriers (e.g., police control, relying on self-driver skills) as barriers for speeding would decrease. In addition, perceptual motor skills had a positive relationship with perceived barriers and a negative relationship with cues to action. That is, as perceptual-motor skills increase, their tendency to perceive the listed perceived barriers (e.g., police control, relying on self-driver skills) as barriers for speeding would increase; and to perceive having higher perceptual-motor skills and to perceive the listed external and internal factors (being fined due to speeding, safety campaigns about speeding) as speed triggering decrease.

4.2.3. Evaluations of Hierarchical Regression Analyses

In the current study, three sets of hierarchical regression analyses were conducted to test the relationships between the HBM constructs and driver behaviors; the HBM and driver skills; and driver behaviors and skills (after controlling for the statistical effects of the HBM constructs). In the analyses the effects of age, sex, and annual mileage were controlled.

Results revealed that violations, aggressive violations and ordinary violations were positively related to the perceived barriers construct of the HBM. In addition, the results showed that the frequency of obeying speed limits was positively associated with perceived barriers and negatively associated with the cues to action construct of the HBM. That is, increases in action triggers about obeying speed limits brings about decreases in speeding behaviors. The more drivers are exposed to the stimulus both external and internal form to obey speed limits, the greater likelihood of obeying speed limits. In addition, the results indicated perceived barriers as the strongest predictors of risky behaviors in the present study (Lajunen, & Räsänen, 2001; Champion, & Skinner, 2008). The results evidencing the relationship between violations and perceived barriers is an expected one because perceived barriers consist of answers to the questions of what are the reasons for exceeding speed limits while driving. Not having a significant relationship between violations, aggressive violations, ordinary violations and speeding behavior and perceived benefits is also expected because perceived benefits include answers to the benefits of obeying speed limits. In addition, people may show optimistic bias, which means people have tendency to believe that they are at a lesser risk of experiencing a negative event compared to others engaging in similar event (Weinstein, 1989). In the traffic context, drivers have generally optimistic bias. They believe that they are at less risk of experiencing the road accidents than "other drivers", based on their overestimated driving skills (Elvik, 2013); Most of the drivers rates themselves as safer compared to average drivers (e.g., Goszczynska & Roslan, 1989; Job, 1990: Näätänen & Summala, 1976).

In the second set of analyses, the relationship between the HBM and driver skills was investigated. The results showed that the one of the HBM construct being related to the safety skills was perceived barriers. As mentioned in the previous parts, perceived barriers have already contained the causes of violations as context,

and also have been associated with violations positively. In addition, many studies revealed that safety skills have negative relationship between hazardous driving and accident involvement (Hatfield, Fernandes, & Soames Job, 2014; Jonah, 1997; Jonah et al., 2001). Therefore, it is expected that perceived barriers negatively associated with safety skills. In other words, decrease in safety skills related to increase in perceived barriers. Moreover, safety motivation and health motivation have some similarities. They have common goals which are to reduce severity of injuries and promote health behaviors. As expected, in the current study, safety skills and motivation have not positively associated because safety skills were identified as motives toward safety (Lajunen, & Summala, 1995). Although some studies proposed that motivation constructs of the HBM is not a powerful predictor (e.g., Glanz, Rimer, and Viswanath, 2008; Fernandes, Hatfield, & Job, 2010), in the current study, increases in motivation about health and safety bring about increases in safety skills. That is, to increase safety behaviors by increasing safety skills, motivation about health and safety should be increases. On the other hand, perceptual-motor skills positively associated with only perceived barriers. Due to the fact that perceived barriers contain speeding items, the results are consistent with the literature. For example, the results of the study conducted by Lajunen and his colleagues (1998) revealed that perceptual-motor skills positively correlated with speeding like in the current study. In addition, the reason for not having a significant relationship between perceived susceptibility and severity and perceptual-motor skills may be drivers' high self-esteem, which is associated with belief about having high perceptual-motor skills, because drivers who rated themselves high perceptual-motor skills may not feel at risk in traffic or not notice how serious consequences of negative traffic conditions (Lajunen, & Summala, 1995). To sum up, consistent with the literature, safety skills have negatively related to risky behaviors (i.e. speeding) whereas perceptual-motor skills positively related to speeding (Walton, & Bathurst, 1998; Walton, 1999; Harré, & Sibley, 2007; Lajunen et al., 1998).

In the final set of analyses, in which the relationship between the driver behaviors and driver skills was investigated after controlling for the statistical effects of the HBM constructs in addition to age, sex and exposure. The results indicated that safety skills negatively related to violation, aggressive violation, ordinary violation, and the frequency of obeying speed limits whereas perceptual-

motor skills positively related, as consistent with the literature. Most of the studies investigating the relationship between driver behaviors and skills indicated that drivers who reported having high perceptual-motor skills have a tendency to drive riskier due to the fact that they believed they can handle the traffic situation (Martinussen, Møller, & Prato, 2014; Gregersen, 1996; Sümer et al., 2006). In addition, other drivers who rated themselves as high in safety skills have a tendency to report lower frequencies of violations (Martinussen, Møller, & Prato, 2014). Also, there is an asymmetric relationship between driver behaviors and skills (Sümer et al., 2006). As consistent with the previous studies, the present study evidenced that perceptual-motor skills were positively associated with, and safety skills were negatively associated with aberrant driver behaviors. The present study made a contribution by showing that that previously evidenced relationship still exist even when controlling for the statistical effects of the HBM constructs.

4.2.4. Evaluations of Mediation Analyses

In the current study, the mediator roles of perceptual-motor and safety skills in the relationship between driver behaviors (i.e., violations, aggressive violations, ordinary violations, and the frequency of obeying speed limits) and the HBM constructs (i.e., perceived susceptibility, perceived severity, perceived benefits, perceived barriers, motivation, and cues to action) were examined by conducting 5 different mediation analyses.

The first mediation analysis was conducted to examine whether the relationship between perceived barriers and violations is mediated by driving skills. The results of the mediation analysis showed that driver skills, both perceptual-motor and safety skills partially mediated the relationship between perceived barriers and violations. In the second mediation analysis both perceptual-motor and safety skills fully mediated the relationship between perceived barriers and aggressive violations. That is, after the exclusion of the driver skills as the mediators the relationship between the perceived barriers construct of the HBM model and aggressive violations is no longer significance. The third mediation analysis revealed that driver skills partially mediated the relationship between perceived barriers and ordinary violations. Also, the results of the forth mediation analysis showed that driver skills partially mediated the relationship between perceived barriers and the frequency of obeying speed limits.

Comparison of the indirect effects of the mediators separately indicated that safety skills are stronger mediators than perceptual-motor skills in the relationships between perceived barriers and violations, aggressive violations, ordinary violations and the frequency of obeying speed limits. The results of the above mentioned mediation analyses revealed that the relationship between perceived barriers construct of the HBM model and violations factor of the DBQ is established through the driver skills of the drivers. According to the results it can be inferred that increases in the perceived barriers scores are related to decreases in the safety skills scores of the drivers and this in turn is related to the increases in the frequency of all types of violations (i.e. total overall violations, aggressive and ordinary violations, and speeding). While increases in perceived barriers scores resulting in increases in the perceptual-motor skills and this is resulting in increases in the frequency of all types of violations.

Fifth mediation analysis was conducted to examine whether perceptual-motor and safety skills mediate the relationship between cues to action and the frequency of obeying speed limits or not. Although there is a significant direct effect, indirect effect is not significant. This means that although there is a significant relationship between cues to action and the frequency of obeying speed limits, neither perceptual-motor nor safety skills mediate the relationship between cues to action and speeding behaviors. Cues to action consists of both external triggers and internal (Claar, 2011; Ng et al., 2009; Rosenstock et al., 1994). External triggers can be exampled as safety campaign about obeying the speed limits, or the advice about obeying the speed limits from friends and family whereas internal triggers can be exampled as previous experience with speeding accidents or speeding tickets. In the current study, the items of cues to action have more external triggers in content. Therefore, although there is a relationship between cues to action and speeding behaviors, driver skills do not mediate this relationship.

In summary, the mediation analyses of the present study showed for the first time that driver skills are mediating the relationship between perceived barriers and violations, emphasizing speeding. That is, it has been found that as the tendency to perceive the listed perceived barriers (e.g., police control, relying on self-driver skills) as barriers for speeding increase, it makes perceptual-motor and safety skills stronger and it results in higher frequencies of total and sub-type of violations. As it has been emphasized in the previous sections, the human factors in driving are

being investigated together in considerable amount of studies. However, none of the previous studies investigated the relationship between these concepts by adding into the HBM constructs into the model. As violation factor of driver behaviors, and safety skills of the driver skills are directly related to risky driving, the HBM constructs are critical factors to investigate together with those human factors. Because the HBM is basically developed to understand the nature and reduce the frequency of unsafe behaviors. The findings of the present study also supported some previous models and theories like Theory of Planned Behavior (TPB - Ajzen, 1991). The TPB proposed that attitudes, perceptions, and norms have a mediating effect on the relationship between beliefs and intended behaviors (Montaño, & Kasprzyk, 2008; Chorlton, Conner, & Jamson, 2012). In the mediation model of the present study, driver skills playing as the mediator had a similar role in content to the attitudes, perceptions, and norms of the TPB; the HBM constructs had a similar role in content to the beliefs of the TBP; and violations which had a similar role in content to the intended behaviors of the TPB.

4.3. Critical Remarks

The present study has some methodological critical issues to talk about. The first one is, self-report method of data collection. This way of data collection may result in common method bias. That is, the significant relationships found between the research variables may be the result of collecting data through self-report measures. Another critical issue is related to the cross-sectional nature of the study. It is not possible to mention about causality in such a design, and this is true for the present study as well.

Concerning the tools being used in the present study, it can be told that, as the scales measuring the HBM constructs were changed into the versions in which traffic violations, especially speeding, is emphasized. While doing this, in the motivation scale, the number of the items being used has changed although the original model has two motivation items, in the current study four motivational items were used with two additional traffic safety motivation items. The non-significant relationship between this construct and violations, aggressive violations, ordinary violations, and the frequency of obeying speed limits might be related to the content of the items or the way they were added into the scale. In the future

research, the possibility of inclusion or removal of some items to the HBM might be considered.

4.4. Implications of the study and Future Directions

The present study indicated that perceptual-motor and safety skills mediate the relationship between perceived barriers and violations, aggressive violations, ordinary violations, and the frequency of obeying speed limits. These findings might have critical implications. The future studies to investigate the HBM at traffic settings can take this study as a reference study and make some additional investigations based on its findings. For instance, as in the present study the main aim was to test the mediating effects of driver skills in the HBM constructs-driver behavior relationship, any other type of comparison was not made. After evidencing the proposed mediation model in the present study, the future studies might focus on some other investigations including the examined variables of this study. For instance, comparison of different age and sex groups or exposure differences could be investigated in terms of the relationships between the HBM constructs and human factors in driving. Similarly, cross-cultural comparisons on the significance of the HBM factors at driving contexts, especially in relation to the human factors in driving could be made.

From the applied perspective, the results of the present study could be used to prepare a safety campaign to decrease violations on the roads; they could be used to enrich the content of the training programs to increase safety skills. In addition, to decrease speeding behavior, action triggers such as advice from family and friends, safety campaign about the consequences of speeding can be more efficient; and the number of them can be increases.

The results of the study showed that most of the drivers have same ideas, values, and belief about violations, especially speeding. Future studies can use Social Representation Theory (Moscovici, 1976). The theory emphasis that the effects of social experiences on inner experiences. That is, it maps the processes "how the 'we' becomes contained in the responses of the 'I'" (Joffe, 2003, pp. 60). To sum up, social representations enable the social world to be understood and the interaction within the groups in which the representatives are shared. Therefore, future studies can be used social representations in traffic settings.

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APPENDICES

APPENDIX A

ETHICAL PERMISSION

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

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20 EKİM 2015

Gönderilen: Yrd. Doç. Dr. Bahar ÖZ
Psikoloji Bölümü

Gönderen: Prof. Dr. Canan SÜMER
İnsan Araştırmaları Komisyonu Başkanı

İlgi: Etik Onayı

Danışmanlığını yapmış olduğunuz Yüksek Lisans Öğrencisi İrem USLU " Genç Sürücülerin Hız Limitlerini Aşma Davranışlarını Etkileyen Faktörler ve bu Davranışların Sağlık İnanç Modeline göre Açıklanması" isimli araştırması İnsan Araştırmaları Komisyonu tarafından uygun görülerek gerekli onay 26.10.2015-31.01.2016 tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Canan SÜMER
Uygulamalı Etik Araştırma Merkezi
İnsan Araştırmaları Komisyonu Başkanı

APPENDIX B

INFORMED CONSENT FORM/ GÖNÜLLÜ KATILIM FORMU

Bu çalışma Orta doğu Teknik Üniversitesi (ODTÜ) Trafik ve Ulaşım Psikolojisi Yüksek Lisans programı öğrencilerinden İrem USLU tarafından, Psikoloji Bölümü öğretim üyelerinden Yard. Doç. Dr. Bahar ÖZ ve Doç. Dr. Türker ÖZKAN danışmanlığındaki tez çalışması için yürütülmektedir. Çalışmanın amacı, Sağlık İnancı Modelinin hız limitlerine uyma davranışını pekiştirerek artırıp artırmadığını uygulanan anketlerle araştırmaktadır. Çalışmada kimlik belirleyici hiçbir bilgi istenmemektedir. Anket formları gizli tutulacak ve sadece araştırmacılar tarafından değerlendirilecektir. Elde edilecek bilgiler sadece bilimsel yayımlarda kullanılacaktır. Katılım tamamıyla gönüllülük esasına dayalıdır.

Çalışma genel olarak kişisel rahatsızlık verecek bir etkileşim içermemektedir. Ancak, katılım sırasında herhangi bir nedenden ötürü kendinizi rahatsız hissederseniz çalışmayı bırakmakta serbestsiniz. Çalışmanın sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Çalışma hakkında daha fazla bilgi almak için ODTÜ Psikoloji Bölümü öğretim üyelerinden Yard. Doç. Dr. Bahar ÖZ (Oda: B33; Tel: 0312 210 5945; E-posta: ozbahar@metu.edu.tr) ve Doç. Dr. Türker ÖZKAN (Oda: B123; Tel: 0312 210 5118; E-posta: ozturker@metu.edu.tr) veya öğrencilerinden İrem USLU (Oda: BZ08; Tel: 0312 210 3154; E-posta: iremuslu2@gmail.com) ile iletişim kurabilirsiniz.

Katılımınız için şimdiden teşekkür ederiz.

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

Bu çalışmaya ehliyeti olan ve araç kulanmış veya kullanıyor olan kişilerin katılması uygundur.

İsim Soyad Tarih İmza

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APPENDIX C

DEMOPGRAPHIC INFORMATION FORM

Demografik Bilgi Formu

1. Yaşınız: _____
2. Cinsiyetiniz: ____ Kadın ____Erkek
3. Eğitim Düzeyi: ____Okur-yazar____ İlkokul ____ Ortaokul ____ Lise ____ Yüksekokul ____ Üniversite ____ Yüksek Lisans/Doktora
4. Ehliyetiniz var mı? _____
5. Kaç yıldır araba kullanıyorsunuz? _____
6. Geçen yıldan bu yana yaklaşık olarak toplam kaç kilometre araç kullandınız? _____ km
7. Ehliyeti aldığınızdan bu yana yaklaşık olarak toplam kaç kilometre araç kullandınız? _____ km
8. Son üç yılda kaç kez araç kullanırken **aktif olarak** (sizin başka bir yol kullanıcısına veya bir nesneye çarptığınız durumlar) kaza yaptınız? _____
9. Son üç yılda kaç kez araç kullanırken **pasif olarak** (başka bir yol kullanıcısının size çarptığı durumlar) kaza yaptınız? _____
10. Hiç hız limitleri üstünde bir hızla araç kullanırken kaza geçirdiniz mi? _____
11. Son üç yılda aşağıdaki ceza tiplerinden hangilerini aldınız? (Birden fazla işaretleyebilirsiniz.)

    Hız ihlali ____ Işık ihlali ____ Kemer ihlali ____

    Alkollü araç kullanma____ Diğer_____
12. Ne sıklıkla hız limitlerini ihlal edersiniz?
    a. Her zaman b. Çoğunlukla c. Ara sıra d. Nadiren e. Hiçbir zaman
13. Sizce her sene Türkiye'de hızlı araç kullanmaktan dolayı kaç tane sürücü yaralanmaktadır ya da hayatını kaybetmektedir? _____ tane

14. Sizce, hızlı araç kullanmaktan dolayı kaza yapmış ve hayatını kaybetmiş kişilerden, ne kadarı hız limitlerine uygun araç kullansaydı yaşıyor olabilirdi?

    a. Neredeyse hepsi b. Çoğu c. Yarısı d. Birazı e. Neredeyse hiçbiri7

15. Lütfen aşağıda verilmiş olan durumlarda, ne sıklıkta hız limitlerini aştığınızı uygun rakamı daire içine alarak belirtiniz.

1 = Hiçbir zaman 2= Nadiren 3= Bazen 4= Oldukça sık 5= Sık sık 6 = Neredeyse her zaman							
1.	Genel olarak tüm yolculuklarda	1	2	3	4	5	6
2.	Şehir içindeki yolculuklarda	1	2	3	4	5	6
3.	Şehirlerarasındaki yolculuklarda	1	2	3	4	5	6
4.	Kısa yolculuklarda	1	2	3	4	5	6
5.	Uzun yolculuklarda	1	2	3	4	5	6
6.	Gündüz yolculuklarında	1	2	3	4	5	6
7.	Akşam ya da gece yolculuklarında	1	2	3	4	5	6
8.	Yazın	1	2	3	4	5	6
9.	Kışın	1	2	3	4	5	6
10.	Düz yolda	1	2	3	4	5	6
11.	Virajlı yolda	1	2	3	4	5	6
12.	Sisli havada	1	2	3	4	5	6
13.	Yağmurlu havalarda	1	2	3	4	5	6

APPENDIX D

DRIVER BEHAVIOR QUESTIONNAIRE (DBQ)

Sürücü Davranışları Ölçümü

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. 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.	Başka bir sürücüye kızgınlığınızı belirtmek için korna çalmak	1	2	3	4	5
2.	Kavşağa çok hızlı girip geçiş hakkı olan aracı durmak zorunda bırakmak	1	2	3	4	5
3.	Şehir içi yollarda hız sınırını aşmak	1	2	3	4	5
4.	Trafikte sinirlendiğiniz bir sürücüyü takip edip ona haddini bildirmeye çalışmak	1	2	3	4	5
5.	Otoyolda ileride kapanacak bir şeritte son ana kadar ilerlemek	1	2	3	4	5
6.	Solda yavaş giden bir aracın sağından geçmek	1	2	3	4	5
7.	Trafik ışığında en hızlı hareket eden araç olmak için yandaki araçlarla yarışmak	1	2	3	4	5
8.	Acil bir durumda duramayacak kadar, öndeki aracı yakın takip etmek	1	2	3	4	5
9.	Trafik ışıkları sizin yönünüzde kırmızıya döndüğü halde kavşaktan geçmek	1	2	3	4	5
10.	Bazı tip sürücülere kızgın olmak (illet olmak) ve bu kızgınlığı bir şekilde onlara göstermek	1	2	3	4	5
11.	Otobanda hız limitlerini dikkate almamak	1	2	3	4	5

APPENDIX E

DRIVER SKILLS INVENTORY (DSI)

Sürücü Becerileri Ölçümü

Araç kullanırken güçlü ve zayıf yönleriniz nelerdir?

Özellikle araç kullanmanın farklı yönlerinde sürücüler arasında pek çok farklılıklar vardır. Hepimizin güçlü ve zayıf yönleri vardır. Lütfen, sizin bir sürücü olarak güçlü ve zayıf yönlerinizi size göre doğru olan seçeneği daire içine alarak belirtiniz. Her bir soru için cevap seçenekleri şu anlamdadır:

1 = Çok zayıf 2 = Zayıf 3= Ne zayıf ne de güçlü 4= Güçlü 5= Çok güçlü

1.	Seri araç kullanma	1	2	3	4	5
2.	Sabırsızlanmadan yavaş bir aracın arkasından sürme	1	2	3	4	5
3.	Hızlı karar alma	1	2	3	4	5
4.	Yeterli takip mesafesi bırakma	1	2	3	4	5
5.	Geriye kaçırmadan aracı yokuşta kaldırma	1	2	3	4	5
6.	Sollama	1	2	3	4	5
7.	Hız sınırlarına uyma	1	2	3	4	5
8.	Gereksiz risklerden kaçınma	1	2	3	4	5
9.	Trafik ışıklarına dikkatle uyma	1	2	3	4	5
10.	Dar bir yere geri geri park edebilme	1	2	3	4	5

APPENDIX F

HEALTH BELIEF MODEL (HBM)

Sağlık İnancına Yönelik Maddeler

Bu bölümde, **sağlık inancına** yönelik maddeler bulunmaktadır. Sizden istenen, her bir maddede ifade edilen görüşe ne oranda katıldığınızı beş basamaklı ölçek üzerinde ilgili rakamın bulunduğu kutucuğu işaretleyerek belirtmenizdir.

1= Hiç Katılmıyorum 2= Pek Katılmıyorum 3= Biraz Katılıyorum
4= Oldukça Katılıyorum 5= Tamamen Katılıyorum

		Hiç Katılmıyorum	**Pek Katılmıyorum**	**Biraz Katılıyorum**	**Oldukça Katılıyorum**	**Tamamen Katılıyorum**
1.	Hızlı araç kullandığımdan dolayı bir kaza anında yaralanma olasılığım çok yüksektir.	1	2	3	4	5
2.	Bir kaza anında hızlı araç kullandığımdan dolayı yaralanma olasılığım düşüktür.	1	2	3	4	5
3.	Hızlı araç kullanma alışkanlığım bir kaza anında yaralanma olasılığımı arttırır.	1	2	3	4	5
4.	Hızlı araç kullanmaktan sebebiyle bir kaza anında yaralanma olasılığım beni endişelendiriyor.	1	2	3	4	5
5.	Gelecekte, hızlı araç kullandığım için bir kaza anında yaralanacağımı hissediyorum.	1	2	3	4	5
	Hızlı araç kullanırken meydana gelebilecek herhangi bir kazada yaralanma düşüncesi (6, 7, 8, 9 numaralı soruları bu ifadeye göre cevaplayınız.					
6.	Beni korkutuyor.	1	2	3	4	5

7.	Çok kötü hissetmeme neden oluyor.	1	2	3	4	5
8.	Kalbimin hızlı atmasına neden oluyor.	1	2	3	4	5
9.	Ümitsiz hissetmeme neden oluyor.	1	2	3	4	5
	Hızlı araç kullanırken meydana gelen bir kaza anında yaralanırsam; (10 – 16 arasındaki soruları bu ifadeye göre cevaplandırınız.)					
10.	Kariyerim tehlikeye girebilir.	1	2	3	4	5
11.	Evliliğim ve önemli ilişkilerim tehlikeye girebilir.	1	2	3	4	5
12.	Ekonomik güvencem tehlikeye girebilir.	1	2	3	4	5
13.	Kendimle ilgili duygularım değişebilir.	1	2	3	4	5
14.	Bütün hayatım değişebilir.	1	2	3	4	5
15.	Kaza nedeniyle yaşayacağım problem çok uzun sürebilir.	1	2	3	4	5
16.	Aldığım yara, hız limitlerine uyma durumunda alabileceğim yaradan daha ciddi olurdu.	1	2	3	4	5
	Araç kullanırken hız limitlerine uymak; (17 – 22 arasındaki soruları bu ifadeye göre cevaplandırınız.)					
17.	Bir kaza anında yaralanma riskimi azaltır.	1	2	3	4	5
18.	Bir kaza anında bana birçok kazanç sağlar.	1	2	3	4	5
19.	Beni bir kaza ihtimaline karşı daha az kaygılı yapar.	1	2	3	4	5
20.	Kendimi daha güvenli hissetmememi sağlar.	1	2	3	4	5
21.	Kaza yapma riskimi azaltır.	1	2	3	4	5
22.	Hız cezası alıp, maddi olarak zarar görmememi sağlar.	1	2	3	4	5

	Araç kullanırken hız limitlerini aşmanızın sebepleri; (23 – 34 arasındaki soruları bu ifadeye göre cevaplandırınız.)					
23.	Zor olabilir.	1	2	3	4	5
24.	Hız limiti işaretleri güvenilir olmadığı için gereksizdir.	1	2	3	4	5
25.	Gideceğim yere gecikmeme sebep olur.	1	2	3	4	5
26.	Hız limitlerine yola uygun değildir.	1	2	3	4	5
27.	Hız limiti işaretlerine dikkat etmem gerektiği için zahmetlidir.	1	2	3	4	5
28.	Trafik polisi veya radar yoktur.	1	2	3	4	5
29.	Mutsuzumdur.	1	2	3	4	5
30.	Sürüş becerilerime güveniyorum.	1	2	3	4	5
31.	Hızlı araç kullanmak çok riskli bir durum değil.	1	2	3	4	5
32.	Herkes hızlı gittiği için, trafiğe uyum sağlamam lazım.	1	2	3	4	5
33.	Diğerlerine hızlı araba kullanabileceğimi göstermek için.	1	2	3	4	5
34.	Arabam hız yapmama müsaade ettiği için. (Güvenli bir arabam olduğu için)	1	2	3	4	5
35.	Yollar hız yapmaya uygun. (Güvenli ve düzgün yollar)	1	2	3	4	5
36.	Hiçbir şey sağlık kadar önemli değildir.	1	2	3	4	5
37.	Sağlık eğlenceden daha önemlidir.	1	2	3	4	5

APPENDIX G

CUES TO ACTION

Davranış ile İlgili İpucular

Sizce aşağıdakilerden hangileri hız limitlerine uyma davranışını arttırmada önemlidir? **1= hiç önemli değil 2= pek önemli değil 3 = biraz önemli 4= oldukça önemli 5 = çok önemli** anlamına gelmektedir. Lütfen sizin düşüncenizi en iyi yansıtan seçeneği işaretleyiniz.						
		Hiç önemli değil	**Pek önemli değil**	**Biraz önemli**	**Oldukça önemli**	**Çok önemli**
1.	Ailenizdeki kişilerin size hız limitlerinize uymanızı söylemesi	1	2	3	4	5
2.	Arkadaşlarınızın size hız limitlerine uymanızı söylemesi	1	2	3	4	5
3.	Hız limitlerine uyma ile ilgili güvenlik kampanyaları	1	2	3	4	5
4.	Hız kazaları ile ilgili televizyon ve gazete haberleri	1	2	3	4	5
5.	Hızlı araç kullanırken polisin sizi durdurması	1	2	3	4	5
6.	Hız sınırını aşınca uyarı veren araç güvenlik sistemleri	1	2	3	4	5
7.	Hız sınırını aşma cezaları	1	2	3	4	5
8.	Polis arabası görmek	1	2	3	4	5

APPENDIX H

TURKISH SUMMARY/TÜRKÇE ÖZET

SAĞLIK İNANÇ MODELİ VE SÜRÜCÜ DAVRANIŞLARI ARASINDAKİ İLİŞKİ: SÜRÜCÜ BECERİLERİNİN ARACI ROLÜ

GİRİŞ

Trafik kazaları, önemli halk sağlığı problemleridir. Dünya Sağlık Örgütünün istatistiklerine göre, dünya çapında her yıl yaklaşık 1,2 milyon kişi trafik kazalarından dolayı hayatını kaybetmektedir, bundan daha fazla insan ise ölümcül olmayan yaralanmalara maruz kalmaktadır (2002). Bu istatistikler azalmak yerine yıllar boyunca artmaktadır. Yaralanmalara ve ölümlere sebep olan bu kazaların en temel sebeplerinden biri ise yol güvenlik problemleridir. Bazı yol güvenlik problemlerinin çözülmesi daha zordur; mesela hız yapma davranışları. Bunun nedeni de, sürücülerin hız davranışını bir problem olarak görmemeleri olabilir (Elvik, 2010).

İnsan hayatının ve sağlığının değeri trafik kazalarının maddi sonuçlarından daha önemli olmalıdır. İsveç Parlamentosu tarafından geliştirilen, "Sıfır Görüş" terimi insan hayatının ve sağlığının artırılması için en önemli çalışmalardan biridir (1997). Bu proje, ölümleri ve yaralanmaları azaltarak insan hayatına ve sağlığına dikkat çekmeyi amaçlamıştır. Trafik kazaları ise, yaralanmalara ve ölümlere sebep olduğu için insan hayatı ve sağlığı için tehlike oluşturmaktadır. Bu sebeplerden ötürü sağlık davranışları ve trafik güvenliğinin birlikte incelenmesi gerekmektedir.

Trafikte İnsan Faktörü: Sürücü Davranışları ve Becerileri

Trafik güvenliği problemlerini incelemek için, risk faktörlerinde en büyük paya sahip olanlar incelenmelidir. Amerika'da yapılan bir araştırmaya göre, trafik

kazalarının %57'sinin sebebi yol kullanıcılarıdır. Üstelik yol kullanıcıları ile diğer bileşenlerin etkileşimini eklediğimiz zaman bu oran %95'e çıkmadadır (Oppenheim ve Shinar, 2011). Risk faktörleri incelenirken, sürücü davranışları ve becerileri de açıklanmalıdır. Sürücü davranışları, sürücülerin nasıl araç kullanacaklarını seçmeleri olarak tanımlanırken; sürücü becerileri, motor beceriler ve güvenlik becerileri olarak tanımlanmaktadır. Kısacası, sürücü davranışları sürücülerin trafik ortamında "sıklıkla ne yaptıkları" ile ilgiliyken, sürücü becerileri, sürücülerin "neler yapabildikleri" ile ilgilidir.

Sürücü Davranışları

Sürücü davranışları iki temel tür sapkın sürücü davranışlarından oluşmaktadır; ihlaller ve hatalar. Hatalar "planlanan eylemlerin amaçlanan sonuçlara ulaşmaması" olarak tanımlanırken, ihlaller "potansiyel olarak tehlikeli bir sistemin güvenli bir şekilde çalışmasını sağlamak için gerekli olduğuna inanılan uygulamalardan kasıtlı sapmalar" olarak tanımlanıyor (Reason, Manstead, Stradling, Baxter & Campbell, 1990, pp.1316). Hatalar da iki farklı türden oluşmaktadır. İhmaller ve dikkatsizlikler, dikkat ve hafıza hataları olarak tanımlanırlar (Lucidi, Giannini, Sgalla, Mallia, Devoto, & Reichmann, 2010). Mesela, "anahtarlar içeride iken, arabanın kapısını kitli halde dışarda kalmak bir ihmal örneğidir. "Yolculuk sırasında yolun net bir şekilde hatırlanmaması" bir dikkatsizlik örneğidir. Yukarıda belirtilen gibi sapkın sürücü davranışlarını incelemek için Sürücü Davranışları Anketi (SDA, Reason ve ark, 1990) geliştirilmiştir. SDA sapkın sürücü davranışlarını araştırmak için kullanılan en yaygın anketlerden biridir (Wåhlberg, Dorn, & Kline, 2011). SDA'nın daha sonrasında Türkçe çevirisi ve adaptasyonu da yapılmıştır (Lajunen, Sümer ve Özkan, 2003).

Mevcut çalışmada, yalnızca ihlal maddeleri kullanılmıştır, çünkü birçok trafik çalışması riskli davranışlarda ihlallerin hatalara göre daha yordayıcı olduğunu bulmuştur (Rowe ve ark, 2015; Elliott, Baughan ve Sexton, 2007; Freeman ve Rakotonirainy, 2015). Sadece ihlallerin kullanılmasının diğer bir nedeni ise, ihlallerin niyetli davranışlar olmasıdır.

İhlaller

Lawton ve arkadaşları (1997) SDA'yı genişleterek, ihlalleri iki ayrı bölüme ayırmıştır; saldırgan ve sıradan ihlaller. Saldırgan ihlaller, başka bir yol kullanıcısına yönelik düşmanca davranış veya saldırgan bir şekilde sürüş olarak tanımlandı (Sullman, Meadows ve Pajo, 2002). Örneğin, başka bir şoföre sinirli olmak ve ona haddini bildirmek için kovalamak saldırgan ihlal olarak kabul edilir. Öte yandan,

sıradan ihlaller, saldırgan bir amaç olmadan yapılan kasıtlı ihlaller olarak belirlenmiştir (Dimmer ve Parker, 1999). Bir otoyoldaki hız sınırlarını göz ardı etmek olağan bir ihlal olarak değerlendirilir.

Birçok farklı ihlal tipi vardır; hız, emniyet kemeri, kırmızı ışık veya dur tabelası ihlalleri, ehliyeti olmadan araç kullanmak, alkollü araç kullanmak, hatalı sollama… Bu alanda yapılan bir çalışma gösterdi ki; Türkiye'de hız davranışları ve emniyet kemeri ihlalleri en sık yapılanlardandır (Alver, Demirel ve Mutlu, 2014). Birçok çalışmanın sonucu gösterdi ki; hız davranışları, diğer ihlallere göre trafik güvenliğinde daha kritik bir rol oynamaktadır (Bogstrand ve ark, 2015; WHO, 2004; Williams, Kyrychenko ve Retting, 2006). Bundan dolayı, mevcut çalışmada, hız ihlallerine daha fazla önem verilmiştir.

Sürücü Becerileri

Sürücü becerileri, uygulama ve eğitim gibi deneyimlerle geliştirilen bilgi işleme, motor becerileri ve güvenlik becerilerinden oluşur (Elander ve ark, 1993). Lajunen ve Summala, sürücü becerilerinin araştırılması/incelenmesi için Sürücü Becerileri Anketini (SBA) geliştirmişlerdir (1995). Bu anket iki farklı faktörden oluşmaktadır; algı-motor ve güvenlik becerileri.

Algı-motor becerileri, yukarda belirtildiği gibi, bilgi işleme ve motor becerilerden oluşmaktadır. Bu beceriler, eğitim ve uygulama ile geliştirilebilir. Örneğin, dar bir alana geri gelerek park etmek algı-motor becerilerine örnek olarak gösterilebilir. Lajunen ve arkadaşlarının yaptığı çalışmanın sonucu göstermiştir ki; algı-motor becerileri hız davranışları ile pozitif yönde ilişkilidir (1998). Öte yandan, güvenlik becerileri geçici motivasyonel ve kalıcı kişilik özellikleri ile güvenlik konusundaki tutumları içeren bir dürtü olarak tanımlanmıştır (Lajunen ve Summala, 1995). Yeterli takip mesafesinin korunması güvenlik becerilerine örnek olarak gösterilebilir. Ayrıca, güvenlik becerileri sapkın sürücü davranışları ile negatif yönde ilişkili bulunmuştur (Sümer ve Özkan, 2002).

Sürücü Davranışları ve Becerileri Arasındaki İlişki

Literatür, bu iki kritik trafikte insan faktörü değişkeninin birbiriyle ilişkili olduğunu gösterdi. Birçok araştırmanın sonuçları, kendilerini algılama-motor becerileri bakımından yüksek olarak derecelendiren sürücülerin, durumu idare edebilecek kadar yetenekli olduklarını düşündükleri için daha riskli olma eğiliminde olduklarını gösteriyor (Martinussen, Møller, & Prato, 2014; Gregersen, 1996; Sümer

ve diğerleri, 2006). Öte yandan, yüksek güvenlik becerileri bildiren sürücülerin, daha düşük sıklıkta ihlal ve hata yapma eğilimi vardır (Martinussen, Møller ve Prato, 2014).

Sürüşte Bireysel Faktörler: Yaş, Cinsiyet ve Maruz Kalma

Sürücü davranışları ve sürücü becerileri arasındaki ilişkiye ek olarak, trafikte insan faktörü değişkenleri ile bazı bireysel değişkenler arasındaki ilişkiler literatürde dikkat çekmektedir. Yaş, cinsiyet ve maruz kalma en ağırlıklı demografik değişkenler olduğu için bu çalışmanın kapsamına dâhil edilmiştir. Bahsedilen değişkenler sürekli olarak trafikte insan faktörleri ile ilişkili olarak bulunmuştur.

Sağlık İnanç Modeli

1950'lerde Sağlık İnanç Modeli (SİM) ilk olarak ABD Halk Sağlığı Servisindeki sosyal psikologlar tarafından sağlıklı davranışların teşvik edilmesi ve artırılmasına yönelik davranışları öngörmek üzere geliştirildi (Rosenstock, 1974a). İlk olarak, model olumlu sağlık sonuçlarıyla ilgili davranışları öngörürken, daha sonra, kişilerin semptomlara verdikleri tepkileri araştırmak için genişletildi (Rosenstock, 1974a).

SİM altı farklı değişkenden oluşmaktadır; algılanan hassasiyet, algılanan ciddiyet, algılanan yararlar, algılanan engeller, hareket ipuçları ve motivasyon. Algılanan hassasiyet "kişinin bir duruma maruz kalma ya da acı çekme riski hissetmesi" anlamına gelir (Jones ve ark, 2014). Örneğin, bir kişi sigara içtiğinden dolayı kansere yakalanma ihtimali olduğuna inanırsa, bu inanç sigarayı bırakmasını etkiyebilir. Algılanan hassasiyet önleyici davranışlar ve sağlık davranışları için çok etkili bir yordayıcıdır (İbrahim ve Sheeran, 2005). Algılanan ciddiyet " durumun ve sonuçların ne kadar ciddi olduğu ile ilgili inanç" olarak tanımlanır (Jones ve ark, 2014). Algılanan faydalar " sağlıklı davranışların teşvik edilmesi ve geliştirilmesine yönelik davranışın uygulanmasının etkinliği ve kullanılabilirliği" olarak tanımlanmıştır (Jones ve ark, 2014). Örneğin, sigarayı bırakmak, sağlık için yararları olması gibi finansal olarak da fayda sağlayabilir. Algılanan engeller ise "sağlık davranışlarının teşvik edilmesini önlemenin altında yatan faktörler" olarak tanımlanır (Jones ve ark, 2014). Olumsuz yan etkilere sahip olmak, hoş olmayan duygulara neden olmak, pahalı ve zaman kaybettirici gibi sebepler algılanan engellere örnek olarak gösterilebilir. Diğer bir bileşen ise hareket ipuçlarıdır; bunlar eylem tetikleyici olarak tanımlanabilirler (Jones ve ark, 2014). Hareket ipuçları hem içsel (negatif bedensel belirtiler) hem de dışsal (kitle iletişim araçları kampanyaları veya destek gruplarından gelen tavsiyeler) türde olabilirler. Toplumsal normlar, sağlık uzmanlarının tavsiyeleri

veya aile deneyimleri hareket ipuçlarına örnek olarak sayılabilir. Bunlara ek olarak, motivasyon, SİM bileşeni, bireylerin genel olarak sağlıkla ilgili konularda endişe etmeye hazır oldukları anlamına gelir. Motivasyon ve sağlık davranışı, küçük fakat anlamlı olarak pozitif bir ilişkiye sahiptir. Bu iki yapı, motivasyonun net tanımlamaları olmadığından dolayı SİM'i inceleyen bazı araştırmacılar tarafından incelenmemiştir.

Trafikte İnsan Faktörleri ve SİM

SİM ve trafikte insan faktörleri hakkındaki yapılan çalışmaların ortak amacı, yaralanmaların ciddiyetini azaltmak ve sağlık davranışlarını geliştirmektir. Bu konuların ortak çalışıldığı çok az sayıda araştırma bulunmaktadır (Fernandes, Hatfield ve Soames Job, 2010; Hatfield, Fernandes ve Soames Job, 2014). Bu çalışmalar, SİM ve insan faktörleri arasındaki ilişkiyi incelemek için yeterli değildir.

Bildiğimiz kadarıyla, SİM bileşenleri ile sürücü becerileri arasındaki ilişkiyi SBA'yı kullanarak araştıran bir trafik araştırması yoktur. Bununla birlikte, aralarında bir ilişki bulunması mümkündür. Örneğin, güvenlik motivasyonu ve sağlık motivasyonu bazı benzerliklere sahiptir. Bu iki kavramın ortak amacı, yaralanmaların ciddiyetini azaltmak ve sağlık davranışlarını geliştirmektir.

Sürücü Davranışı ve Becerileri ve SİM

Literatürdeki birçok çalışma, sürücü davranışları ve becerileri arasında bir ilişki olduğunu göstermiştir. Bu nedenle SİM ve sürücü davranışları arasındaki ilişki, aracılık değişkeni olarak sürücü becerileri tarafından gerçekleştirilebilir. Değişkenler arasındaki ilişkileri test etmenin bu yolu, daha önce bilinen bir kuramın yapısıyla da desteklenebilir. Planlı Davranış Teorisi (PDT - Ajzen, 1991) amaçlanan davranışa giden yolun davranışla ilgili inançların yol gösterdiğini belirtmektedir; tutumlar, normlar, davranışa ilişkin algılanan davranışsal kontrol ve niyet, sırasıyla. Bu mantık, bu çalışmadaki ilişkilerin yönlerini belirleme ve değişkenleri sıralamanın mantığına çok benzemektedir. Diğer bir deyişle, SİM bileşenlerinin sürücü davranışlarıyla (ör. ihlal) sürücü becerileri, katılımcıların tutum ve algılanan davranış kontrolleri sürüş becerileri hakkında kendi değerlendirmelerini oluşturur, üzerinden ilişkili olduğu varsayılmaktadır.

Çalışmanın Amacı

Bu çalışmanın amaçları aşağıdadır;

- SİM bileşenleri ile sürücü davranışları (toplam ihlaller, saldırgan ve sıradan ihlaller, hız limitlerine uyma sıklığı) arasındaki ilişkinin incelenmesi
- SİM bileşenleri ile sürücü becerileri arasındaki ilişkinin incelenmesi

- Sürücü becerileri ile sürücü davranışları arasındaki ilişkinin incelenmesi
- SİM bileşenleri ile sürücü davranışları arasındaki ilişkinin sürücü becerileri tarafından aracılık edip etmemesinin incelenmesi

YÖNTEM

Katılımcılar

Bu çalışmaya toplamda 505 sürücü (217 kadın, 288 erkek) katılmıştır. Katılımcıların yaş aralığı 18 ve 68 olup, ortalama yaş 27.14'tür. Bütün katılımcıların en az bir yıllık ehliyetleri bulunmaktadır. Hem yıllık hem de toplam yaptıkları kilometreler sorulmuştur. Katılımcıların, ortalama yıllık kilometreleri 9,222.97'dir.

İşlem

Veri toplamaya başlamadan önce ODTÜ Uygulamalı Etik Araştırma Merkezinde etik izin alınmıştır. Veriler, uygun örnekleme yöntemi kullanılarak toplanmıştır. Katılımcıların bazıları psikoloji öğrencisi olmadan, Psikoloji bölümünden ders alan öğrencilerdir. Diğer katılımcılara ise internetten mail atarak veya Facebook ve Twitter'dan anket linkini göndererek ulaşılmıştır. Bütün katılımcılar çalışmanın amacı hakkında bilgilendirilmiştir. Katılım gönüllük esasına dayanmaktadır.

Materyaller

Demografik Bilgi Formu

Bu form yaş, cinsiyet, kaç yıldır ehliyet sahibi oldukları, yıllık ve hayat boyu yaptıkları kilometreler ve yaptıkları kaza sayıları gibi genel bilgiler içermektedir. Bunlara ek olarak, hız davranışları ile ilgili soru da içermektedir. Bu soru "Ne sıklıkla hız limitlerini aşıyorsunuz?". Bu soru ile Sağlık İnanç Modeli ve hız limitlerine uyma sıklığı arasındaki ilişki incelenecektir.

Sürücü Davranışları Anketi (SDA)

Anket, Reason ve arkadaşları (1990) tarafından sapkın sürücü davranışlarını ölçmek için geliştirilmiştir. Lajunen ve Özkan ise Türkçe'ye çevirisini ve uyarlamasını yapmıştır (2004). SDA temel olarak sürücü ihlallerini ve hatalarını içeren bir kişisel rapor anketidir. Bu çalışmada sadece ihlaller kullanılmıştır, çünkü diğer bileşenler niyet içermedikleri için bu çalışmanın doğasına uymamaktadır. İhlaller 11 maddeden

oluşmaktadır (3 saldırgan ihlaller, 8 sıradan ihlaller). Anketten alınan yüksek skorlar kişisel olarak raporlanan ihlallerin sıklığının yüksek olduğunu göstermektedir.

Sürücü Beceriler Anketi (SBA)

Anket, Lajunen ve Summala (1995) tarafından katılımcıların kişisel raporlarıyla algı-motor ve güvenlik becerileri yönelimlerini ölçmek için geliştirilmiştir. Sümer ve Özkan tarafından Türkçe çevirisi ve adaptasyonu yapılmıştır (2002). Anket 10 sorudan oluşmaktadır. Bunlardan 5 tanesi algı-motor becerileri, 5 tanesi ise güvenlik becerileriyle ilgilidir. Anketin alt ölçeklerine göre alınan yüksek puanlar algı-motor ve güvenlik beceriler yönelimlerinin yüksek olduğunu göstermektedir.

Sağlık İnanç Modeli Ölçeği

Sağlık İnanç Modeli (SİM), sağlık davranışlarını teşvik etmek için geliştirilmiştir (Rosenstock, 1974). Model gibi, ölçekte 6 tane alt alandan oluşmaktadır; algılanan hassasiyet, algılanan ciddiyet, algılanan yararlar, algılanan engeller, hareket ipuçları, motivasyon. Bu çalışmada, SİM ölçeği maddeleri, sağlık alanı yerine hız limitlerine uyma konusunda uyarlanmıştır. Algılanan hassasiyet 5 maddeden, algılanan ciddiyet 11 maddeden, algılanan yararlar 6 maddeden, algılanan engeller 13 maddeden, hareket ipuçları 8 maddeden ve motivasyon 4 maddeden oluşmaktadır. Algılanan engeller bileşeni hariç, diğer bileşenlerdeki yüksek puanlar hız limitlerine uyma eğiliminin yüksek olduğunu gösterir. Algılanan engellerdeki yüksek puanlar ise bu eğilimin düşük olduğunu gösterir.

BULGULAR

Bu çalışmada, analizler üç farklı bölümde açıklanmıştır. İlk bölümde bu çalışmada kullanılan değişkenlere ilişkin tanımlayıcı istatistiklerden bahsedildi. Buna ek olarak, iki değişkenli korelasyon analizleri değişkenler arasındaki temel ilişkileri hesaplamak için yapıldı. İkinci kısımda ise, Sağlık İnanç Modeli (SİM) ölçeği bileşenleri, Sürücü Davranışları Anketindeki ihlaller bileşeni ve Sürücü Becerileri Ölçeği bileşenleri arasındaki ilişkileri incelemek için hiyerarşik regresyon analizleri yapıldı. Son olarak, Hayes'in (2013) dolaylı makrosu kullanılarak, sürücü becerilerinin ihlaller ile SİM bileşenleri arasındaki ilişkiye aracılık edip etmediğinin

bulunması için aracılık analizleri yapılmıştır. Mevcut araştırmadaki tüm analizler SPSS 22 programı kullanılarak yapılmıştır.

Temel Analizler: Hiyerarşik Regresyon Analizleri

SİM ve Sürücü Davranışları Arasındaki İlişkinin İncelenmesi

Hiyerarşik Regresyon Analizi SİM bileşenleri ve ihlaller arasındaki ilişkiyi incelemek için yapılmıştır. İhlaller bağımlı değişken, SİM bileşenleri de bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisini kontrol edebilmek için, bu değişkenler analizin ilk adımına eklenmiştir. İkinci adımda ise SİM bileşenleri eklenmiştir. Sonuçlar, ihlallerin SİM bileşenlerinden yalnızca algılanan engellerle ilişkili olduğunu göstermiştir (β = .39). Bu ilişki pozitif yöndedir.

İkinci analiz, SİM bileşenleri ile saldırgan ihlaller arasındaki ilişkiyi incelemek için yapılmıştır. Saldırgan ihlaller bağımlı değişken, SİM bileşenleri de bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisi kontrol edilmiştir. Sonuçlar, saldırgan ihlallerin SİM bileşenlerinden yalnızca algılanan engellerle ilişkili olduğunu göstermiştir (β = .19). Bu ilişki pozitif yöndedir.

Üçüncü analiz, SİM bileşenleri ile sıradan ihlaller arasındaki ilişkiyi test etmek için yapılmıştır. Sıradan ihlaller bağımlı değişken, SİM bileşenleri de bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisi kontrol edilmiştir. Sonuçlar, sıradan ihlallerin SİM bileşenlerinden yalnızca algılanan engellerle ilişkili olduğunu bulmuştur (β = .42). Bu ilişki pozitif yöndedir.

Dördüncü analiz, SİM bileşenleri ile hız limitlerine uyma sıklığı arasındaki ilişkiyi incelemek için yapılmıştır. Hız limitlerine uyma sıklığı bağımlı değişken, SİM bileşenleri bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisi kontrol edilmiştir. Sonuçlar, hız limitlerine uyma sıklığı ile algılanan engellerin (β = .39) pozitif yönlü, hareket ipuçlarının (β = -.09) ise negatif yönlü ilişkisi olduğunu göstermiştir.

SİM ve Sürücü Becerileri Arasındaki İlişkinin İncelenmesi

Hiyerarşik Regresyon Analizi SİM bileşenleri ve güvenlik becerileri arasındaki ilişkiyi incelemek için yapılmıştır. Güvenlik becerileri bağımlı değişken, SİM bileşenleri de bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisini kontrol edebilmek için, bu değişkenler analizin ilk adımına eklenmiştir. İkinci adıma ise SİM bileşenleri eklenmiştir. Bulgular, güvenlik becerilerinin algılanan engellerle (β = -.33) ile negatif yönlü, motivasyon bileşeni (β = .11) ile ise pozitif yönlü

olduğunu göstermiştir. Diğer bir taraftan, SİM bileşenleri ve algı-motor becerileri arasındaki ilişkiyi incelemek için yapılan Hiyerarşik Regresyon Analizinin sonuçları, algı-motor becerileri ile yalnızca algılanan engellerin ilişkili olduğunu göstermiştir (β = .17). Bu ilişki pozitif yöndedir.

Sürücü Davranışları ve Becerileri Arasındaki İlişkinin İncelenmesi

Hiyerarşik Regresyon Analizi, SİM bileşenlerinin istatistiksel etkisi kontrol edildiği zaman ihlaller ve sürücü becerileri arasındaki ilişkiyi incelemek için yapılmıştır. İhlaller bağımlı değişken, sürücü becerileri bağımsız değişkendir. Yaş, cinsiyet ve maruz kalmanın istatistiksel etkisini kontrol etmek için, analizin ilk adımına eklenmiştir. SİM bileşenlerinin istatistiksel etkisini kontrol etmek için, analizin ikinci adımına eklenmiştir. Temel ilişkiyi analiz etmek için ise sürücü becerileri analizin üçüncü adımına eklenmiştir. Sonuçlar, ihlallerin güvenlik becerileri (β = -.45) ile negatif yönde, algı-motor becerileri (β = .14) ile pozitif yönde ilişkili olduğunu göstermiştir. Aynı analizler aynı şekilde, saldırgan ihlaller, sıradan ihlaller ve hız limitlerine uyma sıklığı için de yapılmıştır. Sonuçlar, saldırgan ihlallerin güvenlik becerileri (β = -.25) ile negatif yönde, algı-motor becerileri (β = .10) ile pozitif yönde ilişkili olduğunu ortaya çıkarmıştır. Üçüncü analizin sonuçları, sıradan ihlallerin güvenlik becerileri (β = -.47) ile negatif yönde, algı-motor becerileri (β = .14) ile pozitif yönde ilişkili olduğunu göstermiştir. Son analizin bulguları, hız limitlerine uyma sıklığının güvenlik becerileri (β = -.39) ile negatif yönde, algı-motor becerileri (β = .21) ile pozitif yönde ilişkili olduğunu göstermiştir.

Aracılık Analizleri: İki Aracı ile Çoklu Aracılık Modeli

Aracılık analizleri SİM bileşenleri ile sürücü davranışları arasındaki ilişkiye sürücü becerilerinin aracılık edip etmediğini bulmak için yapılmıştır. Bu analizlerde, önceki bölümde belirtilen Hiyerarşik Regresyon Analizlerinde sürücü davranışları ile anlamlı ilişkili çıkan SİM bileşenleri kullanılmıştır. Bu bileşenler de algılanan engeller ve hareket ipuçlarıdır. İlk aracılık analizi, algılanan engeller ile ihlaller arasındaki ilişkide sürücü becerileri aracılık ediyor mu diye yapılmıştır. Sonuçlar, ilişkinin toplam etkisinin (β = .39) ve algılanan engellerin ihlaller üzerindeki direk etkisinin (β = .21) anlamlı olduğunu göstermiştir. Algılanan engeller ve ihlaller ilişkisinde, güvenlik becerilerinin direk olamayan etkisi (β =.16), ile algı-motor becerilerinin direk olmayan etkisi (β = .02) anlamlı çıkmıştır. Direk olmayan etkiler karşılaştırıldığı zaman güvenlik becerilerinin bu ilişki üzerindeki etkisi daha fazla bulunmuştur.

İkinci aracılık analizi, algılanan engeller ile saldırgan ihlaller arasındaki ilişkide sürücü becerileri aracılık ediyor mu diye yapılmıştır. Sonuçlar, ilişkinin toplam etkisinin (β = .24) anlamlı, algılanan engellerin saldırgan ihlaller üzerindeki direk etkisinin ise anlamlı olmadığını göstermiştir. Diğer bir deyişle, aracılık değişkenlerinin istatistiksel etkisi kontrol edildiği zaman, algılanan engeller ile saldırgan ihlaller arasındaki ilişki anlamlılığını kaybediyor. Bu da demek oluyor ki, sürücü becerileri algılanan engeller ile saldırgan ihlaller arasındaki ilişkiye tam aracılık ediyor. Algılanan engeller ve ihlaller ilişkisinde, güvenlik becerilerinin direk olamayan etkisi (β =. 12) ile algı-motor becerilerinin direk olmayan etkisi (β = .02) anlamlı çıkmıştır. Direk olmayan etkiler karşılaştırıldığı zaman güvenlik becerilerinin bu ilişki üzerindeki etkisi daha fazla bulunmuştur.

Üçüncü aracılık analizi, algılanan engeller ile sıradan ihlaller arasındaki ilişkide sürücü becerileri aracılık ediyor mu diye yapılmıştır. Sonuçlar, ilişkinin toplam etkisinin (β = .45) ve algılanan engellerin sıradan ihlaller üzerindeki direk etkisinin (β = .25) anlamlı olduğunu göstermiştir. Algılanan engeller ve sıradan ihlaller ilişkisinde, güvenlik becerilerinin direk olamayan etkisi (β = .17), ile algı-motor becerilerinin direk olmayan etkisi (β = .02) anlamlı çıkmıştır. Direk olmayan etkiler karşılaştırıldığı zaman güvenlik becerilerinin bu ilişki üzerindeki etkisi daha fazla bulunmuştur.

Dördümü aracılık analizi, algılanan engeller ile hız limitlerine uyma sıklığı arasındaki ilişkide sürücü becerileri aracılık ediyor mu diye yapılmıştır. Sonuçlar, ilişkinin toplam etkisinin (β = .54) ve algılanan engellerin hız limitlerine uyma sıklığı üzerindeki direk etkisinin (β = .31) anlamlı olduğunu göstermiştir. Algılanan engeller ve hız limitlerine uyma sıklığı ilişkisinde, güvenlik becerilerinin direk olamayan etkisi (β = .20), ile algı-motor becerilerinin direk olmayan etkisi (β = .04) anlamlı çıkmıştır. Direk olmayan etkiler karşılaştırıldığı zaman güvenlik becerilerinin bu ilişki üzerindeki etkisi daha fazla bulunmuştur. Buna ek olarak, hareket ipuçları ile hız limitlerine uyma sıklığı arasında da anlamlı bir ilişki olduğu Hiyerarşik Regresyon Analizlerinde bulunmuştu. Aracılık analizlerine bakıldığı zaman, sürücü becerilerinin bu iki değişken arasındaki ilişkiye aracılık etmediği bulunmuştur.

TARTIŞMA

Bu çalışmanın asıl amacı, SİM bileşenleri (algılanan hassasiyet, algılanan ciddiyet, algılanan yararlar, algılanan engeller, hareket ipuçları ve motivasyon) ile sürücü davranışları (toplam ihlaller, saldırgan ihlaller, sıradan ihlaller ve hız limitlerine uyma sıklığı) arasındaki ilişkinin sürücü becerileri (algı-motor ve güvenlik becerileri) yönünden ilk kez literatürde incelenmesidir. Bilgimize göre, SİM bileşenlerini trafik kapsamında kullanan çok az çalışma vardır (Fernandes ve ark, 2010; Fernandes & Soames Job, 2014). Önceki çalışmaların hiçbiri bu çalışmadaki gibi aracılık etkisini kullanmamıştır.

Birçok trafik alanındaki araştırmalar ve SİM araştırmaları aynı kritik amaca sahiptir: sağlık davranışlarını teşvik etmek ve ölümleri ve yaralanmaları ya da yaralanmalarının ciddiyetini azaltmak. Trafik alanındaki çalışmalar bu amaca trafik güvenliğini artırarak ulaşmaya çalışırken, SİM ise "Sağlık davranışlarının yapılma olasılığını nasıl artırırım?" veya "Sağlık davranışlarının önündeki engelleri nasıl kaldırırım?" gibi soruların cevaplarını bulmaya çalışarak ulaşıyor. Bu yüzden, aynı amaca sahip bu iki bakış açısının birleştirilmesi yeni teorik ve pratik katkılar sağlayabilir. Bu bölümde sonuçların değerlendirilmesi, eleştirel yorumlar ve çalışmanın sonuçlarının katkıları ve gelecek araştırmalar için öneriler tartışılacaktır.

Bulguların Değerlendirilmesi

Hiyerarşik Analizlerin Değerlendirilmesi

Bu çalışmada, SİM bileşenleri ve sürücü davranışları arasındaki ilişki, SİM bileşenleri ve sürücü becerileri arasındaki ilişki; sürücü davranışları ve becerileri arasındaki (SİM bileşenlerinin istatistiksel etkisi kontrol edildikten sonra) ilişkiyi incelemek için bir dizi Hiyerarşik Regresyon Analizleri yapılmıştır.

Bulgular, genel ihlaller, saldırgan ihlaller ve sıradan ihlallerin SİM bileşenleri arasından yalnızca algılanan engellerle ilişki olduğunu göstermiştir. Bu ilişkilerin hepsi pozitif yönde çıkmıştır. Buna ek olarak, hız limitlerine uyma sıklığı pozitif yönde algılanan engellerle ilişkili iken, negatif yönde de hareket ipuçları ile ilişkili çıkmıştır. Bu demek oluyor ki, hız limitlerine uyma hakkında eylem tetikleyicilerdeki artış hız davranışlarına azalmaya sebep olur. Sürücüler dışsal ve içsel türde ne kadar çok

uyarıcıya maruz kalırsa, hız limitlerine uyma ihtimalleri o kadar artar. Bunlara ek olarak, literatürlerle uyumlu olarak, bu çalışmada da riskli davranışların en güçlü yordayıcısı algılanan engeller olarak bulunmuştur (Lajunen ve Räsänen, 2001; Champion ve Skinner, 2008). Bulgularda, algılanan engellerle ihlaller arasındaki ilişki beklendiği gibi bulundu, çünkü algılanan engeller "Hız limitlerini aşmanızın sebepleri nelerdir?" sorusunun cevaplarını içermektedir.

İkinci analizler ise, SİM ile sürücü becerileri arasındaki ilişkiyi incelemek için yapılmıştır. Sonuçlar, motivasyon bileşeni ile algılanan engeller bileşeninin güvenlik becerileri ile ilişkili olduğunu göstermiştir. Birçok çalışma güvenlik becerileri ile trafik kazalarının ve tehlikeli araç kullanmanın negatif yönlü ilişkisini ortaya çıkardığı için (Hatfield, Fernandes ve Soames Job, 2014; Jonah, 1997; Jonah ve ark. 2001), bu çalışmada algılanan engeller ile güvenlik becerilerinin negatif yönde ilişkili çıkması beklenen bir sonuçtur. Buna ek olarak, beklendiği gibi güvenlik becerileri ile motivasyon bileşeni arasında pozitif yönlü ilişki bulunmuştur. Trafik alanındaki çalışmalarda güvenlik becerilerini güvenliğe yönelik güdüler olarak bulduğu için bu ilişki beklendiği gibi bulunmuştur (Lajunen ve Summala, 1995). Bu demek oluyor ki; güvenlik becerilerini artırmak için sağlık ve güvenlik motivasyonunu artırmak gerekmektedir. Diğer yandan, algı-motor becerileri SİM bileşenlerinden yalnızca algılanan engellerle ilişkili çıkmıştır. Bu ilişki literatürle uyumlu olarak pozitif yönde çıkmıştır. Algılanan engeller hız davranışları ile ilgili maddeler içermektedir ve hız davranışları da birçok çalışmada algı-motor becerileri ile pozitif yönlü ilişkili çıkmıştır (Lajunen ve Summala, 1998; Walton ve Bathurst, 1998; Walton, 1999).

Bir diğer analizler ise, SİM bileşenlerinin istatistiksel etkisi kontrol edilerek sürücü davranışları ve becerileri arasındaki ilişki incelenmek için yapılmıştır. Sonuçlar, güvenlik becerilerinin toplam ihlaller, saldırgan ihlaller, sıradan ihlaller ve hız limitlerine uyma sıklığı ile negatif yönlü ilişkisi olduğunu ortaya çıkarmıştır. Ayrıca, algı-motor becerilerinin de aynı değişkenler ile pozitif yönde ilişkili olduğu bulunmuştur. Bu sonuçlar literatürdeki birçok trafik çalışması ile uyumlu çıkmıştır (Martinussen, Møller ve Prato, 2014; Gregersen, 1996; Sümer ve ark, 2006). Bu çalışma, SİM bileşenlerinin istatistiksel etkisi çıkartıldığı zamanda sürücü davranışlarının ve becerilerinin arasındaki ilişkinin devam ettiğini bularak literatüre katkı sağlamıştır.

Aracılık Analizlerinin Değerlendirilmesi

Mevcut çalışmada, algı-motor ve güvenlik becerilerinin sürücü davranışları ve SİM bileşenleri arasındaki ilişkiye aracılık ettiğini araştırmak için 5 farklı aracılık analizi yapılmıştır. İlk aracılık analizleri, sürücü becerileri toplam ihlaller ile algılanan engeller arasındaki ilişkiye aracılık ediyor mu diye yapılmıştır. Sonuçlar, hem algı-motor hem de güvenlik becerilerinin bu ilişkiye kısmen aracılık ettiğini göstermiştir. İkinci aracılık analizlerinde ise, hem algı-motor hem de güvenlik becerilerinin algılanan engeller ile saldırgan ihlaller arasındaki ilişkiye tamamen aracılık ettiğini ortaya çıkarmıştır. Bu demek oluyor ki, sürücü becerilerinin etkisi bu ilişkiden çıkartıldığı zaman, algılanan engeller ile saldırgan ihlaller arasındaki direk ilişki artık anlamlı değildir. Üçüncü aracılık analizlerinin sonuçları, sürücü becerilerin algılanan engeller ile sıradan ihlaller arasındaki ilişkiye kısmen aracılık ettiğini ortaya çıkarmıştır. Dördüncü aracılık analizlerinin bulgular ise gösterdi ki, sürücü becerileri algılanan engeller ile hız limitlerine uyma sıklığı arasındaki ilişkiye kısmen aracılık etmektedir. Beşinci aracılık analizlerinde ise, sürücü becerilerinin hareket ipuçları ile hız sınırlarına uyma sıklığı arasındaki ilişkide anlamlı bir aracılık rolü olduğu bulunamamıştır. Aracılık değişkenlerinin direk olmayan etkilerini karşılaştırdığımızda, algılanan engeller ile sürücü davranışları arasındaki ilişkide güvenlik becerileri algı-motor becerilerinden daha etkili aracı değişken olarak bulunmuştur. Bu sonuçlara göre şunlar çıkartılabilir; algılanan engellerdeki artışlar güvenlik becerilerinde düşüşle veya algı-motor becerilerinde artışla ilişkilidir ve bu durum bu çalışmada kullanılan bütün ihlaller tiplerinin sıklığının artması ile ilişkilidir.

Özetle, mevcut çalışmadaki aracılık analizleri, algılanan engeller ile ihlaller arasındaki ilişkiye sürücü becerilerinin aracılık ettiği ilk kez ortaya çıkarmıştır. Bu demek oluyor ki; listelenen durumların (polis kontrolü olmaması, sürücü becerilerine güvenmek gibi) hız davranışı için engel olarak algılanması arttıkça, sürücü becerileri daha etkili bir şekilde ihlallerin sıklığının artmasına sebep olacaktır. Mevcut çalışmanın sonuçları bazı önceden çalışılmış model ve teorilerle desteklenmektedir; Planlı Davranış Teorisi (PDT –Ajzen, 1991). PDT, tutumlar, algılar ve normların inançlar ve niyetli davranışlar arasındaki ilişkide aracılık etkisi olduğunu iddia etmektedir (Montaño, & Kasprzyk, 2008; Chorlton, Conner, & Jamson, 2012). Bu çalışmadaki aracılık modelinde ise, sürücü becerileri PDT'deki tutumlar, algılar ve normlarla aynı pozisyonda aracılık görevindedir; SİM bileşenleri PDT'deki inançlarla aynı pozisyondadır, ihlaller ise PDT'deki niyetli davranışlarla aynı pozisyondadır.

Eleştirel Yorumlar

Bazı değinilmesi gereken metodolojik konular olabilir. Bunlardan biri, kişisel raporlar şeklinde veri toplandığından dolayı, ortak yöntem önyargısı olabilir. Bir diğer kritik durum ise bu çalışmanın doğası gereği kesitsel çalışma olmasıdır. Bu durum da nedensellik yorumu yapmayı imkânsız hale getirmektedir. Bunlara ek olarak, normalde SİM kullanıldığı çalışmalarda motivasyon bileşeni iki maddeden oluşmaktadır. Bu çalışmada ise 2 tane güvenlik motivasyonu maddesi eklenerek, 4 madde haline getirilmiştir. Motivasyon bileşenin sürücü davranışlarıyla anlamlı ilişkide çıkmama sebebi maddelerin içeriği veya eklenme şekli olabilir. Gelecek çalışmalar bu konuya dikkat edebilirler.

Çalışmanın Etkileri ve Gelecek Çalışmalar için Önerileri

SİM bileşenlerini trafik kapsamında kullanmak isteyen gelecekteki çalışmalar bu çalışmayı bir referans çalışması olarak kullanıp, bazı ek araştırmalar ekleyebilirler. Mesela, bu çalışmada asıl amaç sürücü becerilerinin aracılık etkisi olduğu için, diğer bazı grup karşılaştırmalarına bakılmamıştır. Gelecek çalışmalar, yaş ve cinsiyet grup farklarına veya maruz kalmadan dolayı oluşan farklılıkları inceleyebilirler. Ayrıca ülkeler arası çalışmalar da bu çalışmanın sonucunu doğrulamak ve ülkeler de farklılık gösteriyor mu diye araştırmak için yapılabilir. Bunlara ek olarak, bu çalışmanın sonuçları ihlalleri azaltmak için güvenlik kampanyaları oluştururken veya güvenlik becerilerini artırmak için yapılan eğitim programlarını planlarken kullanılabilir.

APPENDIX I

TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

Sosyal Bilimler Enstitüsü ■

Uygulamalı Matematik Enstitüsü ☐

Enformatik Enstitüsü ☐

Deniz Bilimleri Enstitüsü ☐

YAZARIN

Soyadı : Özbay
Adı : İrem
Bölümü : Trafik ve Ulaşım Psikolojisi

TEZİN ADI (İngilizce) : The Relationship Between The Health Belief Model Consturcts And Driver Behaviors: Mediating Role Of Driving Skills

TEZİN TÜRÜ : Yüksek Lisans ■ Doktora ☐

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın.. ■
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullancılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐
3. 3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) ☐

Yazarın imzası …… Tarih ……..