THE EFFECT OF IMPLEMENTATION INTENTION ON SPEEDING BEHAVIOR: A SIMULATOR STUDY

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ABSTRACT

THE EFFECT OF IMPLEMENTATION INTENTION ON SPEEDING BEHAVIOR: A SIMULATOR STUDY

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Intention was accepted as the major contributor to driver behaviors in the literature. The present thesis aimed to systematically review the literature on the association between intention and speeding behavior. Based on the results of the review, intention was found as the main contributor of speeding. In the next chapter, intention was aimed to manipulate by implementation intention to reduce speeding. Implementation intentions are self-regulatory 'if-then' plans, which are the subordinate concept of goal intentions. Additionally, implementation intention was divided as approach and avoidance goals to compare their impact on the subsequent behavior. A randomized controlled design was used and both self-reported and simulated driver behavior were measured at baseline and follow-up levels. In baseline level, participants in experimental group were manipulated by implementation intentions using a volitional help sheet, which they matched the critical items with appropriate responses, whereas participants in control

group received a filler task. After a two-week time-interval, follow-up level of the study was conducted. According to the results, implementation intention can promote a goal attainment in the context of speeding, which is important for road safety. Also, the differentiation between approach and avoidance goals in speeding was found as effective in support of approach goals, but the efficacy of avoidance goals was found as context-specific which covers situations related to pedestrians. Lastly, the previous preferences on speed choices can affect the goal attainment and both reduce or increase the efficacy of implementation intention. The results were discussed in the context of the related literature.

Keywords: implementation intention, speeding, approach goals, avoidance goals

ÖZ

HIZ YAPMA DAVRANIŞI ÜZERİNDE NİYET AŞILAMANIN ETKİSİ:
BİR SİMÜLATÖR ÇALIŞMASI

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Sürücülük ile ilgili literatürde niyet davranışın en önemli belirleyicisi olarak kabul edilmektedir. Bu tezde öncelikle niyet ve hız yapma davranışı arasındaki ilişkiyi inceleyen çalışmaların sistematik bir literatür taraması ile incelenmesi amaçlanmaktadır. Literatür taraması sonucunda, niyetin hız yapma üzerinde en çok etkisi olan değişken olduğu bulgulanmıştır. Bir sonraki bölümde niyetin, hız yapma davranışını düşürmek amacıyla niyet aşılama kullanılarak manipüle edilmesi amaçlanmıştır. Niyet aşılama, hedefe yönelik niyetlerin alt kavramı olan, öz-düzenlemeye dayalı, "…ise/o zaman" şeklinde kurulan planlardır. Ek olarak çalışmada, ulaşılmak istenen hedefin türünün davranış üzerindeki etkisi incelenmek istendiğinden, niyet aşılama yaklaşma ve uzaklaşma türü hedefler olarak ikiye ayrılmıştır. Kendi-bildirim türünde ve simülasyonda ölçülen hız yapma davranışları, seçkisiz kontrollü bir deney deseninde, ön ve son ölçümler alınarak test edilmiştir. İlk aşamada deney

grubundaki katılımcılar bir ‘niyete yönelik yardım cetveli’ aracılığı ile kritik durumları uygun buldukları tepkiler ile eşleştirirken, kontrol grubundaki katılımcılar araştırma hipotezi ile ilgili olmayan günlük cümleleri eşleştirmişlerdir. İki haftalık bir zaman aralığından sonra tekrar ölçümler alınmıştır. Bulgulara göre, niyet aşılama hız yapma davranışı bağlamında hedefe ulaşmayı sağlayabilmekte ve yol güvenliğine katkı sağlayabilmektedir. Ayrıca, yaklaşma ve kaçınma türü hedeflerde de yaklaşma türü hedefler lehine bir farklılık olduğu, ancak kaçınma türü hedeflerin ise yayaların dahil olduğu senaryolarda daha faydalı olduğu görülmüştür. Son olarak, hız limitlerine uyma konusundaki tercihlerin hedefe ulaşma üzerinde etkili olduğu ve önceki tercihlere bağlı olarak niyet aşılamaya olumlu ya da olumsuz etki edebildiği görülmüştür. Bulgular ilgili literatür bağlamında tartışılmıştır.

Anahtar kelimeler: niyet aşılama, hız yapma, yaklaşma türü hedefler, kaçınma türü hedefler

To my parents and precious baby sister,

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TABLE OF CONTENTS

THE STRUCTURE OF THE PRESENT STUDY

The present thesis is composed of two themed chapters. The first chapter of this paper was examined the related literature with a systematic review on the relationship between intention and speeding behavior. In this chapter, the studies revealed by the systematic review was summarized. Additionally, these studies were investigated from a methodological approach. In the light of the findings of Chapter 1, studies investigated the relationship between intention and subsequent speeding behavior were discussed. Based on the conclusions and future directions of the systematic review, implementation intention, which is a method to reduce speeding behavior by manipulating intention was used in Chapter 2.

In Chapter 2, a study of behavioral change to reduce speeding was aimed to conduct. Thus, implementation intention to reduce speeding used with an experimental research design. Driver behaviors were investigated both with self-reported measurements and a driving simulation. Additionally, implementation intention to speeding behavior was aimed to manipulate according to the goal type (i.e. approach vs. avoidance types of goals) of implementation intention. Lastly, the prior preferences to comply the speed limits was considered a factor, which can influence the effect of experimental manipulation. Thus, speed limit compliances in different speed limits and road types were included in the study to observe their interaction with experimental manipulation.

CHAPTER 1

LITERATURE REVIEW

The present literature review study examined the relationship between intention and speeding behavior on the framework of an extended version of the Theory of Planned Behavior. The studies that examined and reported the relationship between intention and speeding were included. After irrelevant articles were excluded, database search revealed twenty-one articles. Results showed that intention was the strongest predictor of behavior among investigated studies. Also, habit strength was found as strongly related to speeding behavior. Overall results of the studies, further directions, and critics on driving-related thinking process were discussed on the conceptual framework.

1.1 Introduction

1.1.1 The Definition of Intention

Intention is defined as "*a thing intended; an aim or plan*" or "*the action or fact of intending*" (Oxford online dictionary, 2015). In the field of psychology, intention is described as a person's probability to engage in a behavior. Intention is an indicator of future behavior; and a motivational factor, which helps to estimate how much effort people give to perform or how willing they are to perform the behavior. In cases where intended behavior is under volitional control, intention is expected to engage in a behavior. In other words, the more one intends to perform a behavior, the more (s)he is likely to perform it (Ajzen, 1991).

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1.1.2 Theoretical Background

The interest of psychology in intention can be retraced more than 70 years ago. Lewin, Dembo, Festinger, and Sears (1944) were the first scholars who are familiar with the gap between intention and behavior. In other words, they recognized that not all of the intentions lead to a desired subsequent behavior. Accordingly, both volitional and motivational components such as skills and strategies as well as intentions were required. Later that, another early definition of intention was defined by two complementary theories; The Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and The Theory of Planned Behavior (Ajzen, 1985). In the following section, these theories were introduced.

1.1.2.1 Theory of Reasoned Action

In psychology, intention was profoundly examined by The Theory of Reasoned Action (TRA). The TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) predicts behavioral intentions and behavior, based on the assumption that the behavior being investigated is under full volitional control. According to this theory, behavioral intentions are the key determinants of behavior. In other words, the more people intend to perform a specific behavior, the more they are expected to try. Intentions contain two independent components known as attitudes toward the behavior and subjective norm. The first one, attitudes toward the behavior related to whether a behavior is perceived as favorable or not. The second one, a subjective norm is about perceived social pressure; how others will evaluate performing or not performing a behavior. The theory of reasoned action suggests that salient information and beliefs are antecedents of behavior and they influence behavior through these attitudes and subjective norms. Two different types of beliefs are defined; behavioral beliefs are expected to influence attitudes, and they are outcome evaluations on how good or bad it will be. On the other hand, normative beliefs are expected to influence subjective norms. Normative beliefs are shaped by motivations to comply with others who are important such as friends or family members (Ajzen, 2002; Ajzen & Fishbein, 1980; Ajzen & Madden, 1986;

Fishbein & Ajzen, 1975; Madden, Ellen, & Ajzen, 1992; Sheppard, Hartwick, & Warshaw, 1988).

Three points should be addressed to fulfill the requirements of the TRA: Firstly, the measure of intention must accurately represent the behavior. Secondly, intention must not have been changed in the time interval until behavior is observed; and lastly, the investigated behavior must be under full volitional control (Ajzen & Madden, 1986). Fishbein & Ajzen (1975) claimed that knowledge, skill, resource or others' cooperation are essential components to perform (or not to perform) a behavior, one may intend to perform a specific behavior, but if (s)he doesn't have resources to do it, the behavior will not be performed.

1.1.2.2 Theory of Planned Behavior

As stated above, the theory of reasoned action based on the idea that intention is the only predictor of behavior, thus it had been criticized for ignoring the influence of both internal and external factors over intention and behavior. Even though it is impossible to evaluate all internal and external factors that influence a person's intention and behavior, it is possible to predict how much control (s)he perceives on his/her own behavior. In the light of this information, The Theory of Planned Behavior (TPB) was developed as an extension of the theory of reasoned action with the addition of the variable 'perceived behavioral control' (Ajzen, 1985, Ajzen, 1991; Schifter & Ajzen, 1985). The TPB defines perceived behavioral control as perceived difficulty of a behavior which is intended to act. It has both a direct and an indirect (through intentions) effect on the given behavior. TPB states that motivation (intention) and ability (behavioral control) are joint functions to perform a behavior. Similar to TRA, TPB claims that the possibility to perform a behavior increase with stronger intention. In other words, one should decide to perform or not to perform a behavior according to his (her) own will (Ajzen, 1991).

Fishbein & Ajzen (1975) claim that most behaviors can be correctly predicted by intentions since they are under volitional control. However, the TPB also was frequently criticized by this rationality perspective (e.g. Chung, 2015; Conner, 2014; Sniehotta, Presseau, & Araujo-Soares, 2014). According to Reyna and Brainerd (1995), decision-making strategies can be categorized as deliberate, reactive and intuitive. Whereas TPB components correspond to deliberate and reactive categories, it doesn't provide sufficient explanation for intuitive decision making. Ajzen (2011, 2015) suggested "*TPB makes no assumptions about objectivity or veridicality of beliefs*" and claimed that TPB doesn't ignore the fact that human judgments are biased. Instead, TPB pointed out that it is not important how these beliefs were reached. Attitudes, subjective norms and perceived behavioral control follow these beliefs automatically, whether they are irrational or biased. Similarly, TPB was criticized for disregarding the role of affect and emotion. Ajzen (2011, 2015) explained that emotions are background variables of behavioral, normative and control beliefs, and have an influence on both how events will be perceived and how they will be recalled from memory. Yet, affective beliefs were not considered as an independent contributor to predicting intentions.

Meta-analysis studies showed that TPB constructs were used by many studies focusing on preventive behavior such as alcohol or drug use, abortion, blood donation, consumption behavior, food choice and many other health-related behaviors (Godin & Kok, 1996; Sheppard, Hartwick, & Warshaw, 1988). Traffic and transportation psychology was one of the health-related fields that focus on TPB. Many researchers in traffic and transportation psychology conducted studies among a wide variety of sample groups such as pedestrians (Jalilian, Mostafavi, Mahaki, Delpisheh, & Rad, 2015), passengers (Şimşekoğlu, & Lajunen, 2008), cyclists (Lajunen & Räsänen, 2004), motorcyclists (Aghamolaei, Tavafian, & Madani, 2011), professional drivers (Aghamolaei, Ghanbarnejad, Tajvar, Asadiyan, & Ashoogh, 2013) and regular car drivers (Elliott et al., 2003, 2007) to explain different issues such as public

transportation use (Chen & Chao, 2011), electric car use (Moons & De Pelsmacker, 2015) or many road traffic violations (e.g. Elliott et al., 2003, 2007; Elliott, 2012). In this current study, the link between intention and speeding behavior was investigated and an alternative method to close the gap between intention and speeding was suggested. In the next section, the important role of intentionality in the driver behavior was demonstrated.

1.1.3 Human Factors: Driving Style and Driving Performance and Intention

Human factors are investigated under two components: driving performance and driving style, which are also called as driver skill and driver behavior. Driver skill (or performance) refers to abilities related to information process and motor skills. On the other hand, driver behavior (or style) refers to the preferences or habits of drivers regarding driving (Elander, West, & French, 1993). Driver behaviors were classified based on Reason et al. (1990)'s theoretical taxonomy of aberrant behavior. In the field of human error, distinctions between aberrant behaviors are important, however, cannot be separated easily. It is important to clear the boundaries between two main distinctions of aberrant behavior; errors and violations since it is assumed that the two concepts are based on different psychological origins. Errors are failures of planned actions. They are related to individual cognitive processes. Errors are classified into two sub-categories as 'slips or lapses' and 'mistakes'. Norman (1983) defines two concepts as follows: 'If the intention is appropriate this is a mistake. If action is not what was intended, this is a slip.' On the other hand, violation refers to a deliberate action to perform or not to perform a specific behavior. Violations have a social context, they are related to others such as rules, norms, operation procedures or codes of practice (Özkan & Lajunen, 2005; Reason et al., 1990).

According to Reason et al.'s (1990) taxonomy, the terms mentioned above can be clearly dissociated by asking certain questions regarding intention, planning and the end of the action. In order to decide whether an aberrant behavior is an error or a violation, first, the question of whether there was a prior intention to commit the violation should

be asked. If the answer is no, behavior can be classified as erroneous or unintended violations. Secondly, it should be asked if there was a prior intention to cause harm. If the answer is yes, it can be named as an act of sabotage. However, in many concepts, especially in driving, violations are between these two poles; they are intentional, but without aiming harm. A detailed taxonomy of aberrant behavior was given in Figure 1.

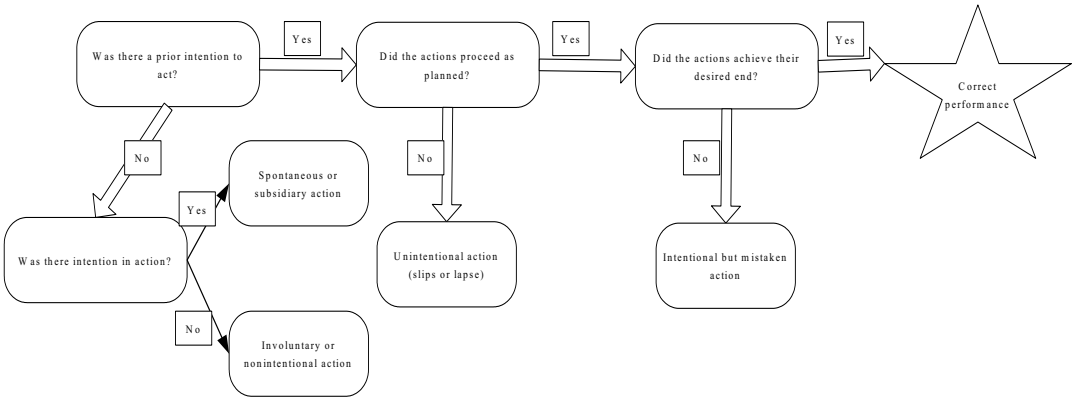

Figure 1. Reason's et al. (1990)'s Theoretical Taxonomy of Aberrant Behavior (Özkan, 2006).

However, Reason et al. (1990)'s theoretical taxonomy of aberrant behavior can be criticized based on the definition of correct performance. In this presented study, Reason et al. (1990)'s theoretical taxonomy of aberrant behavior was followed by the extension of Özkan (2006). According to the revised model, if there was a prior intention, it should be asked that whether it is neutral or harmful. If the prior intention was harmful, it directs us to a negative intention. If the prior intention was not harmful, it directs us to a positive intention. It should be noted that both positive and negative performances can be the "correct" performance, in other words, both can be the targeted act. According to the model of Reason et al. (1990), under the condition of not involving an accident, speeding itself can be categorized as a correct behavior.

Considering that the prior intention is the determinant factor to classify a behavior, not the outcome, the extension of Özkan (2006) provide a more comprehensive model.

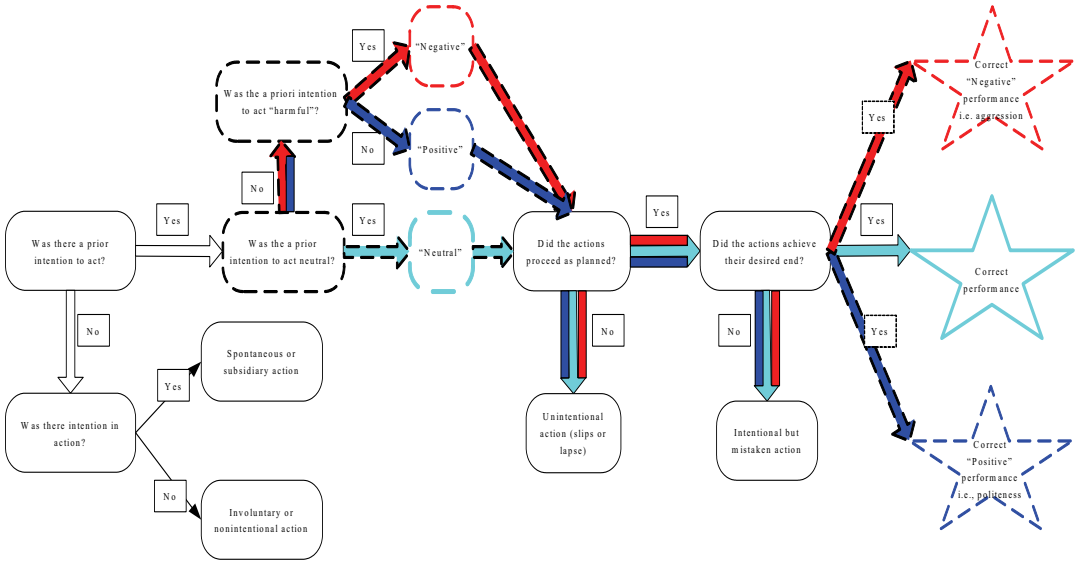

Figure 2. The revised version of Reason et al. (1990)'s Theoretical Taxonomy of Aberrant Behavior with the extension of Özkan (Özkan, 2006).

1.1.4 Speeding

Speeding can be defined as exceeding the legal speed limit while driving (Campbell & Stradling, 2003). Exceeding the speed limit affects i) the severity of the crash, and ii) the risk of being involved in the crash (Aarts & Van Schagen, 2006; Elvik, Christensen, & Amundsen, 2004). Beilinson (2004) summarized the risk of exceeding the speed limit with five criterions: First, speeding negatively affects the reaction time of the driver, when something unexpected occurs. Second, the driver may not able to stop even if s/he aims, based on the laws of physics. Third, speeding decreases the level of perception regarding other road users or road environment. Fourth, even a small amount of increase in the speed may cause more severe consequences. Lastly, these consequences in higher speed are hardly being compensated.

Although there are some environmental factors related to speeding such as roadway dynamics and vehicle systems, factors related to the driver are more under the focus of the field of psychology. The driver-related studies on speeding can be categorized into three antecedents: cultural, behavioral and personal factors. The cultural context of speeding can be explained by the law system (e.g., speed limits, regulations and enforcement of the country), as well as the influence of the media and the shared norms and beliefs (Berry, Johnson, Porter, & 2011). The study of Warner, Özkan, and Lajunen (2009) compared two countries (i.e. Sweden and Turkey) in terms of drivers' intention to comply with the speed limits, attitudes, subjective norms, and perceived behavioral control towards complying with the speed limits. Results showed that, drivers who live in a 'safer' country with fewer road traffic fatalities (i.e. Sweden), report more positive attitudes and subjective norms towards complying with the speed limit, perceive higher behavioral control, intend to comply with the speed limit, and eventually, their subsequent behavior regarding compliance with the speed limit is higher.

Behavioral factors contribute to speeding, or driver behavior in general, often under the influence of habit. Habitual driving does not require an explicit attention. In other words, the driver is capable of engaging in some distractions such as listening to music or talk to the passenger. However, the extent of these distractions is under the focus of literature. Distracted driving studies showed that drivers operating radios and drivers using even a hands-free cell phone reduce their speed (Horberry, Anderson, Regan, Triggs, & Brown, 2006; Strayer & Drews, 2004).

Lastly, personal factors can be summarized as demographic, personality and information processing characteristics (Berry et al., 2011). In order to exemplify the demographic characteristics, the role of age and gender on speeding was widely supported. In detail, being male and young is related to drive above speed limits (e.g. Rhodes & Pivik, 2011). Also, the driving experience is positively related to speeding; the more driver has experienced the more s/he likely to speed (Delhomme, Chaurand, & Paran, 2012).

The personality of driver is under focus for a long time as well. The related literature points out that individual differences can be linked to not only for speeding but also for many other risky driver behaviors. According to a recent study (Endriulaitiené, Seibokaité, Zardeckaité-Matulaitiené, Markšaityté, & Slavinskiené, 2018), dark triad personality traits (i.e., machiavellianism, narcissism, and psychopathy) was significantly associated with speeding. Other personality related constructs revealed significant associations with speeding as well. For instance, people who are high in sensation seeking found as low in compliance with speed limits (Delhomme et al., 2012). Traffic locus of control, which is the internal or external beliefs about the control of traffic events, was found as an important contributor of driver's speed (Warner, Özkan, & Lajunen, 2010).

The last personal factor associated with speeding is information-processing, which explores what types and levels of information are processed. Although there are several models explain the information-processing system of driver behaviors (e.g. protection-motivation theory of Roger, Cacioppo, and Petty (1983), or the prototype/willingness model of Gibbons, Gerrard, Blanton, & Russell (1998), evidence showed that TPB (Ajzen, 1985) is sufficient to explain, predict and manipulate speeding behavior (e.g. Elliott & Armitage, 2006; Elliott et al., 2003).

1.1.5 The Role of Intention in Speeding

As it was mentioned above, the TPB has been widely used in the context of driver behavior. Many studies applied TPB to a driver behavior, such as driving under influence (e.g. Barry, Howell, & Dennis, 2011; Lheureux, Auzoult, Charlois, Hardy-Massard, & Minary, 2015), disobeying road signals (e.g. Castanier, Deroche, & Woodman, 2013), aggressive driving (e.g. Efrat & Shoham, 2013), seat belt use (e.g. Okamura, Fujita, Kihira, Kosuge, & Mitsui, 2012; Tavafian, Aghamolaei, Gregory, & Madani, 2011; Torquato, Franco, & Bianchi, 2012) and provide evidence on the link between intention and behavior.

Right along with aforementioned aberrant behaviors, speeding was investigated by many studies in the context of TPB (e.g. Elliott et al., 2003, 2007; Elliott, Thomson, Robertson, Stephenson, & Wicks, 2013; Leandro, 2012; Letirand & Delhomme, 2005; Paris, & Van den Broucke, 2008; Warner et al., 2009). Related studies repeatedly supported the view that intention is the major predictor of speeding behavior. On the framework of TPB, after the significant role of intention, other variables have roles to predict speeding. Habit (i.e. De Pelsmacker & Janssens, 2007; Lheureux et al., 2015), moral norms (i.e. Conner et al., 2007), past behavior (i.e. Conner et al., 2007) and self-identity (i.e. Elliott & Thomson, 2010) can be exemplified as some of the variables investigated and revealed significant results in the concept of TPB. However, the significant role of intention of speeding remains salient regardless of the model.

1.2 Method

1.2.1 Procedure

The literature was examined on the basis of intention and speeding behaviors. Scopus database (www.scopus.com) was searched by using keywords “intention-traffic-driver behavior”, “intention-traffic-driving behavior” and “intention-traffic-accident” repeatedly. Keywords were searched by using the “title”, “abstract”, and “keyword” alternatives; selecting the duration as “all years” to “present”; selecting the document type as “all”. The search was completed in all subject areas without any limitation. Only the English language was used as a limiting criterion. Since there are three groups of keywords, the search was repeated three times. After cleaning overlapped articles, a total of 963 articles non-patient car driver sample were included in the review. According to the exclusion criteria shown in Figure 3; eight-teen articles presented and evaluated below. The studies which (i) used intention as an independent variable, (ii) used intention as a mediator or moderator variable (iii) used speeding behavior as an outcome (e.g., a self-report measure of speeding or speeding measured by a simulation etc.), (iv) used a quantitative analytical method and (v) used an adult non-patient car

driver sample were included in the review. For the recently published articles, related literature was re-checked accordingly to the criterions of the present study, and three publications were also included. According to the exclusion criteria shown in Figure 3; twenty-one articles were presented and evaluated below.

1.3 Results

1.3.1 Studies Investigated Intention as an Independent Variable

In this section, fifteen studies which measured speeding behavior as a dependent variable were presented. Speeding can be defined as exceeding the legal speed limit while driving (Campbell & Stradling, 2003). Since 'joy(fun)riding' is related to speeding behavior, studies which examined joyriding were also presented in this section. Also, because of the limited number of articles found, nine studies which investigate intention as a mediator variable to predict speeding were also presented in this following section. Studies investigated both the direct and the mediator roles of intention were presented separately. Detailed information was presented in Table 1.

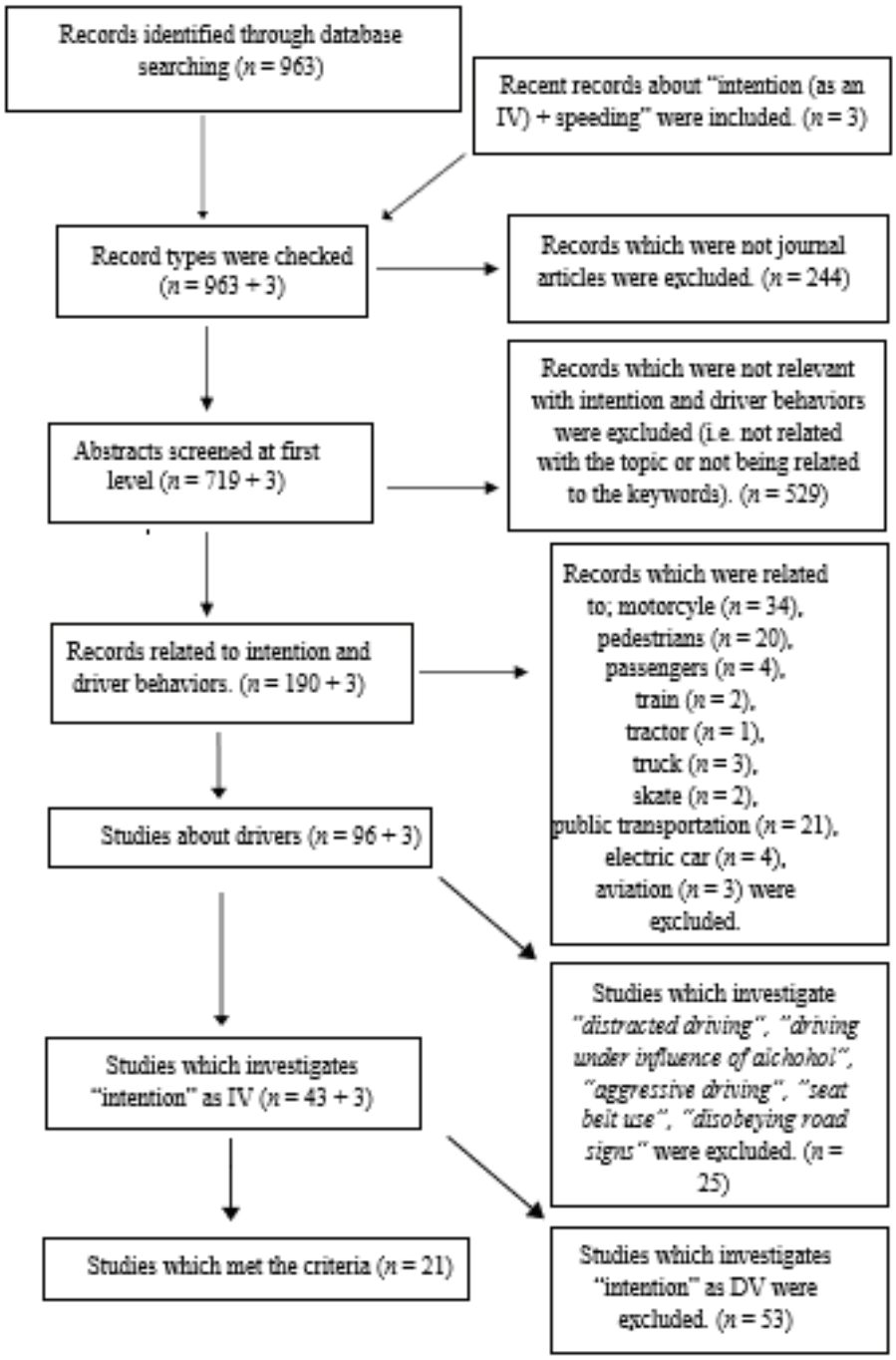

Figure 3. Flow of information through the different phases of the systematic review

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings Results	Intention & Speeding Strength
Atombo, C., Wu, C., Tettehfio, E.O., & Agbo, A. A. (2017)	• 354 participants • 78.5% males ($n = 278$) • 21.5% females ($n = 76$) • Age range; 25 to 35	Speeding	Intention to speed (4 items)	Structural equation modeling	• There is a significant relationship between the intention and RDB, and there is both direct and indirect effect of normlessness on risky driver behavior (RDB) through the mediation of intention to speed. The study has demonstrated that intention is the main predictor of driver's risky behavior irrespective of driver personalities.	• Risky Driver Behavior (Speeding); $\beta = 0.55$**
Auzoult, L., Lheureux, F., Hardy-Massard, S., Minary, J. P., & Charlois, C. (2015)	• 852 participants • 48% males • 52% females • Age; $M = 34$	• Speeding	Intention to drive above the speed limit (2 items)	Mediation analysis Hierarchical regression analysis	• There is a relationship between the perceived effectiveness of interventions of the penalty/surveillance type and the behaviors adopted and that it is mediated by intention.	• Speeding; $\beta = 0.76$**
Beullens, K., Roe, K., & Van Den Bulck, J. (2011)-a	• 426 participants • 66.4% male • 33.6% female • Adolescents (born in 1987-1988-1989)	• Speeding • Joy(fun) riding	Intention to speed (2 items)	Structural equation modeling *longitudinal study*	• Intention predicts joyriding and speeding in all three models. Also, intentions mediated relationships between action program viewing and joyriding and speeding.	• Joyriding; $\beta = 0.50$* • Speeding; $\beta = 0.52$**
Beullens, K., Roe, K., & Van den Bulck, J. (2011)-b	• 354 participants • 62.7% male • 37.3% female • Adolescents (born in 1987-1988-1989)	• Speeding • Joy(fun) riding	Intention to speed (2 items)	Structural equation modeling *longitudinal study*	• Intention predicts joyriding and speeding in all three models. Also, video game playing during adolescence predict joyriding and speeding through attitudes and intentions.	• Joyriding; $\beta = 0.45$** • Speeding; $\beta = 0.45$**

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors(continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings/Results	Intention & Speeding Strength
Brewster, S. E., Elliott, M. A., & Kelly, S. W. (2015)	• 243 participants • 46.9% male (n = 114) • 53.1% female (n = 129) • Age; M = 35.58, SD = 14.20	• Speeding	Intention to speed (5 items)	Moderated linear regression	• Implementation intentions moderate the relationship between intention and speeding. Goal intention predicts speeding behavior stronger for experimental group than control group.	• β = 0.50**
Castanier, C., Deroche, T., & Woodman , T. (2013)	• 280 participants • 127 males • 153 female • Age; M = 39.7; SD = 3.6	• Speeding	Road violation intentions (4 items)	Moderated regression analysis	• The intention was highly related to excessive speeding.	• Speeding; r = .63**
Conner, M., Lawton, R., Parker, D., Chorlton, K., Manstead, A. S. R., & Stradling, S. (2007)	Study 1: • 83 participants • 56 males • 27 females • Age; M = 35.4; SD = 13.8 Study 2: • 318 participants • 170 males • 148 females • Age; 17-86 years • M = 48	• Speeding	Intention to speed (4 items)	Hierarchical regression analysis	Study 1; • Intentions predicted speeding behavior on the simulator with perceived behavioral control, moral norms, and accidents. Study 2; • Intentions and moral norms predicted speeding behavior on the road.	• Study 1; *(simulator)* r = .48** • Study 2; *(road)* r = .41**
Cristea, M., Paran, F., & Delhomme, P. (2013)	• 1192 participants • 593 males • 599 females • Age; M = 24.2	• Speeding	Intention to speed (6 items; 2 items for each of three options)	Hierarchical regression analysis	• Intentions are best predictors of transgressive speeding for all three speed conditions.	• Over 10 km/h; r = .54** • 91-110 km/h; r = .56** • Compliance; r = -.50**

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings /Results	Intention & Speeding Strength
De Pelsmacker, P., & Janssens, W. (2007)	• 334 participants • 55.4% male • 44.6% female • 28.3% 17-24 age	• Speeding	Intention to speed (3 items)	Structural equation modeling	• Intentions are second important predictor of self-reported speeding behavior after habit formation and before personal norm.	• $\beta = 0.47$**
Elliott, M. A. (2012)	• 198 participants • 48% male ($n = 95$) • 52% female ($n = 103$) • Age; $M = 20.39$, $SD = 2.04$	• Speeding (30/40/60 /70 mph areas)	Intention (11 items for different violations, 4 item for speeding)	Regression-based statistical simulations	• Statistical simulation analysis revealed that manipulation of intentions generated behavioral change. • Maximum change of TPB generated larger behavioral change, i.e., lower level of violation behavior.	• $\beta = 0.48$**
Elliott, M. A., & Thomson, J. A. (2010)	• 1403 participants • Speed limit offenders • 60% male ($n = 845$) • 40% female ($n = 558$) • Age; $M = 57.18$, • $SD = 13.82$	• Speeding	Intention to speed (2 items)	Hierarchical multiple regression analysis	• A hierarchical multiple regression analysis was conducted to predict speeding behavior with all components of TPB, and also three additional predictors; moral norm, anticipated regret, self-identity, and past behavior. The intention, self- efficacy and past behavior predict speeding behavior with an equivalent importance.	• $\beta = 0.41$**
Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003)	• 598 participants • 57% male ($n = 341$) • 43% female ($n = 257$) • Age; 18-85 years • $M = 51$	• Speeding	Intention to keep within the speed limit (3 items)	Hierarchical multiple regression analysis	• Intention predicted speeding behavior. Age, gender, and SEG are related with both intention and speeding. TPB variables were better predictors of behavior than the demographics. Also, TPB mediated the age-behavior and gender-behavior relationships.	• $\beta = 0.46$***

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings /Results	Intention & Speeding Strength
Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2007)	• 150 participants • 77 males • 73 females • Age; 17-75 years • *M* = 36.7	• Speeding	Intention to avoid exceeding the speed limit (3 items)	Multiple regression analysis Survival analysis	• In each context, intention positively predicted self-reported speeding, whereas it predicted speeding behavior from driving simulator negatively (when participants intend to avoid speed, they drove slower). • As long as participants' intent to comply with the speed limit, the time interval until the first breach became longer. Intention to comply with the speed limit also found as negatively associated with the hazard function on each road type.	• Self- reported speeding; $\beta = .48$*** • Observed speeding; • *Urban distributor road;* $\beta = -0.63$*** • *Village through-roads;* $\beta = -0.66$*** • *Rural single carriageways;* $\beta = -0.62$*** • *Motorway;* $\beta = -0.53$***

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings /Results	Intention & Speeding Strength
Elliott, M. A., Thomson, J. A., Robertson, K., Stephenson, C., & Wicks, J. (2013)	• Study 1; 135 participants 33% male (n = 45) 67% female (n = 102) Age; 17-77 years M = 35.75, SD = 15.44 • Study 2; 1149 participants Speed limit offenders 61% male (n = 696) 39% female (n = 453) Age; 18-88 years M = 56.37, SD = 13.54	• Speeding	Intention to comply with speed limit (4 items) Intention to speed (6 items; road type specific)	Hierarchical cross- lagged regressions	Study 1; • Intention significantly predicted behavior. The relationship remained significant after the entry of demographic variables. Study 2; • Intention and self-efficacy predicted changes in speeding behavior after six months. Also, the relationship between baseline and follow-up behaviors was mediated by intention change.	Study 1; • β = 0.23* Study 2; • β = 0.18*
Leandro, M. (2012)	210 participants 160 males 50 females Age; 18-30 years M = 21.9, SD = 2.81	•Speeding	Intention to comply with the speed limit (3 items)	Structural equation modeling	• The intention was found as a predictor of actual behavior, but its' effect is reduced by direct effects of norms and perceived behavioral control on speeding behavior.	• β = -0.17**
Letirand, F., & Delhomme, P. (2005)	238 participants 100% male Age; 18-25 years M = 21, SD = 2	•Speeding	Intention to observe and to exceed the speed limit by at least 20 km/h (3 items)	Stepwise regression analysis	• Self-reported speeding was predicted by both intention to exceed speed limit by at least 20 km/h the speed limit and intention to observe the speed limit.	• to exceed the speed limit by at least 20 km/h; β = 0.34** • Observe the speed limit; β = -0.28**

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings /Results	Intention & Outcome Behavior Strength
Lheureux, F., Auzoult, L., Charlois, C., Hardy-Massard, S., & Minary, J. (2015)	• 642 participants • 47% male • 53% female • Age; $M = 34.3$, $SD = 14.2$	• Speeding	Intention to speed (2 items)	Hierarchical linear regression analysis	• The intention was found as a stronger predictor of speeding than habit. • Based on the frequency of traffic offenses, usual magnitude of traffic offenses and maximum magnitude of traffic offenses intention repeatedly predicted speeding behavior	<u>Overall behavior:</u> • Speeding; $\beta = 0.40$** <u>Frequency, usual and maximal magnitude of offences:</u> *Speeding;* • Frequency; $\beta = 0.70$*** • Usual magnitude; $\beta = .49$*** • Maximum magnitude; $\beta = 0.54$**
Jovanovic, D., Sraml, M., Matovic, B., & Micci, S. (2017)	• 546 participants • 63% male • 37% female • Age; $M = 37.30$; $SD = 12.09$ • Age range, 19 to 72	• Speeding	Intention to exceed the speed limits (3 items)	Structural equation modeling	• Intention was the most immediate and important predictor of behavior, and that intention mediates the influence of other variables (attitudes, norms, PBC). The results of our study support the view that traffic offenses are both intentional and habitual, with emphasis on deliberative intentions.	• $\beta = 0.94$***

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings/Results	Intention & Speeding Strength
Paris, H., & Van den Broucke, S. (2008)	• 116 participants • 70.7% male (n = 82) • 29.3% female (n = 34) • Age; M = 38.6	• Speeding	Intention to comply speed limit (1 item)	Multiple regression analysis	• Intentions significantly predicted self-reported speeding behavior with perceived (internal) control. • The prediction of intention on observed speeding behavior was not statistically significant. However, moderate to large effect sizes were observed between intention and number and duration of violations.	• Self-reported speeding; β = 0.64** • Observed speeding; • *Actual speed;* β = 0.20 • *Number of violations;* β = -0.45 • *Duration of violation;* β = -0.53
Tavafian, S. S., Aghamolaei, T., & Madani, A. (2011)	• 246 participants • Age; M = 32.2, SD = 6.7	• Speeding	Intention to drive within speed limits (1 item)	Multiple regression analysis	• Intention significantly predicted driving within speed limits with perceived behavioral control. The contribution of intention to behavior is less than the contribution of perceived behavioral control.	• r = .57**

Table 1. *The summary table of the studies investigating the relationship between intention and speeding behaviors (continue)*

Authors of the study in surname order	Sample size/ characteristics	Driver Behaviors	IV Measurement	Analytical Methods	Main findings /Results	Intention & Outcome Behavior Strength
Warner, H., Özkan, T., & Lajunen, T. (2009)	Swedish group; • 219 participants • 56% male • 44% female • Age; 21-68 years • $M = 40$, $SD = 14$ Turkish group; • 252 participants • 70% male • 30% female • Age; 19-68 years • $M = 32$, $SD = 12$	• Speeding	Intention to comply with the speed limit (3 items)	Structural equation analysis	• Intention significantly predicted self-reported speed limit compliance in both groups. However, Swedish drivers have higher intention to comply with the speed limit and they spent more time to comply than Turkish drivers.	• Swedish group; $\beta = .20$* • Turkish group; $\beta = .35$*

* $p < .05$, ** $p < .01$, *** $p < .001$

Atombo, Wu, Tettehfio, and Agbo (2017) investigated a model, which personality variables (i.e. normlessness and sensation seeking) directly influence intention, attitude, and speeding. The study conducted with 354 participants with a 3-month time interval. Structural equational modeling results showed that intention has a strong direct link with speeding.

Auzoult, Lheureux, Hardy-Massard, Minary, and Charlois (2015), investigated the effectiveness of road safety interventions. They conducted a study with 852 drivers. According to the results, the perceived effectiveness of road safety interventions was moderately correlated with intentions.

Brewster, Elliott, and Kelly (2015) conducted a study to investigate whether implementation intentions predict speeding behavior. For experimental manipulation, participants were asked to link four critical situations with four goal intentions from a volitional help sheet which comprised 20 items of critical situations and 20 items of goal intentions. Moderated linear regression analysis based on 117 participants revealed that intention was the most powerful predictor of speeding. Also, intention and intention implementation interaction showed that intention predicted speeding behavior in experimental group, but not in the control group. In other words, participants in the experimental group reported less speeding than the control group, thus intention implementation can be evaluated as an effective technique for behavior-change.

Conner, Lawton, Parker, Chorlton, Manstead and Stradling's (2007) study examined both simulated and observed speeding behavior in the framework of TPB, including moral norms, anticipated regret, and past behavior. A driving simulated data was collected from 83 drivers and it was analyzed by hierarchical regression analysis. Intention positively predicted speeding behavior on the simulator with perceived behavioral control and number of accidents. Additionally, moral norms negatively predicted speeding behavior. In Study 2, 318 drivers were observed. Similar to Study 1, intention positively predicted observed speeding, while moral norms negatively predicted it.

Cristea, Paran, and Delhomme (2013) worked with 1192 drivers to investigate self-reported speeding behavior using TPB factors. Hierarchical regression analysis showed that both intention not to comply speed limit, intention to drive between 91 km/h and 110 km/h and lastly intention to drive over 110 km/h were the strongest predictors of speeding, rather than other TPB constructs. In detail; the predictors were as follows; in Model 1, high social pressure not to comply speed limits, in Model 2, high social pressure to drive between 91 km/h and 110 km/h, positive attitudes and perceived behavioral control with respect to driving over 110 km/h and in Model 3, positive attitude towards driving over 110 km/h, high social pressure and perceived behavioral control with respect to driving over 110 km/h predicted self-reported speeding with contribution of intention, respectively.

Elliott and Thomson (2010) tested an extended version of TPB with 1403 drivers to predict self-reported speeding behavior. Moral norms, anticipated regret, self-identity, and past behavior were measured in addition to basic TPB constructs. Hierarchical regression analysis results showed that intention and self-efficacy significantly predicted speeding behavior. Intention was the strongest predictor of behavior and it predicted speeding positively, whereas self-efficacy negatively predicted it.

Elliott, Armitage, and Baughan (2003) conducted a longitudinal study with 598 drivers with three months interval to examine self-reported compliance of speed limits in the frame of TPB. Hierarchical regression analysis showed that future behavior to comply speed limits was significantly predicted by intention and perceived behavioral control.

Elliott, Armitage, and Baughan (2007) measured both self-reported speeding behavior and observed speeding behavior obtained from a driving simulator. Multiple regression analysis results revealed that intention and perceived behavioral control positively predicted self-reported speeding. Similarly, observed speeding behavior was predicted by intention on each road type (i.e., urban distributor roads, village through-roads, rural single carriageways, motorways). Also, the time interval until the first breach of the speed limit increase with drivers' intention to comply with the speed limit. In other

words, as drivers intended to comply with speed limits more, their first breach of the speed limit became later.

Jovanovic, Sraml, Matovic, and Micic (2017) examined a self-reported speeding behavior model with an extended construct of TPB (subjective norm, personal norm, descriptive norm, cognitive attitudes towards speeding, affective attitudes towards speeding, perceived behavioral control) as well as habit. Sample consisted of 546 participants. The structural equational analysis model revealed that intention was the strongest construct of the model in relation to speeding behavior.

Leandro (2012) measured drivers speed choice by a video depicting a real-life driving situation based on TPB. Sample consisted of 210 drivers and data analyzed by structural equation modeling. Results showed that only intention and perceived behavioral control predicted speed selection significantly. A model with a direct effect of norms on speeding was also found as significant, but intention still plays the most important role in predicting behavior.

Letirant and Delhomme (2004) investigated whether speed choice was predicted by intention to observe or exceed the speed limit by at least 20 km/h. Self-reported data from 238 drivers suggested that drivers' speed choice increased with their intention to speed, similarly it also decreased with their intention to observe the speed limit. Also, a stepwise regression analysis was used to predict self-reported speed. Both observing and exceeding the speed limit (by 20 km/h) was predicted by intention. Perceived behavioral control was also a significant predictor of behavior, however, the contribution of intention was stronger.

Lheureux et al. (2015) examined the frequency, usual magnitude (i.e., the most frequent deviation from speed limit) and maximal magnitude (i.e., the greatest deviation from speed limit) of speeding based on TPB. The sample consisted of 642 drivers and it was analyzed by hierarchical linear regression analyses.

Intention and habit were significant predictors of self-reported speeding behavior for overall behavior. In detail, frequency, usual and maximal magnitudes of offenses were

predicted by intention and habit, respectively. Also, attitudes predicted the frequency and maximal magnitude and perceived control of respect predicted the usual magnitude of offenses by a third contribution.

Paris and Van den Broucke (2008) examined behavioral determinants towards both self-reported and observed speed limit. A hundred and sixteen drivers answered a self-reported questionnaire and 55 drivers were monitored for actual driving behavior. Multiple regression analysis showed that self-reported speeding was significantly predicted by intention and perceived behavioral control, respectively. However, there was no significant relationship between intention and observed behavior, although effect sizes were considerable.

Tavafian, Aghamolaeii, and Madani (2011) carried out the study to examine self-reported speeding behavior for a sample of commercial car drivers on the basis of TPB. Two hundred and forty-six drivers participated in the study and multiple regression analysis was used to predict results. Intention and perceived behavioral control were found as significant predictors of complying speed limits. Perceived behavioral control had a greater contribution to behavior than intention.

Lastly, Warner et al. (2009) investigated the cross-cultural differences in complying with speed limits between Turkish and Swedish samples. Data consisted of 219 drivers from Sweden and 252 drivers from Turkey. Self-reported compliance was analyzed with the structural equation modeling on the basis of TPB constructs. Results showed that higher intention to comply speed limit was found in support of Swedish group. Both Swedish and Turkish models based on TPB significantly predicted self-reported compliance and perceived behavioral control had a greater contribution to compliance than intention.

1.3.2 Studies Investigated Intention as a Mediator to Predict Speeding

Atombo et al. (2017) investigated a mediational model, intention has a mediator role between personality variables (normlessness and sensation seeking) speeding. The

study conducted with 354 participants with a 3-month time interval. Results showed that intention has mediator role on the link between personality and speeding. In detail, intention partially mediated the link between normlessness and speeding behavior, but not mediated the link between sensation seeking and speeding.

Auzoult et al. (2015), investigated the effectiveness of road safety interventions. They conducted a study with 852 drivers. According to the mediation analysis results, the perceived effectiveness of penalty/surveillance interventions and speeding link was mediated by intentions.

Beullens, Roe and Van den Bulck (2011-a) conducted a study with 426 which aims to show whether self-reported speeding and joy(fun)riding was predicted by video game playing through TPB constructs after two years. Structural equation modeling results revealed that attitudes were good predictors of intentions and video game playing was a significant predictor of both self-reported speeding and joy(fun)riding behaviors through intention for both genders.

Beullens, Roe, and van den Bulck (2011-b) study investigated whether the relationship between choices of TV shows and speeding was mediated by intention and other TPB constructs. Data was collected from 426 participants with a two-wave panel survey and it was analyzed by structural equation modeling. Results indicated that self-reported speeding and joy(fun)riding were predicted by intention two years before, and also, the relationships between action program viewing and speeding and joy(fun)riding were mediated by intention.

Castanier et al. (2013) explored whether the interaction of perceived behavioral control components (i.e., perceived capacity and autonomy) and intention predicted self-reported speeding and close following. Data was collected from 280 participants and analyzed by moderated regression analysis. Results showed that intention predicted speeding and close following. After entering variables age, sex, driving frequency and past driving behavior, intention remained significant to predict both speeding and close following.

De Pelsmacker and Janssens (2007) run a structural equation analysis to estimate TPB predictors on self-reported speeding behavior. The sample consisted of 334 drivers. Results indicated that habit formation influences speeding directly and it also predicted speeding through intention to speed. Intention to speed was the second powerful predictor of self-reported speeding after habit.

Elliott, Armitage, and Baughan (2003) run a mediation analysis to test whether demographic variables mediate future self-reported behavior of complying speed limits through TPB variables. Data from 598 drivers were analyzed by mediation analysis. Results showed that TPB factors were powerful mediators between age-future behavior and gender-future behavior relationships, but not for SEG-future behavior relationship. The intention had the strongest mediator role between demographic variables and future behavior to comply speed limit relationship than other TPB constructs.

Elliott et al. (2013) conducted a two-wave study with a sample of 135 participants. Hierarchical cross-legged regression results showed that changes in both intention and perceived behavioral control mediated the relationship between baseline and follow-up self-reported speeding behaviors. In Study 2, a six-month gap was used instead of one month. Also, data were collected from speed limit offenders across three different road contexts (urban, country, fast dual carriageways/motorways). Study 2 extended the results of Study 1, which demonstrated that changes in intention and self-efficacy mediate the relationship between baseline and follow-up behaviors.

Jovanovic, Sraml, Matovic, and Micic (2017) examined a self-reported speeding behavior model with an extended construct of TPB as well as habit with structural equational modeling. Sample consisted of 546 participants. Analysis showed that cognitive attitudes towards speeding, affective attitudes towards speeding, personal norms, perceived behavioral control, subjective norms, and descriptive norms were associated with speeding indirectly through intention.

All in all, intention seems to be the strongest predictor of both self-reported and observed speeding behavior and this relationship was visible for both independent and

mediator roles of intention. Also, the time interval between studies supports the link between intention to speed and speeding behavior. According to the other related variables, many studies mentioned above found an important relationship with perceived behavioral control and speeding behavior. Additionally, two studies found habit strength as an important contributor to speeding behavior with intention (De Pelsmacker & Janssens, 2007; Lheureux et al., 2015).

Additionally, the measurements of the reviewed studies were investigated. Results were summarized in Table 2. Accordingly, three issues can be noticed. First of all, five of the twenty-one studies did not report a Cronbach's alpha internal consistency value. Second, the total number of the intention measurements were changed between 1 item to 6 items and only two studies used a six-items tool to measure intention. In detail, according to the twenty-three studies conducted by twenty-one articles presented above, seven studies measured speeding intentions more than three items, eight studies measured intention with three items, six studies measured intention with two items and two studies measured intention with only one item. The last but not the least, ten of the twenty-one studies have no time interval between two baseline and follow-up measurements, in other words, the measurements of intention and behavior were collected simultaneously.

Table 2. *Measurement of intention in the studies reviewed*

Authors of the study in surname order	Intention Measurement	Number of items	Time interval between measures	Alpha values	Intention items / Sample items
Atombo, C., Wu, C., Tettehfio, E.O., & Agbo, A. A. (2017)	Intention to speed	• 4 items	• 3 months	• α = .87	"When driving, I intend to drive faster, if possible" * Response categories were not given.
Auzoult, L., Lheureux, F., Hardy-Massard, S., Minary, J. P., & Charlois, C. (2015)	Intention to drive above speed limit	• 2 items	• none	• *Not stated.*	''To what extent do you intend to drive above the speed limit in the coming months" ''I will probably drive above the speed limit in the coming months" Response categories; (0 = never, to 6 = always)
Beullens, K., Roe, K., & Van Den Bulck, J. (2011)-a	Intention to speed	• 2 items	• 2 years	• *Not stated.*	(a) drive faster than allowed, (b) drive faster than allowed on the highway Response categories; (0) never, (1) seldom, (2) sometimes, (3) often, (4) very often, (5) always
Beullens, K., Roe, K., & Van den Bulck, J. (2011)-b	Intention to speed	• 2 items	• 2 years	• *Not stated.*	(a) drive faster than allowed, (b) drive faster than allowed on the highway Response categories; (0) never, (1) seldom, (2) sometimes, (3) often, (4) very often, (5) always

Table 2. *Measurement of intention in the studies reviewed (continued)*

Authors of the study in surname order	Intention Measurement	Number of items	Time interval between measures	Alpha values	Intention items / Sample items
Brewster, S. E., Elliott, M. A., & Kelly, S. W. (2015)	Intention to speed	• 5 items	• 1 month	• α = .91	"I plan to drive faster than the speed limit over the next month" (1 = strongly disagree to 9 = strongly agree) "How likely or unlikely is it that you will drive faster than the speed limit over the next month?" (1 = extremely unlikely to 9 = extremely likely) "I intend to drive faster than the speed limit over the next month" (1 = definitely no to 9 = definitely yes) "I would like to drive faster than the speed limit over the next month" (1 = strongly disagree to 9 = strongly agree) "I want to drive faster than the speed limit over the next month" (1 = strongly disagree to 9 = strongly agree)
Castanier, C., Deroche, T., & Woodman, T. (2013)	Road violation intentions (speeding)	• 4 items;	• 6 months	• α = .88 - .96	"Within the next six months, I intend to [commit this road violation]" "How likely is it that you will [commit this road violation] within the next six months" "Within the next six months, I would like to [commit this road violation]" "I expect to [commit this road violation] within the next six months" Response categories; 1 = very unlikely to 7 = very likely
Conner, M., Lawton, R., Parker, D., Chorlton, K., Manstead, A. S. R., & Stradling, S. (2007)	Intention to speed	• 4 items	• 3 months	• Study 1; α = .87 - .93 • Study 2; α = .82 - .92	Study 1: e.g. "I intend to refrain from driving 10 mph or more above the posted speed limit on an urban road during the day" Response categories; 1= definitely do, to 7= definitely do not Study 2: e.g. 'How strong is your intention to exceed the 30 mph speed limit on this sort of road in your future driving?" Response categories; 1= very weak, to 7= very

Table 2. *Measurement of intention in the studies reviewed (continued)*

Authors of the study in surname order	Intention Measurement	Number of items	Time interval between measures	Alpha values	Intention items / Sample items
Cristea, M., Paran, F., & Delhomme, P. (2013)	Intention to speed	• 6 items; 2 items for each of three options	• none	• α = .86 - .92	"Will you drive at 90 km/h/between 91 km/h and 110 km/h/over 110 km/h should you find yourself in a similar situation?" "How frequently will you drive at 90 km/h/between 91 km/h and 110 km/h/over 110 km/h should you find yourself in a similar situation?" Response categories; 1= never, to 5= often
De Pelsmacker, P., & Janssens, W. (2007)	Intention to speed	• 3 items	• none	• α = .77 - .82	"I shall do my best to respect the speed limits next time I drive in the built- up area (r)" "I think I will still exceed the speed limits in the built-up area in future" "My intention from now on to never exceed the speed limits in the built-up area anymore is fairly large (r)" Response categories; agree to disagree (7-point scale)
Elliott, M. A. (2012)	Intention	• 4 items	• 1 month	• α = .87	"I would want to [perform the driving violation] when driving in this sort of situation over the next month" Response categories; -4= strongly disagree to 4= strongly agree (9-point scale)
Elliott, M. A., & Thomson, J. A. (2010)	Intention to speed	• 2 items	• 6 months	• α = .89	"To what extent do you intend to drive faster than the speed limit over the next 6 months?" 1= No extent at all to 9= A great extent (9-point scale) "How often do you think you will drive faster than the speed limit in the next 6 months?" 1= Never to 9= All the time (9-point scale)

Table 2. *Measurement of intention in the studies reviewed (continued)*

order	Measurement	Items	measures		tention items / Sample items
Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003)	Intention to keep within the speed limit	• 3 items	• 3 months	• α = .91	"Do you intend to keep within the speed limit while driving in built-up areas in the next 3 months?" (definitely do not to definitely do), "How much do you want to keep within the speed limit while driving in built-up areas in the next 3 months?" (not at all to very much) "How likely or unlikely is it that you will keep within the speed limit while driving in built-up areas in the next 3 months?" (unlikely to likely) Response categories; -3 to +3 (7-point scale)
Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2007)	Intention to avoid exceeding the speed limit	• 3 items	• 1 week	• α = .86	"Do you intend to avoid exceeding the speed limit while driving in the next week?" (definitely do not – definitely do), "How much do you want to avoid exceeding the speed limit while driving in the next week?" (not at all – very much) "How likely or unlikely is it that you will avoid exceeding the speed limit while driving in the next week?" (unlikely – likely). Response categories; -3 to +3 (7-point scale)

Table 2. *Measurement of intention in the studies reviewed (continued)*

Authors of the study in surname order	Intention Measurement	Number of items	Time interval between measures	Alpha values	Intention items / Sample items
Elliott, M. A., Thomson, J. A., Robertson, K., Stephenson, C., & Wicks, J. (2013)	Intention to comply with speed limit Intention to speed	• 2 items • 6 items (urban roads country roads fast dual carriageway or motorway)	• Study 1; 1 month • Study 2; 6 months	• Study 1; α = .81 - .85 • Study 2; α = .90	Study 1: "I intend/want/plan to comply with speed limits while driving in urban areas over the next month" (1 = strongly disagree to 9 = strongly agree, for each item); "How likely or unlikely is it that you will comply with speed limits while driving in urban areas over the next month?" (1 = extremely unlikely to 9= extremely likely). Study 2: "To what extent do you intend to drive faster than the speed limit over the next 6 months on: urban roads/country roads/fast dual carriageways or motorways" (1 = no extent at all to 9 = a great extent) "How often do you think you will drive faster than the speed limit in the next 6 months on: urban roads/country roads/fast dual carriageways or motorways?" (1 = never to 9 = all the time).
Jovanovic, D., Sraml, M., Matovic, B., & Micci, S. (2017)	Intention to speed	• 3 items	• none	• α = .81	The frequency with which the drivers intend to exceed the speed limits by 10 km/h or more within the next two weeks (1 = never to 7 = always) The likelihood of breaking the speed limit by10 km/h or more within the next two weeks. (1 = very improbable to 7 = very probable) "I will try not to exceed the speed limit in future," (1 = strongly disagree to 7 = strongly agree)
Leandro, M. (2012)	Intention to comply with speed limit	• 3 items	• none	• α = .93	"Do you want to keep speed indicator under 60 km/h all the time in this place?" "Do you intend to keep speed indicator under 60 km/h all the time in this place?" "Do you expect to keep speed indicator under 60 km/h all the time in this place?" * Response categories were not given.

Table 2. *Measurement of intention in the studies reviewed (continued)*

Authors of the study in surname order	Intention Measurement	Number of items	Time interval between measures	Alpha values	Intention items / Sample items
Letirand, F., & Delhomme, P. (2005)	Intention to observe and to exceed the speed limit by at least 20 km/h	• 3 items (observe) • 3 items (exceed)	• none	• α = .87 (observed) • α = - .89 • (exceed)	e.g. "In the forthcoming month, in this situation, (1) I intend to, (2) I will try and (3) I want to observe the speed limit. Response categories; 1= Strongly disagree to 5= Strongly agree
Lheureux, F., Auzoult, L., Charlois, C., Hardy- Massard, S., & Minary, J. -. (2015)	Intention to speed	• 2 items	• none	• α = .93	"I intend to drive above the speed limit [drink alcohol before driving] in the coming months" "I will probably drive above the speed limit [drink alcohol before driving] in the coming months". Response categories; (0= never to 6= always)
Paris, H., & Van den Broucke, S. (2008)	Intention to comply speed limit	• 1 item	• none	• *Not stated.*	''From now on, I intend to keep to the speed limits'' Response categories; 1= strongly disagree to 5= strongly agree
Tavafian, S. S., Aghamolaei, T., & Madani, A. (2011)	Intention to drive within speed limits	• 1 item	• none	• *Not stated.*	"I have intended to drive within speed limits." Response categories; 1= strongly disagree to 5= strongly agree
Wallén Warner, H., Özkan, T., & Lajunen, T. (2009)	Intention to comply with the speed limit	• 3 items	• none	• α = .87 - .89 (Sweden-Turkey)	"Do you intend to comply with the speed limit 50 km/h in urban areas over the next 3 months?" (definitely do not/definitely do) "How much do you want to comply with the speed limit 50 km/h in urban areas over the next 3months?" (not at all/very much) "How likely is it that you will comply with the speed limit 50 km/h in urban areas over the next 3 months?" (very unlikely/very likely) Response categories; 7-point scale

1.4 Discussion

In this presented chapter of the review, studies investigated the relationships between intention and speeding were discussed. First of all, an overall discussion of the studies was summarized. Then, general discussion and limitations of the review were presented.

1.4.1 Overall Discussion of Studies Investigated

As it was mentioned in the results section, studies reviewed accordingly the taxonomy of Reason et al. (1990), thus studies were discussed in the same order. Thus, related variables revealed by results (e.g. habit, anticipated regret or moral norms) were discussed in their relation with intention and speeding.

Among twenty-one studies investigated in this review, intention was as the major contributor to explain speeding; both complying and exceeding speed limits. Results revealed that, after the significant role of intention, other variables have roles to predict speeding which it should be considered. Habit (i.e. De Pelsmacker & Janssens, 2007), moral norms (i.e. Conner et al., 2007), past behavior (i.e. Conner et al., 2007) and self-identity (i.e. Elliott & Thomson, 2010) were investigated and revealed significant results in the concept of TPB. One study (De Pelsmacker & Janssens, 2007) found a stronger predictor role of habit than intention to predict speeding, however, the rest of the studies supported the view that intention was the major predictor of speeding behavior.

Results of the present review showed that only one study investigated speeding in cross-cultural level (Warner et al., 2009). Although culture groups differ on their intention levels, intention was related to complying with speed limits in both groups. This finding supported the validity of intention-behavior link in multicultural level. More cross-cultural studies are needed to reach more detailed knowledge since interventions to improve road safety require culture-specific actions.

Additionally, there were some methodological points needed to be a focus on. First, since speeding can be measured by experimental techniques such as a driving simulator or a video game set up, causal models can be developed. In detail, only five of twenty-one studies provided an observed speeding behavior, and sixteen studies collected data with self-reported measures. This limitation was not only in the field of traffic and transportation psychology but also in other fields of psychology use TPB as a conceptual model with a lack of experimental approach (Conner, 2014). However, there is also a growing number of research that investigates driver behaviors by driving simulators and other recent technological tools (i.e. instrumented cars, or visual reality glasses). Thus, combining these two approaches can eliminate the limitation.

Secondly, the lack of the time interval of the studies became visible after present review's results. Eleven of the reviewed studies had a time interval between the measurements of intention and speeding behavior changed from one month to two years (see Table 2). However, the rest of the studies (ten) collected data related to intention, speeding and other TPB constructs simultaneously. This lack of time interval between measures might cause a primary effect since items of TPB constructs have a very similar concept of self-reported behavioral items (see Table 2 for example items).

Lastly, as it was given in Table 2, the number of items measured intention to comply or exceed speed limits was limited. As it was stated before, the total number of the intention measurements showed differences between one-item to six-items and only two studies used a six-items tool to measure intention and seven studies used a scale consist of more than four items. Also, the maximum number of items used in a study to predict speeding intention was six and five of the studies did not state any statistics regarding internal consistency. Although there is an evidence that even single-item measurements can provide sufficient results and provide a holistic information (Bergkvist & Rossiter, 2007; Youngblut & Casper, 1993), fewer items may lead some statistical problems. As Wittink and Bayer (2003) stated, a scale consisting of fewer items has a risk of less

variance, a lower degree of measurement precision, and less opportunity to detect the aimed changes.

1.4.2 General Discussion

Ajzen (1985, 1991) repeatedly pointed out that when knowledge, skills, resources or other's cooperation requires performing an action, it is problematic to use TPB structure to explain behavior. People might intend to perform a behavior, but if they don't have required knowledge, skills, resources or other's cooperation they won't be able to perform it. Therefore, it should be considered and criticized that as a complex, social and dynamic environment, does the basic form of TPB provide accurate information about road traffic violations and driver behavior?

In order to understand human behavior in the broadest sense, intention and intuition should be considered together. This dual process perspective of psychology find support by many different fields which aim to explain human social behavior such as Social Intuitionist Model (see, Haidt, 2001) or Nobel laureate psychologist Kahneman's famous book, '*Thinking, fast and slow*' (see, Kahneman, 2011). In the field on traffic and transportation psychology, the importance of both implicit and explicit systems also should be evaluated together since traffic is a complex, social, and dynamic environment which requires rapid decision making as well as deliberate reasoning.

Related literature on TPB tries to understand underlying mechanisms of volitional behavior. There is a growing number of research focusing on intention on the framework of TPB aiming to contribute efficiency of behavioral change by studying these underlying mechanisms. However, it is not easy to get permanent changes not only in driver behaviors such as speeding but also in other health-related behaviors. Results of the present review revealed that changes in both TPB and additional components (i.e. habit, anticipated regret and moral norm) are linked to speeding, but intention is the greatest factor associated with behavior. However, there are two issues which should be considered. First, despite the fact that the link between intention and behavior based on solid evidence, the lack of causality in most of the studies prevent to

conclude a direction between two concepts. In other words, intention should be manipulated to conclude a behavioral change. Second, the permanence of the behavioral change is still unclear for intentions. Future longitudinal studies are recommended by manipulations of intention to see permanence of behavioral change.

According to the present review results, some measurement gaps in the literature became visible. First of all, since demographic variables such as age, gender or mileage are substantial factors to predict driver behavior, they should be statistically controlled. Second, as stated above, the number of experimental research is one of the limitations to investigate the relationship between intention and speeding. Since the number of experimental studies of the TPB is limited, the related literature on the field is based on correlational models rather than causal models. Thus, future studies with observed data or other experimental measurements can provide useful information to represent actual behaviors. Third, the measurement of self-reported intention mostly represented by a limited number of items, thus low reliability or lack of reliability statistics in articles can be evaluated as a statistical problem. Fourth, the lack of time interval between the measurement of intention and speeding is one of the major concerns in this study. The repetitive statement of specific words on these items to measure intention (e.g. "*I intend to speed*") and behavior (e.g. "*I did speed*") can create a primary effect and cause a statistically artificial correlation. Although it was not statistically compared with each other, studies which are lack of time interval between measurements and used self-reported measurements seem to have found stronger relationships between intentions and behaviors than others. This hypothesis can be investigated by future meta-analytic studies.

1.4.3 Limitations and Future Research

The present study has its own limitations based on the exclusion criteria were given in Figure 3. First of all, only car drivers were investigated as a sample group. In further studies, other road users can be included in the analysis. In this review, the relationship between intention on speeding was examined, thus intention was accepted as the

independent variable. However, many important studies that measured intention as the dependent variable were excluded (e.g. Parker, Manstead, Stradling, Reason, 1992). A meta-analysis on the relationship between intention and speeding can provide a quantitative data which might be helpful to improve the understanding of the relationships between TPB constructs. In future studies, even if the number of studies examined the intention-intuition relationship and their interaction with speeding is limited, related literature can be reviewed for these relationships and the topics can be investigated. In other words, a more comprehensive model of TPB with newly suggested components can be investigated by a review of their predictions on behavior. Also, to develop an implicit measurement of intention can prevent measurement problems and provide crucial information for road safety.

The last but not the least, the intention and subsequent behavior link, which was revealed by the present systematic review, can highlight future studies on behavioral change. All in all, the main aim of the aforementioned theoretical studies was improving safety by providing evidence regarding factors interact with intention and eventually helping to the literature to create applicable methods.

1.5. The Aim of the Present Thesis Study

In the view of the present systematic review and the conclusions stated above, the aim of the present thesis was to manipulate intentions in order to achieve a behavioral change as reducing the speed. As a result of the systematic review, intention was found as the main contributor of speeding. However, the limited number of experimental studies on the link between intention and behavior revealed as a limitation of the related literature summarized above. Thus, an experimental design to manipulate intention to speeding behavior was aimed to conduct. In the next chapter, implementation intention, which is a concept of behavioral change was presented. Implementation intention is a relatively new method for behavioral change used by health psychology literature. In this present thesis, implementation intention was used to reduce speeding behavior.

CHAPTER 2

THE EFFECT OF IMPLEMENTATION INTENTION ON SPEEDING BEHAVIOR

2.1 Introduction

As stated in the Chapter 1, the link between intention and speeding behavior was widely supported by the previous literature (e.g. Elliott et al., 2003, Elliott et al., 2013). Not only TRA and TPB, but also many other theories (e.g. protection-motivation theory of Roger et al.'s (1983), or the prototype/willingness model of Gibbons et al. (1998), focused on the role of intention on behavior, and the strong link between them was repeatedly supported; a strong intention indicated a strong possibility to perform the behavior. As a solid evidence, in the meta-analysis of Sheeran (2002) which is conducted on 10 meta-analysis studies, a large effect size to interpret the link between intention and actual behavior was found. As a general implication, in order to change the behavior in a desired way, the link between intention and behavior should be manipulated. In this presented chapter, the theoretical background of the link between intention and behavior was profoundly investigated and an intervention to achieve a change in speeding behavior was tested.

2.1.1 Bamberg's (2013) The Stage Model of Self-Regulated Behavioral Change

Behavioral change is under investigation by many different and powerful models for a long time, however Bamberg's The Stage Model of Self-Regulated Behavioral Change provide an integrative approach on this issue. The Theory of Planned Behavior (Ajzen, 1985, 1991) was one of the important contributors to explain the nature of volitional

behavior. As it was stated in Chapter 1, TPB was criticized by its view of 'rational choice', since the theory suggested that planned behavior is a result of the volitional, and rational process. On the other hand, norm activation model (Schwartz & Howard, 1981) explains the altruistic and environmentally friendly behavior guided by the activation of a personal moral norm. Bamberg (2013) integrate these two theories a third one, model of action phases, which suggested the deliberate nature of behavioral change (Heckhausen & Gollwitzer, 1987).

In brief, Bamberg's (2013) The Stage Model of Self-Regulated Behavioral Change is a combination of these theories and stressed a time-ordered four-stages model, which focus on the self-regulatory aspects of behavioral change. According to the model, there are three different types of intention formations; goal intention, behavioral intention and implementation intention. In each stage, a person needs to solve the related task with the stage and move on to the next one. Accordingly, the first stage of the model (the predecisional stage) reflects the habitual acts. People in the predecisional stage are not aware of the negative consequences of the behavior, thus they don't need to change it. A direct intervention for the behavioral change in this stage may result in a reactance. The form of the intention in this stage overlaps with Ajzen (1991)'s goal intentions, which specify the desired outcome in a simple way as "*I intend to perform X*". In order to move to the next stage, a person needs to form his/her goal intention.

The pre-action stage reflects a general goal regarding their behavioral change. In this stage, people have high goal intention for behavioral change. In order to change their behavior, they need to consider different behavioral strategies, calculate pros and cons of these strategies, come up with one and make a self-commitment (Bamberg, 2013). Different from TPB, present model differentiates behavioral intentions from goal intentions with the structure of "*I intend to perform the behavioral option X*".

The next one is the action stage. People in action stage not only have a strong goal intention but also have a strong behavioral intention to change. They decide to test their new behavioral strategy by forming implementation intentions. Forming

implementation intention is one step further than behavioral intentions, people create a strong mental link between critical situations and related responses. People who successfully created implementation intentions can move to the next and last stage of postaction. Lastly, the postactional stage is the habituating the new behavior. People experience their new behavior and they have the opportunity to compare it with the old one.

2.1.2 Implementation Intention

As stated, Ajzen's (1985) TPB define goal intentions have a structure of "*I intend to do x*", which "*x*" can be a behavior or an outcome. They are basic links between a desire and a goal. As it was mentioned above, the more one's intention towards an act is strong the more he or she is likely to perform it. On the other hand, "implementation intentions" are 'if-then' plans, which are the subordinate concept of goal intentions. They are self-regulatory interventions which specify goal intentions. To form an implementation intention, the person is supposed to decide when, where and how to perform the behavior in order to increase desirable behaviors and decrease undesirable behaviors. In other words, s/he must consider the situational context in which one will enact it: "*If situation X occurs, I will initiate Y*". This form of detailed thinking and planning provides a solution to the intention-behavior gap by including people's ability to initiate, maintain or detach to a goal (Gollwitzer, 1993; Gollwitzer & Sheeran, 2006; Prestwich & Kellar, 2014). According to a recent study of Bieleke, Legrand, Mignon, & Gollwitzer (2018) implementation intentions were found as more effective than goal intentions in attainment goals, which is a task of rapid classification of geometric objects. In detail, study investigated the generalizability of both approaches to other situations and implementation intention provided evidence regarding both in same and similar situations. Participants who were implemented intention to do the task rapidly were faster than goal intention participants in the same task, and also another similar task. As a conclusion, this finding was an evidence that implemented intentions can be generalized to the similar situations.

Although there are other ways to formulate implementation intention, "if-then" plans are the most commonly used way to do it (Armitage, Norman, Noor, Alganem, & Arden, 2014). In his study, Armitage (2004) used a free format to implement intentions on fat intake. Accordingly, participants were given an instruction on the aimed behavior, and they were free to formulate the plans for how they want. This approach was called 'global implementation intentions' and it aimed participants active involvement in the behavioral change by making them pay more attention to the details. This approach found support by some studies in the literature (Sheeran & Orbell, 2000; Jackson et al., 2005), however, it was also criticized about not being effective in building the critical link between the situation and the goal-directed behavior. According to the study of Chapman, Armitage, and Norman (2009), 'if-then' manipulations found superior in promoting behavior change compare to global implementation intentions.

As stated, "if-then" plans are designed to transform goal intentions into desired behaviors and they developed as matching critical situations with appropriate responses (Gollwitzer, 1993). Generally, two lists of "if" and "then" situations in a volitional help sheet were given to the participants to generate their own implementation intentions. The list of "If" situations include tempting health-risk behaviors (e.g. *If I am tempted to speed when I am on a long journey...*), whereas the list of "then" situations includes health-protecting behaviors (*e.g. then I will think about the emotional pain I would suffer if my speeding caused a death or injury to someone*) (Brewster et al., 2015).

According to a meta-analysis of Gollwitzer and Sheeran (2006) across 94 independent studies, implementation intentions were found to have a high effect size of $d = .65$. Right along with the strong effect size, applications of implementation intentions are usually self-directed and require approximately 5 minutes to complete. In general, they are efficient, very brief, easy-to-use and low-cost interventions. Thus, there is a growing body of research on health-related issues which are using implementation intentions as intervention tools such as tobacco and alcohol consumption (e.g.

Armitage, 2015), fat intake (Prestwich, Ayres, & Lawton, 2008), cervical cancer screening (Sheeran & Orbell, 2000), weight control (e.g. Armitage et al., 2014), daily fruit intake (e.g. de Nooijer, de Vet, Brug, de Vries, 2006), exercise (e.g. Budden & Sagarin, 2007), and healthy eating (e.g. Verplanken & Faes, 1999), or other issues require behavioral change such as academic performance (Webb & Sheeran, 2007), or procrastination (Owens, Bowman, & Dill, 2008). All of the aforementioned studies used implementation intention manipulations and reached significant positive effects on subsequent behaviors.

In the field of traffic and transportation psychology, there are only a few studies conducted on the effect of implementation intention. Elliott and Armitage (2006) conducted the first study on the effect of implementation intention on driver behaviors. Accordingly, participants who formulated implementation intentions via if-then plans showed significantly higher compliance with speed limits.

Later, in the study of Brewster et al. (2015), the effect of implementation intention was tested in the context of speeding behavior and it was found as an effective technique to change behavior in a desirable way. In detail, authors pointed out that implementation intentions weaken the effect of habit and it moderates the effect of goal intentions on subsequent behavior.

Similarly, Eriksson, Garvill, and Nordlund (2008) conducted a study on habitual travel choices. In the study, they aimed to reduce personal car use by formulating an implementation intention. Results demonstrated a deliberate reduction in travel mode in experimental condition, in other words, implementation intention was found as effective on subsequent behavior. Moreover, the link between personal car use and habit was weakened by the manipulation, whereas the link between car use and personal norms were strengthened.

In the study of Armitage, Reid, and Spencer (2011) implementation intention was used to reduce single car occupancy. The authors distinguished participants as ‘compliers’

and ‘non-compliers’, based on the responses they gave to the implementation intention manipulation. Participants who followed the general structure of ‘if-then’ plans and who provided detailed and meaningful explanations for the manipulated behavior (i.e. solo car journey) were accepted as compliers. Although participants did not differ according to their single-occupancy car use at the baseline level, there was a difference in attitudes, subjective norms, perceived behavioral control and intention. Moreover, there was a significant reduction of single-occupancy car use only for the ones who comply with instruction. It can be concluded that one’s prior motivation seems to play a promotive role in behavior change.

According to a recent study by Johansson and Fyhri (2017), distracted driving was investigated whether it was affected by implementation intentions. Although an overall decline in different types of distracted driving behaviors was observed, there was only one marginally significant effect of implementation intention (i.e. “operating the radio”). Authors explained the non-significant results with a possibility of participant’s lack of engagement to the implementation task.

Overall, these studies indicate that implementation intention can be considered as an effective tool to change behavior in a desired way in the context of driving. So far, very little attention had been paid of the role of implementation intention on speeding. Thus, the knowledge regarding forming an implementation intention to speeding behavior was still remain unclear. In this section, the implementation intention was defined as building the critical link between the situation and the goal-directed behavior and having a form of “if-then” plans. In the next section, a different approach to the implementation intention was presented. Accordingly, in order to built such critical link between situation and goal-directed behavior, not only the intention but also the goal should be carefully designed. In the present study, the goal type of the implementation intention was considered as a factor which can have an influence on the behavior.

2.1.3 Approach vs. Avoidance Goals

One of the important contributions of this presented study is to differentiate the effects of goal types of implementation intentions on speeding behavior. According to the definition of Elliot and Trash (2002), approach goal aims to achieve a subsequent behavior, which is a positively desirable event (e.g. increasing traffic rules obedience). On the other hand, avoidance type goals aim to avoid a negative, undesirable behavior (e.g. decreasing the number of penalties within a year). The differentiation between goal types does not reflect a new idea, the motivational aspects of behavior and affect were theorized by a number of theorists before. Gray (1970) indicated that there are two nervous systems in terms of the motivation of behavior; *behavioral activation system* (BAS) produce positive affect, and the *behavioral inhibition system* (BIS) produce negative affect. As is evident from their names, BAS is responsible to promote behavior and generate a positive affect, whereas BIS is responsible to suppress the behavior and generate a negative affect.

There was a limited number of studies focused on whether implementation intentions are more powerful to avoidance goals or approach goals. Related literature on health psychology indicates that approach goals may be more suitable for health-related literature consistent with the nature of the specific action, such as do more exercise. In fact, there were studies found that avoidance goals are linked to more negative outcomes such as lower well-being or poorer health conditions (Elliot, Sheldon, & Church, 1997; Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). Avoidance types of goals were also criticized for the difficulty to observe (or perceive) the progress and it is pointed that this difficulty has a deteriorating effect on the motivation to the behavioral change (Elliot et al., 1997). Additionally, avoidance goals were found to be linked to fewer subgoals. In terms of well-formed approaching goals, people tend to use more subgoals to achieve a greater goal (Mor & Cervone, 2002).

Besides all of this knowledge, there is a perspective that some people are prone to avoidance goals than approach goals. Elliot and Trash (2002) conclude that approach

and avoidance temperaments revealed a two-factor structure in terms of personality dimensions. Accordingly, approach temperament is linked to extraversion, positive emotionality, and BAS, whereas avoidance temperament is linked to neuroticism, negative emotionality, and BIS. This structure remained significant even controlled for self-enhancement, self-protection, impression management, self-deception, and overall social desirability.

Consistent with the aforementioned studies, Sullivan and Rothman (2008) investigated the effect of goal type of implementation intentions and it yielded better results for approach goals than avoidance goals. In a within-sample experimental design, authors concluded that in short periods of time goal type was not an absolute determinative factor; both avoidance and approach goals have some effects of the behavior. However, after two-weeks of time-interval, participants which are only in approach goal condition were able to maintain their pursuit. Although the study has its own limitations such as the marginally significance level or the lack of manipulation of goals (i.e. participants were asked to choose either approach or avoidance goals), the finding of Sullivan and Rothman (2008), replicate the ideas revealed by Sheeran and Orbell (1999), which the effect of implementation intention may increase over time.

2.1.4 Aim of The Study

In this chapter, it was aimed to manipulate intentions through implementation intentions in order to reduce speeding. There is a growing body of literature that recognises the effect of implementation intentions in health-related issues such as weight loss, or alcohol consumption (Armitage et al, 2014). However, very little known about implementation intention in driving context (see Elliott & Armitage, 2006; Brewster et al., 2015). Thus, this study set out to investigate the usefulness of implementation intentions towards reducing the speeding behavior. Consistent with the aforementioned literature, implementation intentions were expected to reduce speeding. Additionally, related literature suggested that the motivational aspects of behavior have some effects on implementation intention (Elliot et al., 1997; Elliot & Sheldon, 1998;

Sullivan & Rothman, 2008). Previous research has established that different goal types can have an impact on the effectiveness of the behavioral change manipulations. Although there are studies on the impact of approach and avoidance goals on implementation intention, the link was not investigated on the framework of driver behaviors before. Thus, the second aim of the study was to investigate the effect of approach and avoidance types of implementation intentions towards reducing the speeding behavior. There have been no controlled studies which compare differences in different goal types in the framework of driver behaviors, thus a clear expectation is hard to make. However, in accordance to the health psychology literature, approaching goals can be expected to have a greater impact on behavior. Lastly, as Bamberg (2013) stated in the theory of Stage Model of Self-Regulatory Behavioral Change, prior preferences and a mental preparation was considered as a factor, which can influence behavior in both positive or negative ways. A prior knowledge or preference can both improve or disturb the behavioral change process according to the mental preparation to change a behavior (Bamberg, 2013). Thus, part of the aim of this study is to examine the emerging role of prior preferences in the context of preferred speed limit compliance. Thus, the interaction effect of speed limit compliance and implementation intentions were investigated on simulated speeding behavior and self-reported driver behaviors between baseline and follow-up levels. In accordance to the knowledge above, a positive prior preference regarding speed limit compliance is expected to link with greater change in behavior. Similarly, non-compliance to the speed limits is expected to have a deteriorating effect and it was expected to block the effect of the implementation intention.

2.2 Method

2.2.1 Sample

The participants of the study were reached by the online announcements posted to social media web pages (e.g. Facebook, Instagram). All participants are young drivers between the ages of 18 and 28, who held a current Turkish driver's license for a manual or an

automatic transmission car. Another criterion for selecting the subjects was being an active driver, which was defined as using a car more than a few times per week. The mean age of the sample was 22.35 years (*SD* = 1.95). A total of 78 drivers participated the study in two different setups, which were conducted with a gap of two weeks. In terms of gender distribution, 46.2% of the sample were women (*N* = 36) and 53.8% were men (*N* = 42). Education level of the participants were bachelor (*N* = 73, 93.6%) and postgraduate (*N* = 5, 6.4%) degrees. The average number of years having a driver license was 3.78 years (*SD* = 1.93), ranging from less than a year to 9.25 years. 75 of the participants (96.2%) does own his/her car, whereas 3 of them does not have a car (3.8%). According to the speed violations, 69.2% of the participants (*N* = 54) did not a speed violation before. The speed preferences of the participants were summarized in Table 3. Annual mileage reported by participants ranged from 150 km to 30000 km, with a mean of 7878.70 km (*SD* = 5951.80). Lastly, total mileage reported by the participants ranged from 500 km to 100000 km, with a mean of 24744.87 km (*SD* = 20944.66).

2.2.2 Measurements

2.2.2.1 Demographic information form

Participants were asked to indicate their demographic information such as gender, age, education level, lifetime mileage, last year's mileage, active/passive accident involvement in last three years, duration of having a driver's license, and a total number of offenses (speeding, faulty parking etc.). In order to conduct a more detailed analysis, participants were asked about their duration of having a driver's license and the duration of being an active driver in months and calculated into years by the researcher. Moreover, participants stated their preferred speeds at the limit of 50 km/h, 82 km/h, 90 km/h and 110 km/h with open-ended questions.

2.2.2.2 Volitional Help Sheet

The volitional help sheet developed by Brewster et al. (2015) was adapted to Turkish in the present thesis. As stated above, in the original volitional help sheet of Brewster et al. (2015), participants were expected to choose four items from 20 critical situations and link them with appropriate responses. Similar procedure was used in the present study: Participants were asked to choose four critical situations and link them with appropriate responses. In order to strength the manipulation, participants were asked to write their selections.

Unlike the original study of Brewster et al. (2015), the volitional help sheet was divided into two to manipulate the direction of intention implementation in the present study. More specifically, items were grouped into two categories regarding they aim to approach a goal (e.g. If I am tempted to speed when I am feeling stressed… Then I will drive in a lower gear to help me drive slower) (see Appendix A), or avoid a situation (e.g. If I am tempted to speed when I am feeling stressed…Then I will remind myself that drivers caught for speeding (e.g. by the police or safety cameras) face sanctions) (see Appendix B). In order to check the validity of volitional help sheet, Turkish translations of both of the sheets were back-translated by two independent researchers. Since the new versions of volitional help sheets were consistent with the original one developed by Brewster et al. (2015), the present translations were accepted as sufficient. Later, Turkish adaptations of both approach and avoidance versions of volitional help sheets were checked and corrected by a Ph.D. candidate who is specialized in the field of Turkish language.

2.2.2.3 Driver Behavior Questionnaire (DBQ)

The Driver Behavior Questionnaire was developed by Reason et al. (1990) to measure aberrant driver behaviors and adapted to Turkish by Sümer, Lajunen and Özkan (2002); and Sümer and Özkan (2002). DBQ contains 28 items with four subscales; ordinary violations, aggressive violations, errors, and lapses. The questionnaire will be evaluated

with the same 6-point Likert type scale (0 = Never, 5 = Always) by answering the question “how often you commit these behaviors during your driving practice session”.

According to a recent study (Bıçaksız, 2016), the internal consistency reliabilities of the subscales were found as .80 for ordinary violations, .68 for aggressive violations, .83 for violations (total violations), .74 for errors and .75 for lapses. In the present study, internal consistencies of the subscales were found as .72 (baseline) and .79 (follow-up) for ordinary violations, .62 (baseline) and .69 (follow-up) for aggressive violations, .52 (baseline) and .68 (follow-up) for errors and .68 (baseline) and .60 (follow-up) for lapses.

2.2.2.4 Positive Driver Behavior Scale

In this study, the Positive Driver Behavior Scale (Özkan & Lajunen, 2005) was used to measure driver behaviors with positive intention. The 14-item questionnaire was evaluated with the same 6-point Likert type scale (0 = Never, 5 = Always) with the DBQ. Higher scores indicate a higher frequency of positive driver behaviors. Including 14 items of Positive Driver Behavior Scale to the DBQ, a total form with 42 items was be presented to participants. The internal consistency reliability of the scale was found as .77 in a previous study by Bıçaksız (2015). In this study, the Cronbach’s alpha internal consistency value was found as .64 for baseline level and .58 for the follow-up level.

2.2.2.5 Driving simulation

2.2.2.5.1 Training scenario

Participants drove a 3 km training scenario to become familiar with the mechanical characteristics of the driving simulation and to assure that are familiar with automatic transmission. Also, it was checked whether the participants do not have motion sickness, disturbing the participant during driving simulation. The training scenario

consisted of a double lane two-way road with ongoing low-density traffic, five horizontal curves, and five traffic lights.

2.2.2.5.2 Driving simulator scenario (Speeding scenario)

Actual driver behavior was measured with a driving scenario, which was created in STISIM M100W driving simulator. The driving scenario includes a double lane two-way road with the lane width of 3.6 meters, during daytime and open-air. The driving simulation was consist of 5.000 meters urban route including curves, traffic signs, oncoming traffic, pedestrians and other environmental cues such as trees, buildings, parked cars or pedestrians walking on the sidewalk. Participants can use gas and brake pedals, horn, signals, speedometer, odometer, mirrors and buttons for both right and left sights. The driving simulation was used with the automatic transmission. The speed limit of the road was 90 km. per hour, and it was presented to participants with four road signs during the scenario. Participants were asked to drive as similar as possible to their daily driving behaviors.

Figure 4. Driving Simulator Scenario (Speeding Scenario)

In this presented study the speed related outcomes listed below were accepted as dependent variables. More specifically, STISIM scenario data below was recorded:

a. Driver's total longitudinal distance: Total longitudinal distance that the driver has traveled since the beginning of the run (meter)
b. Driver's longitudinal acceleration (meter/second²): The linear increase in speed (speed-up/acceleration) of the driver.
c. Driver's lateral acceleration (meter /second²): The side to side increase in speed (speed-up/acceleration) of the driver.
d. Driver's longitudinal velocity (kilometer /second²): The linear speed of the driver.
e. Driver's lateral velocity (meter/second): The side to side increase in speed of the driver.
f. Longitudinal acceleration due to the throttle (meter/second²): The linear increase in speed (speed-up/acceleration) of the driver based on the throttle data.
g. Longitudinal acceleration due to the brakes (meter/second²): The linear increase in speed (speed-up/acceleration) of the driver based on the brake data.

2.2.2.5.2.1 Events in the driving scenario

In the scenario, a total of 10 events took place. There were three main types of events in the driving simulator as follows: events regarding pedestrians crossing the street, events regarding traffic light changes, and events regarding other vehicles' actions in traffic. The three types of events selected to see specific actions of the participants in critical conditions, which drivers face with in daily life. In the driving scenario, five signalized intersections were created considering the length of the road in scenario. The occurrence of the events was presented in the order below:

Event #1 – Signalized Intersection-1 (branching both left and right): The first event occurs when the participant covered a distance of 400 meters. When the participant had 100 meters to reach to the first traffic light at the four-way intersection, it turned from green to red. Traffic signal light waited 1 second on yellow and 12 seconds on red. Cars passed from both sides.

Event #2 – Change lanes (park to left): The second event occurred when the participant covered a distance of 680 meters. When the participant is 50 meters behind, a parked car on the right pavement entered the road and drove on the left lane with a speed of 55 km/s.

Event #3 - Signalized Intersection-2 (branching both left and right): The third event occurs when the participant covers a distance of 900 meters. When the participant has 100 meters to reach to the first traffic light at the four-way intersection, it turns from green to red. Traffic signal light wait 1 second on yellow and 10 seconds on red. Cars passed from both sides and four pedestrians used the crossing from both sides.

Event #4 - Signalized Intersection-3 (branching both left and right): The fourth event occurred when the participant covered a distance of 1500 meters. When the participant had 100 meters to reach to the third traffic light at the four-way intersection, it turned from green to red. Traffic signal light waited 1 second on yellow and 10 seconds on red. Six pedestrians used the crossing from right side, but there were no cars passing in this event.

Event #5 – Pedestrian crossing: The fifth event occurred when the participant covered a distance of 1600 meters. When the participant was 100 meters behind, the first pedestrian on the right pavement started crossing over.

Event #6 - Pedestrian crossing: The sixth event occurred when the participant covered a distance of 1950 meters. When the participant was 100 meters behind, the first pedestrian on the right pavement started crossing over. The second pedestrian occurred when the participant covered a distance of 2010 meters. When the participant was 170 meters behind, the second pedestrian on the left pavement started crossing over.

Event #7 – Change lanes (park to right): The seventh event occurred when the participant covered a distance of 2070 meters. When the participant was 75 meters behind, a parked car on the right pavement entered the road and drove on the right lane with a speed of 32 km/s. This event did not interfere with the driving experience of participants, it was located to both enrich the scenerio and a more realistic driving.

Event #8 - Signalized Intersection-4 (branching both left and right): The eighth event occurred when the participant covered a distance of 3500 meters. When the participant had 100 meters to reach to the fourth traffic light at the four-way intersection, it turned from green to red. Traffic signal light waits 1 second on yellow and 10 seconds on red. Cars passed from both sides but there were no pedestrians crossing the street in this event.

Event #9 - Change lanes (park to right): The ninth event occurred when the participant covered a distance of 3950 meters. When the participant was 75 meters behind, a parked car on the right pavement entered the road and drove on the right lane with a speed of 55 km/s. This event did not interfere with the driving experience of participants, it was located to both enrich the scenerio and a more realistic driving.

Event #10 - Signalized Intersection-5 (branching both left and right): The tenth event occurred when the participant covered a distance of 4250 meters. When the participant had 100 meters to reach to the fourth traffic light at the four-way intersection, it turned from green to red. Traffic signal light waits 1 second on yellow and 10 seconds on red. There are no cars passing and no pedestrians crossing in this event.

2.2.3 Procedure

In the presented study, data collection was planned as two applications with a two-week time interval. Participants were reached by announcements (see Appendix) in social media (e.g. Facebook) and accepted to the laboratory with a reservation. All of the participants were asked to bring their driver's license and vehicle license to be sure that only active drivers were included in the study. Also, students who participated in both baseline and follow-up levels were awarded by 20 TL. A debriefing form was sent to the participants at end of the July. The details of baseline and follow-up levels were explained below.

2.2.3.1 Baseline level

Data was collected in the Human Factor laboratory of the Traffic and Transportation Psychology department of Middle East Technical University. At the beginning of the experiment, a researcher explained the study briefly to the participants and asked them to read and signed an informed consent form. The procedure of the baseline level was as follows:

a. Participants were randomly distributed to the experimental (Approach vs. Avoidance) and control conditions.
b. In order to get used to the main characteristics of the driving simulation, participants attended a 3 km test drive. This step last approximately 3 minutes. After completing the test drive, participants continued with the actual driving scenario. As it was explained above, participants drove a 5 km. urban route during daytime. The driving scenario last approximately 5 minutes.
c. Participants were asked to complete Driver Behavior Questionnaire (Reason, Manstead, Stradling, Baxter & Campbell, 1990), Positive Driver Behavior Scale (Özkan & Lajunen, 2005) and a demographic information form. The self-reported data were collected approximately in 15 minutes.
d. Participants in experimental condition were manipulated by implementation intentions. As aforementioned above, the direction of the intention implementation was also investigated. Thus, two experimental conditions as "intention implementation with approach goals" and "intention implementation with avoidance goals" were created. In this stage, participants in both experimental conditions (i.e. approach/avoidance goals) matched critical situations with appropriate responses via different volitional help sheets. On the other hand, control group was presented a filling task, which is required to match sentences non-related with traffic context. The overall data collection did last approximately 45 minutes. The order of the self-reported and simulated measurements was counterbalanced in order to avoid any bias.

2.2.3.2 Follow-up level

After a two-week time interval, both experimental and control groups were asked to come to the human factor laboratory again and they were asked to drive the same driving scenario and complete the same self-reported measurements (i.e. Driver Behavior Questionnaire and Positive Driver Behavior Scale). The summary of the flow was presented in Figure 5.

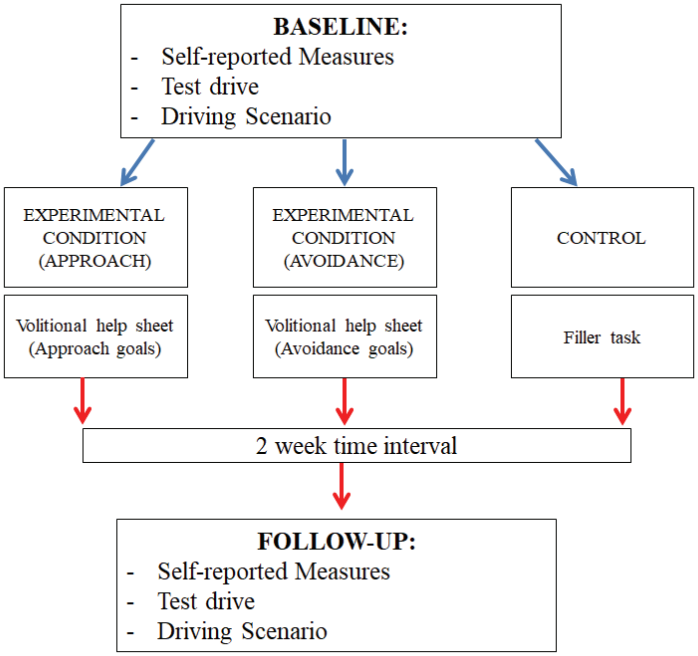

Figure 5. The experimental design of the study.

2.2.4 Analysis

According to Gollwitzer and Sheeran (2006), in order to achieve .80 power, Cronbach's alpha .05, and the effect size as .65, 30 participants required per condition. A randomized controlled design with one between-subject factor (condition: implementation intention (approach/avoidance) versus control) and one within-subject factor (time: Baseline and Follow-up) were used. Randomization were checked by

comparing groups to see whether there was a prerandomization difference in demographic variables. In Baseline level, self-reported driver behavior and the simulated driver behavior were measured. A two-week time interval selected to minimize attrition. In follow-up study, self-reported driver behavior and simulated driver behavior were both evaluated as outcome measures. The main hypothesis of present study (whether there is a significant interaction effect of Condition x Time) was tested by a repeated measures ANOVA.

2.3 Results

2.3.1 Descriptive Statistics

2.3.1.1 Driver Behavior Questionnaire

The descriptive statistics (means, standard deviations, minimum and maximum values) for the self-reported driver behavior questionnaire and demographic information form were presented in Table 3 below.

Table 3. *Descriptive Statistics of the Self-Reported Driver Behaviors both in Baseline and Follow-up Levels*

		Mean	SD	Min.	Max.
	Preferred Speed in Urban Roads	73.32	15.17	40	110
	Preferred Speed in Rural Roads	109.93	16.35	70	140
	Preferred Speed where the limit is 50 km/h	56.38	11.20	70	140
	Preferred Speed where the limit is 82 km/h	85.49	10.32	60	120
	Preferred Speed where the limit is 90 km/h	94.34	12.73	70	140
	Preferred Speed where the limit is 110 km/h	110.57	15.43	70	170
BASELINE LEVEL	Lapses *(M)*	.93	.54	.00	3.00
	Errors *(M)*	.87	.55	.13	2.25
	Aggressive Violations *(M)*	1.71	.90	.00	4.00
	Ordinary Violations *(M)*	1.30	.62	.33	3.11
	Positive Driver Behaviors *(M)*	3.56	.46	2.71	4.79
FOLLOW-UP LEVEL	Lapses *(M)*	.89	.49	.00	2.38
	Errors *(M)*	.78	.51	.00	2.13
	Aggressive Violations *(M)*	1.63	.97	.00	4.67
	Ordinary Violations *(M)*	1.32	.69	.22	3.33
	Positive Driver Behaviors *(M)*	3.53	.52	1.71	4.43

2.3.1.2 Driving Simulation

The descriptive statistics (means, standard deviations, minimum and maximum values) for the driving simulation data in both levels were summarized in the Table 4.

Table 4. *Descriptive Statistics of the Simulated Driver Behaviors both in Baseline and Follow-up Levels*

		Mean	SD	Min.	Max.
BASELINE LEVEL	Longitudinal Acceleration *(M)*	.06	.04	.02	.24
	Lateral Acceleration *(M)*	-.00	.01	-.03	.07
	Longitudinal Velocity *(M)*	64.25	9.78	34.53	90.77
	Lateral Velocity *(M)*	.01	.01	-.02	.06
	Longitudinal Acceleration due to Throttle *(M)*	.74	.15	.50	1.18
	Longitudinal Acceleration due to Brake *(M)*	-.22	.08	-.53	-.11
	Longitudinal Acceleration *(SD)*	1.15	.29	.56	1.87
	Lateral Acceleration *(SD)*	.42	.15	.11	.86
	Longitudinal Velocity *(SD)*	15.95	3.76	7.57	26.09
	Lateral Velocity *(SD)*	.26	.23	.08	2.13
	Longitudinal Acceleration due to Throttle *(SD)*	.65	.19	.23	1.22
	Longitudinal Acceleration due to Brake *(SD)*	.86	.22	.50	1.47
FOLLOW-UP LEVEL	Longitudinal Acceleration *(M)*	.07	.06	.01	.35
	Lateral Acceleration *(M)*	.00	.02	-.04	.12
	Longitudinal Velocity *(M)*	65.77	10.65	33.86	93.38
	Lateral Velocity *(M)*	.01	.02	-.01	.10
	Longitudinal Acceleration due to Throttle *(M)*	.79	.20	.48	1.46
	Longitudinal Acceleration due to Brake *(M)*	-.25	.12	-.92	-.10
	Longitudinal Acceleration *(SD)*	1.22	.36	.54	2.20
	Lateral Acceleration *(SD)*	.46	.19	.11	1.09
	Longitudinal Velocity *(SD)*	16.60	4.38	7.59	27.21
	Lateral Velocity *(SD)*	.25	.10	.09	.52
	Longitudinal Acceleration due to Throttle *(SD)*	.68	.24	.21	1.32
	Longitudinal Acceleration due to Brake *(SD)*	.88	.23	.49	1.51

2.3.2 Correlations

2.3.2.1 Correlations between variables in the baseline level

For the variables in the baseline level, bivariate correlations were computed and presented in Table 5. Accordingly, significant correlations between variables were as follows: Age was significantly and positively correlated with total km (r = .224, p < .05). Gender (1 = Female, 2 = Male) was positively correlated with annual km (r = .296, p < .05), total km (r = .245, p < .05), preferred speed in the limit of 90 km/h (r = .260, p < .05) and 110 km/h (r = .353, p < .01), ordinary violations (r = .322, p < .05), the mean of longitudinal velocity (r = .277, p < .05), and the standard deviation of lateral acceleration (r = .248, p < .05). Also, it was negatively correlated with the means of lapses (r = -.269, p < .05) and positive driver behaviors (r = -.301, p < .05).

Annual km of participants was positively correlated with total km (r = .686, p < .01), penalties of speed violations (r = .321, p < .01), preferred speed where speed limit were 50 km/h (r = .252, p < .05), 82 km/h (r = .289, p < .05), 90 km/h (r = .295, p < .05), and 110 km/h (r = .318, p < .05), total number of accidents (r = .224, p < .05), passive accidents (r = .293, p < .01), the means of aggressive violations (r = .348, p < .01), ordinary violations (r = .411, p < .01), the means of longitudinal velocity (r = .317, p < .01), longitudinal acceleration due to throttle (r = .268, p < .01), and the standard deviations of longitudinal acceleration (r = .224, p < .05), lateral acceleration (r = .364, p < .01), and longitudinal acceleration due to throttle (r = .271, p < .05).

Total km of participants was positively correlated with penalties of speed violations (r = .393, p < .01), preferred speed where speed limit were 50 km/h (r = .293, p < .01), 82 km/h (r = .276, p < .05), 90 km/h (r = .289, p < .05), 110 km/h (r = .250, p < .05), the means of aggressive violations (r = .264, p < .05), ordinary violations (r = .393, p < .01), and lateral acceleration (r = .229, p < .05).

The penalty of speed violations was positively correlated with preferred speed where speed limit was 50 km/h (r = .459, p < .01), 82 km/h (r = .306, p < .01), 90 km/h (r =

.330, $p < .01$), 110 km/h ($r = .287$, $p < .05$), total number of accidents ($r = .349$, $p < .01$) active accidents ($r = .381$, $p < .01$), and passive accidents ($r = .296$, $p < .01$). Also, it was positively correlated with the means of ordinary violations ($r = .280$, $p < .05$) and lateral velocity ($r = .266$, $p < .01$).

Preferred speeds where speed limit was 50, 82, 90 and 110 km/h, were positively correlated with each other (ranging from $r = .523$, $p < .01$ to $r = .872$, $p < .01$). First three were positively correlated with the means of aggressive violations ($r = .274$, $r = .312$, and $r = .292$, $p < .05$, respectively). All of the speed preferences were positively correlated with ordinary violations ($r = .612$, $r = .617$, $r = .619$, and $r = .542$, $p < .05$, respectively). Preferred speed where speed limit was 110 km/h was negatively correlated with positive driver behaviors ($r = -.259$, $p < .05$). The correlation between speed preferences and the means of longitudinal acceleration ($r = .363$, $r = .313$, $r = .317$, and $r = .287$, $p < .01$, respectively) and longitudinal velocity ($r = .391$, $r = .499$, $r = .456$, and $r = .478$, $p < .01$, respectively) were significant. Lateral velocity was found as correlated with the preferred speed where speed limit was 50 km/h ($r = .340$, $p < .01$) and 90 km/h ($r = .228$, $p < .05$). The correlation between speed preferences and the means of longitudinal acceleration due to throttle ($r = .419$, $r = .418$, $r = .380$, and $r = .385$, $p < .01$, respectively), brake ($r = -.330$, $r = -.291$, $r = -.243$, and $r = -.244$, $p < .01$, respectively), the standard deviations of longitudinal acceleration ($r = .402$, $r = .316$, $r = .314$, and $r = .300$, $p < .01$, respectively), lateral acceleration ($r = .387$, $r = .461$, $r = .380$, and $r = .418$, $p < .01$, respectively), longitudinal velocity ($r = .332$, $r = .410$, $r = .381$, and $r = .404$, $p < .01$, respectively), longitudinal acceleration due to throttle ($r = .329$, $r = .272$, $r = .274$, and $r = .245$, $p < .05$, respectively) and brake ($r = .352$, $r = .253$, $r = .248$, and $r = .241$, $p < .05$, respectively) were found as significant.

Total number of accidents was positively correlated with active accidents ($r = .680$, $p < .01$), and passive accidents ($r = .785$, $p < .01$), as well as the means of errors ($r = .226$, $p < .05$), ordinary violations ($r = .242$, $p < .05$), and lateral acceleration ($r = .346$, $p < .01$). The active and passive accidents was also positively correlated ($r = .344$, $p < .01$).

The mean of lapses was positively correlated with errors (r = .465, p < .01). The mean error was positively correlated with ordinary violations (r = .334, p < .01), and the mean of lateral velocity (r = .270, p < .05).

The mean of aggressive violations was positively correlated with the mean of ordinary violations (r = .404, p < .01), the means of longitudinal acceleration (r = .405, p < .01), longitudinal velocity (r = .229, p < .05), longitudinal acceleration due to throttle (r = .256, p < .05), and the standard deviations of lateral acceleration (r = .241, p < .05), longitudinal velocity (r = .230, p < .05), and lateral velocity (r = .322, p < .01).

The mean of ordinary violations was positively correlated with the mean of longitudinal acceleration (r = .305, p < .01), longitudinal velocity (r = .470, p < .01), longitudinal acceleration due to throttle (r = .460, p < .01), longitudinal acceleration due to brake (r = -.390, p < .01), the standard deviation of longitudinal acceleration (r = .372, p < .01), lateral acceleration (r = .502, p < .01), longitudinal velocity (r = .381, p < .01), lateral velocity (r = .254, p < .05), longitudinal acceleration due to throttle (r = .299, p < .01). Lastly, the mean of ordinary violations was negatively correlated with longitudinal acceleration due to brake (r = -.390, p < .01).

The mean and the standard deviations of simulated driver behaviors revealed positive correlations with each other (except the negative correlations with the mean of longitudinal acceleration due to brake), ranging from .298 (p < .05) to .929 (see Table 5). Lastly, the total number of collisions was positively correlated with the means of longitudinal acceleration (r = .376, p < .01), lateral velocity (r = .494, p < .01).

Table 5. *Correlations between Variables in the Baseline Level*

		1	2	3	4	5	6	7	8	9	10	11	12
1	**Age**	1											
2	**Gender (1= Female, 2 = Male)**	-.067	1										
3	**Annual KM**	-.088	.296**	1									
4	**Total KM**	.224*	.245*	.686**	1								
5	**Penalties of Speed Violations**	.012	.098	.321**	.393**	1							
6	**Preferred Speed 50 km/h**	-.046	.011	.252*	.293**	.459**	1						
7	**Preferred Speed 82 km/h**	-.126	.210	.289*	.276*	.306**	.686**	1					
8	**Preferred Speed 90 km/h**	-.062	.260*	.295**	.289*	.330**	.691**	.872**	1				
9	**Preferred Speed 110 km/h**	.005	.353**	.318**	.250*	.287*	.523**	.755**	.833**	1			
10	**Total Accidents**	-.054	-.080	.224*	.203	.349**	.178	.044	.028	-.020	1		
11	**Active Accidents**	.021	-.055	.206	.202	.381**	.214	-.036	.111	.080	.680**	1	
12	**Passive Accidents**	.007	-.083	.293**	.196	.296**	.125	.039	-.026	-.030	.785**	.344**	1

*$p < .05$, **$p < .01$

Table 5. *Correlations between Variables in the Baseline Level (continue)*

		1	2	3	4	5	6	7	8	9	10	11	12
13	**DBQ - Lapses - *M***	-.106	-.269*	-.105	-.177	.040	.125	-.110	-.090	-.108	.136	-.172	-.171
14	**DBQ - Errors - *M***	-.075	.021	.026	.122	-.065	.064	-.118	-.108	-.152	.200	.106	.200
15	**DBQ – Aggressive V. - *M***	-.121	-.009	.348**	.264*	.135	.274*	.312**	.292**	.169	.197	-.004	-.005
16	**DBQ – Ordinary V. - *M***	-.186	.322**	.411**	.393**	.280*	.612**	.617**	.619**	.542**	.242*	.213	.213
17	**DBQ – Positive - *M***	-.066	.000	-.010	-.053	-.074	.040	-.091	-.092	-.259*	-.062	.018	.021
18	**Longitudinal Acceleration - *M***	-.099	.073	.216	.115	.191	.363**	.313**	.317**	.287*	.102	-.013	-.015
19	**Lateral Acceleration - *M***	-.039	-.001	.159	.118	.102	.188	.165	.173	.100	.346**	-.137	-.137
20	**Longitudinal Velocity - *M***	-.159	.277*	.317**	.211	.153	.391**	.499**	.456**	.478**	.056	.121	.120
21	**Lateral Velocity - *M***	.092	.142	.223	.187	.266*	.340**	.222	.228*	.204	.069	.000	-.001
22	**Longitudinal Acceleration due to Throttle - *M***	-.168	.160	.268*	.145	.122	.419**	.418**	.380**	.385**	.119	.123	.123
23	**Longitudinal Acceleration due to Brake - *M***	.176	-.072	-.175	-.063	-.008	-.330**	-.291*	-.243*	-.244*	-.136	-.152	-.153

*$p < .05$, **$p < .01$

Table 5. *Correlations between Variables in the Baseline Level (continue)*

		1	2	3	4	5	6	7	8	9	10	11	12
24	**Longitudinal Acceleration - *SD***	-.163	.094	.224*	.119	.116	.402**	.316**	.314**	.300**	.129	.149	.149
25	**Lateral Acceleration - *SD***	-.150	.248*	.364**	.229*	.153	.387**	.461**	.380**	.418**	.145	.122	.122
26	**Longitudinal Velocity - *SD***	-.103	.152	.211	.067	.129	.332**	.410**	.381**	.404**	.057	.008	.006
27	**Lateral Velocity - *SD***	-.052	.162	.151	.089	-.004	.010	.018	-.011	.041	.110	.021	.023
28	**Longitudinal Acceleration due to Throttle - *SD***	-.213	.114	.271*	.171	.165	.329**	.272*	.274*	.245*	.109	.056	.055
29	**Longitudinal Acceleration due to Brake - *SD***	-.118	.047	.170	.059	.027	.352**	.253*	.248*	.241*	.143	.173	.174
30	**Total Collisions**	-.001	.041	.065	-.162	-.100	.103	-.008	.033	.016	.009	-.070	-.071

*$p < .05$, **$p < .01$

Table 5. *Correlations between Variables in the Baseline Level (continue)*

		13	14	15	16	17	18	19	20	21	22	23
13	**DBQ - Lapses - *M***	1										
14	**DBQ - Errors - *M***	.465**	1									
15	**DBQ – Aggressive V. - *M***	.110	.197	1								
16	**DBQ – Ordinary V. - *M***	.179	.334**	.404**	1							
17	**DBQ – Positive - *M***	.162	-.052	-.124	-.002	1						
18	**Longitudinal Acceleration - *M***	-.014	-.006	.405**	.305**	-.082	1					
19	**Lateral Acceleration - *M***	.153	.153	.126	.223	.138	.296**	1				
20	**Longitudinal Velocity - *M***	-.159	.041	.229*	.470**	-.109	.690**	.324**	1			
21	**Lateral Velocity - *M***	-.131	.073	.215	.151	-.100	.471**	.203	.356**	1		
22	**Longitudinal Acceleration due to Throttle - *M***	-.033	.057	.256*	.460**	-.045	.747**	.375**	.908**	.383**	1	
23	**Longitudinal Acceleration due to Brake - *M***	-.044	-.081	-.110	-.390**	-.031	-.424**	-.324**	-.688**	-.233*	-.888**	1

*$p < .05$, **$p < .01$

Table 5. *Correlations between Variables in the Baseline Level (continue)*

		13	14	15	16	17	18	19	20	21	22	23
24	**Longitudinal Acceleration - *SD***	-.025	.085	.189	.372**	-.031	.622**	.367**	.832**	.622**	.942**	-.899**
25	**Lateral Acceleration - *SD***	-.097	.070	.241*	.502**	-.147	.705**	.392**	.927**	.705**	.873**	-.656**
26	**Longitudinal Velocity - *SD***	-.066	-.035	.230*	.381**	-.167	.676**	.298**	.857**	.676**	.867**	-.708**
27	**Lateral Velocity - *SD***	.063	.270*	.322**	.254*	.000	.391**	.173	.384**	.391**	.422**	-.315**
28	**Longitudinal Acceleration due to Throttle - *SD***	-.069	.097	.203	.299**	-.093	.645**	.438**	.751**	.645**	.841**	-.749**
29	**Longitudinal Acceleration due to Brake - *SD***	.045	.125	.114	.352**	.016	.454**	.329**	.751**	.454**	.861**	-.893**
30	**Total Collisions**	.053	.004	.108	-.040	-.042	.376**	-.005	.036	.376**	.149	-.061

*$p < .05$, **$p < .01$

Table 5. *Correlations between Variables in the Baseline Level (continue)*

		24	25	26	27	28	29	30
24	**Longitudinal Acceleration - *SD***	1						
25	**Lateral Acceleration - *SD***	.772**	1					
26	**Longitudinal Velocity - *SD***	.786**	.838**	1				
27	**Lateral Velocity - *SD***	.386**	.440**	.378**	1			
28	**Longitudinal Acceleration due to Throttle - *SD***	.890**	.743**	.727**	.385**	1		
29	**Longitudinal Acceleration due to Brake - *SD***	.929**	.684**	.684**	.317**	.715**	1	
30	**Total Collisions**	.080	.119	.153	-.011	.089	.040	1

*$p < .05$, **$p < .01$

2.3.2.2 Correlations between variables in the follow-up level

For the variables in the follow-up level, bivariate correlations were computed and presented in Table 6. The correlations between demographic variables were same in both baseline and follow-up levels. Accordingly, significant correlations between investigated variables were as follows:

Gender (1 = Female, 2 = Male) was positively correlated with the mean of longitudinal velocity (r = .255, p < .05), the standard deviations of lateral acceleration (r = .224, p < .05), and longitudinal acceleration due to throttle (r = .234, p < .05).

Annual km of participants was positively correlated with the means of aggressive violations (r = .317, p < .01), ordinary violations (r = .371, p < .01), longitudinal acceleration (r = .284, p < .05), longitudinal velocity (r = .329, p < .01), lateral velocity (r = .310, p < .01), and longitudinal acceleration due to throttle (r = .248, p < .05). Also, annual km was positively correlated with the standard deviations of longitudinal acceleration (r = .238, p < .05), lateral acceleration (r = .359, p < .01), longitudinal velocity (r = .306, p < .01), lateral velocity (r = .420, p < .01), and longitudinal acceleration due to throttle (r = .281, p < .05).

Total km of participants was positively correlated with the mean of ordinary violations (r = .329, p < .01). The speed penalty was positively correlated with the means of ordinary violations (r = .362, p < .01), longitudinal acceleration (r = .239, p < .05), lateral velocity (r = .300, p < .01), and longitudinal acceleration due to throttle (r = .242, p < .05). Also, speed penalties were positively correlated with the standard deviations of lateral acceleration (r = .250, p < .05), longitudinal velocity (r = .266, p < .05), lateral velocity (r = .289, p < .05).

The preferred speed where speed limit was 50 was correlated with the mean of lapses (r = .274, p < .05). The preferred speed where speed limit was 50, 82, 90 and 110 km/h, were positively correlated with the means of aggressive violations (r = .290, r = .363, r = .355, and r = .291, p < .05, respectively), ordinary violations (r = .651, r = .653, r = .662, and r = .563, p < .01, respectively). The mean of longitudinal acceleration was

correlated with the preferred speed where speed limit was 50 (r = .281, p < .05), 82 (r = .250, p < .05), 90 and 110 km/h (r = .285, p < .01).

The correlation between speed preferences (50, 82, 90 and 110 km/h) and the means of longitudinal velocity (r = .362, r = .483, r = .427, and r = .498, p < .01, respectively), lateral velocity (r = .282, r = .226, r = .228, and r = .276, p < .05, respectively), longitudinal acceleration due to throttle (r = .377, r = .376, r = .389, and r = .417, p < .01, respectively), brake (r = -.297, r = -.263, r = -.328, and r = -.303, p < .01, respectively), the standard deviations of longitudinal acceleration (r = .380, r = .358, r = .357, and r = .382, p < .01, respectively), lateral acceleration (r = .343, r = .416, r = .352, and r = .392, p < .01, respectively), longitudinal velocity (r = .350, r = .416, r = .369, and r = .418, p < .01, respectively), lateral velocity (r = .325, r = .374, r = .320, and r = .334, p < .01, respectively), longitudinal acceleration due to throttle (r = .308, r = .338, r = .364, and r = .397, p < .01, respectively) and brake (r = .392, r = .307, r = .303, and r = .312, p < .01, respectively) were found as significant.

Total number of accidents was positively correlated with the mean of errors (r = .277, p < .05), ordinary violations (r = .312, p < .01), positive driver behaviors (r = .231, p < .05), and the standard deviations of lateral velocity (r = .285, p < .05).

The mean of lapses was positively correlated with the means of errors (r = .588, p < .01), ordinary violations (r = .402, p < .01), and longitudinal acceleration (r = .274, p < .05). The mean of errors was positively correlated with the means of ordinary violations (r = .333, p < .01), and longitudinal acceleration (r = .242, p < .05). The mean of aggressive violations was positively correlated with ordinary violations (r = .373, p < .01), the means of longitudinal velocity (r = .319, p < .01), longitudinal acceleration due to throttle (r = .297, p < .01). On the other hand, it was negatively correlated with the mean of longitudinal acceleration due to brake (r = -.248, p < .05). The mean of aggressive violations was also positively correlated with the standard deviations of longitudinal acceleration (r = .269, p < .01), lateral acceleration (r = .305, p < .01), longitudinal velocity (r = .319, p < .01), lateral velocity (r = .330, p < .01), longitudinal

acceleration due to throttle (r = .223, p < .01), and longitudinal acceleration due to brake (r = .225, p < .05). Lastly, the mean of aggressive violations was positively correlated with total collisions (r = .226, p < .05).

The mean of ordinary violations was positively correlated with the mean of longitudinal acceleration (r = .431, p < .01), longitudinal velocity (r = .511, p < .01), lateral velocity (r = .401, p < .01), longitudinal acceleration due to throttle (r = .476, p < .01), and it was negatively correlated with the mean of longitudinal acceleration due to brake (r = -.321, p < .01). Also, the mean of ordinary violations was positively correlated with the standard deviations of longitudinal acceleration (r = .372, p < .01), lateral acceleration (r = .493, p < .01), longitudinal velocity (r = .476, p < .01), lateral velocity (r = .510, p < .01), longitudinal acceleration due to throttle (r = .361, p < .01), and longitudinal acceleration due to brake (r = .315, p < .01). Lastly, the mean of ordinary violations was positively correlated with total collisions (r = .251, p < .05).

The mean and the standard deviations of simulated driver behaviors revealed positive correlations with each other (except the negative correlations with the mean of longitudinal acceleration due to brake), ranging from .232 (p < .05) to .910 (see Table 6). Lastly, the total number of collisions was positively correlated with all of the simulated driver behaviors as follows; the means of longitudinal acceleration (r = .788, p < .01), lateral acceleration (r = .257, p < .05), longitudinal velocity (r = .340, p < .01), lateral velocity (r = .701, p < .01), longitudinal acceleration due to throttle (r = .490, p < .01). In terms of the standard deviations, it was correlated to the standard deviations of longitudinal acceleration (r = .352, p < .01), lateral acceleration (r = .464, p < .01), longitudinal velocity (r = .507, p < .01), lateral velocity (r = .402, p < .01), longitudinal acceleration due to throttle (r = .391, p < .01), longitudinal acceleration due to brake (r = .236, p < .05). Lastly, it was negatively correlated with the mean of longitudinal acceleration due to brake (r = -.236, p < .05).

Table 6. *Correlations between Variables in the Follow-up Level*

		1	2	3	4	5	6	7	8	9	10	11	12
1	**Age**	1											
2	**Gender (1= Female, 2 = Male)**	-.067	1										
3	**Annual KM**	-.088	.296**	1									
4	**Total KM**	.224*	.245*	.686**	1								
5	**Penalties of Speed Violations**	.012	.098	.321**	.393**	1							
6	**Preferred Speed 50 km/h**	-.046	.011	.252*	.293**	.459**	1						
7	**Preferred Speed 82 km/h**	-.126	.210	.289*	.276*	.306**	.686**	1					
8	**Preferred Speed 90 km/h**	-.062	.260*	.295**	.289*	.330**	.691**	.872**	1				
9	**Preferred Speed 110 km/h**	.005	.353**	.318**	.250*	.287*	.523**	.755**	.833**	1			
10	**Total Accidents**	-.054	-.080	.224*	.203	.349**	.178	.044	.028	-.020	1		
11	**Active Accidents**	.021	-.055	.206	.202	.381**	.214	-.036	.111	.080	.680**	1	
12	**Passive Accidents**	.007	-.083	.293**	.196	.296**	.125	.039	-.026	-.030	.785**	.344**	1

*$p < .05$, **$p < .01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		1	2	3	4	5	6	7	8	9	10	11	12
13	**DBQ - Lapses - *M***	-.030	-.193	-.032	-.071	.101	.274*	.097	.068	-.037	.224	.048	.215
14	**DBQ - Errors - *M***	-.060	-.005	-.004	-.124	.139	.132	-.009	.018	.039	.277*	.191	.192
15	**DBQ – Aggressive V. - *M***	-.135	-.075	.317**	.136	.075	.290*	.363**	.355**	.291*	.186	.211	.126
16	**DBQ – Ordinary V. - *M***	-.154	.204	.371**	.329**	.362**	.651**	.653**	.662**	.563**	.312**	.252*	.251*
17	**DBQ – Positive - *M***	-.077	-.198	.021	-.050	-.070	.062	-.016	-.120	-.238*	-.009	-.179	.120
18	**Longitudinal Acceleration - *M***	-.096	.077	.284*	.120	.239*	.281*	.250*	.221	.285*	.103	.177	.081
19	**Lateral Acceleration - *M***	-.139	-.005	.115	.028	.131	.076	-.104	-.061	-.081	.126	.238*	-.010
20	**Longitudinal Velocity - *M***	-.201	.255*	.329**	.153	.211	.362**	.483**	.427**	.498**	.094	.183	.104
21	**Lateral Velocity - *M***	-.076	.079	.310**	.127	.300**	.282*	.226*	.228*	.276*	.119	-.010	-.010
22	**Longitudinal Acceleration due to Throttle - *M***	-.183	.208	.248*	.105	.242*	.377**	.376**	.389**	.417**	.105	.042	.040
23	**Longitudinal Acceleration due to Brake - *M***	.146	-.186	-.099	-.035	-.169	-.297**	-.263*	-.328**	-.303**	-.072	-.044	-.043

*$p < .05$, **$p < .01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		1	2	3	4	5	6	7	8	9	10	11	12
24	**Longitudinal Acceleration - *SD***	-.208	.150	.238*	.064	.205	.380**	.358**	.357**	.382**	.123	.058	.056
25	**Lateral Acceleration - *SD***	-.204	.224*	.359**	.172	.250*	.343**	.416**	.352**	.392**	.168	.072	.071
26	**Longitudinal Velocity - *SD***	-.169	.102	.306**	.135	.266*	.350**	.416**	.369**	.418**	.140	.040	.039
27	**Lateral Velocity - *SD***	-.279*	.132	.420**	.146	.289*	.325**	.374**	.320**	.334**	.285*	-.015	-.015
28	**Longitudinal Acceleration due to Throttle - *SD***	-.257*	.234*	.281*	.077	.210	.308**	.338**	.364**	.397**	.104	.037	.035
29	**Longitudinal Acceleration due to Brake - *SD***	-.134	.077	.162	.037	.145	.392**	.307**	.303**	.312**	.130	.068	.067
30	**Total Collisions**	.035	.067	.206	.106	.125	.073	.059	.076	.100	.118	-.046	-.046

*$p < .05$, **$p < .01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		13	14	15	16	17	18	19	20	21	22	23
13	**DBQ - Lapses - *M***	1										
14	**DBQ - Errors - *M***	.588**	1									
15	**DBQ – Aggressive V. - *M***	.036	.124	1								
16	**DBQ – Ordinary V. - *M***	.402**	.333**	.373**	1							
17	**DBQ – Positive - *M***	.095	-.187	-.166	-.135	1						
18	**Longitudinal Acceleration – *M***	.274*	.242*	.166	.431**	-.081	1					
19	**Lateral Acceleration – *M***	.066	-.042	-.109	.032	-.128	.397**	1				
20	**Longitudinal Velocity – *M***	.078	.166	.319**	.511**	-.144	.672**	.144	1			
21	**Lateral Velocity – *M***	.142	.159	.206	.401**	-.074	.791**	.464**	.543**	1		
22	**Longitudinal Acceleration due to Throttle - *M***	.153	.169	.297**	.476**	-.144	.739**	.200	.820**	.649**	1	
23	**Longitudinal Acceleration due to Brake - *M***	-.070	-.076	-.248*	-.321**	.132	-.374**	-.049	-.528**	-.392**	-.874**	1

*$p < .05$, **$p <. 01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		13	14	15	16	17	18	19	20	21	22	23
24	**Longitudinal Acceleration - *SD***	.113	.184	.269*	.372**	-.014	.672**	.170	.840**	.539**	.881**	-.701**
25	**Lateral Acceleration - *SD***	.158	.197	.305**	.493**	-.048	.758**	.270*	.910**	.699**	.831**	-.542**
26	**Longitudinal Velocity - *SD***	.091	.185	.319**	.476**	-.070	.748**	.088	.846**	.664**	.867**	-.635**
27	**Lateral Velocity - *SD***	.181	.215	.330**	.510**	-.083	.691**	.232*	.822**	.648**	.747**	-.480**
28	**Longitudinal Acceleration due to Throttle - *SD***	.045	.171	.223*	.361**	-.092	.674**	.288*	.780**	.580**	.832**	-.648**
29	**Longitudinal Acceleration due to Brake - *SD***	.169	.174	.225*	.315**	.090	.544**	.058	.752**	.400**	.779**	-.642**
30	**Total Collisions**	.129	.144	.226*	.251*	-.010	.788**	.257*	.340**	.701**	.490**	-.236*

*$p < .05$, **$p < .01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		13	14	15	16	17	18	19	20	21	22	23
24	**Longitudinal Acceleration - *SD***	.113	.184	.269*	.372**	-.014	.672**	.170	.840**	.539**	.881**	-.701**
25	**Lateral Acceleration - *SD***	.158	.197	.305**	.493**	-.048	.758**	.270*	.910**	.699**	.831**	-.542**
26	**Longitudinal Velocity - *SD***	.091	.185	.319**	.476**	-.070	.748**	.088	.846**	.664**	.867**	-.635**
27	**Lateral Velocity - *SD***	.181	.215	.330**	.510**	-.083	.691**	.232*	.822**	.648**	.747**	-.480**
28	**Longitudinal Acceleration due to Throttle - *SD***	.045	.171	.223*	.361**	-.092	.674**	.288*	.780**	.580**	.832**	-.648**
29	**Longitudinal Acceleration due to Brake - *SD***	.169	.174	.225*	.315**	.090	.544**	.058	.752**	.400**	.779**	-.642**
30	**Total Collisions**	.129	.144	.226*	.251*	-.010	.788**	.257*	.340**	.701**	.490**	-.236*

*$p < .05$, **$p < .01$

Table 6. *Correlations between Variables in the Follow-up Level (continue)*

		24	25	26	27	28	29	30
24	**Longitudinal Acceleration - *SD***	1						
25	**Lateral Acceleration - *SD***	.856**	1					
26	**Longitudinal Velocity - *SD***	.861**	.888**	1				
27	**Lateral Velocity - *SD***	.761**	.924**	.846**	1			
28	**Longitudinal Acceleration due to Throttle - *SD***	.916**	.831**	.804**	.746**	1		
29	**Longitudinal Acceleration due to Brake - *SD***	.937**	.730**	.744**	.631**	.734**	1	
30	**Total Collisions**	.352**	.464**	.507**	.402**	.391**	.236*	1

*$p < .05$, **$p < .01$

2.3.3 Results of the Driver Behavior Questionnaire

2.3.3.1 Results of the 2 (Experimental vs. Control) x 2 two-way mixed ANOVA

Separate 2 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of condition and time; and the interaction effect between time and condition on different driver behaviors. The condition includes two levels as experimental (approaching and avoidance goals were combined) and control and the time consist of two levels as baseline and follow-up. Since the 'time' condition has only two levels, the Mauchly's test of Sphericity was not calculated for the rest of the analyses.

For *Lapses*, the main effect of time ($F(1, 76) = 2.06$, $p = .155$, $\eta_p^2 = .026$), condition ($F(1, 76) = .36$, $p = .553$, $\eta_p^2 = .005$), and the interaction effect of time and condition ($F(1, 76) = .75$, $p = .390$, $\eta_p^2 = .010$) were not statistically significant.

For *Errors*, the main effect of time ($F(1, 76) = 2.82$, $p = .097$, $\eta_p^2 = .036$), condition ($F(1, 76) = .33$, $p = .568$, $\eta_p^2 = .004$), and the interaction effect of time and condition ($F(1, 76) = .28$, $p = .600$, $\eta_p^2 = .004$) were not statistically significant.

For *Aggressive Violations*, the main effect of time ($F(1, 76) = 2.60$, $p = .111$, $\eta_p^2 = .033$), condition ($F(1, 76) = .19$, $p = .665$, $\eta_p^2 = .002$), and the interaction effect of time and condition ($F(1, 76) = .51$, $p = .477$, $\eta_p^2 = .007$) were not statistically significant.

For *Ordinary Violations*, the main effect of time ($F(1, 76) = .01$, $p = .910$, $\eta_p^2 = .000$), condition ($F(1, 76) = .30$, $p = .588$, $\eta_p^2 = .004$), and the interaction effect of time and condition ($F(1, 76) = 2.06$, $p = .155$, $\eta_p^2 = .026$) were not statistically significant.

For *Positive Driver Behaviors*, the main effect of time ($F(1, 76) = .01$, $p = .673$, $\eta_p^2 = .002$) was not statistically significant. The main effect of condition was found as statistically significant ($F(1, 76) = 4.69$, $p = .033$, $\eta_p^2 = .058$). Accordingly, the experimental condition in baseline level ($M = 3.49$, $SD = .46$) is lower than control condition ($M = 3.69$, $SD = .44$). Similarly, the experimental condition in follow-up level

(M = 3.44, SD = .53) is lower than control condition (M = 3.70, SD = .45). The interaction effect of time and condition ($F(1, 76) = .29$, $p = .592$, $\eta_p^2 = .000$) was not statistically significant.

2.3.3.2 Results of the 3 (Avoidance vs. Approach vs. Control) x 2 two-way mixed ANOVA

Separate 3 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of condition and time; and the interaction effect between time and condition on different driver behaviors. The condition includes three levels as avoidance goals, approaching goals, and control, and the time consist of two levels as baseline and follow-up. Since the 'time' condition has only two levels, the Mauchly's test of Sphericity was not calculated for the rest of the analyses.

For *Lapses*, the main effects of time ($F(1, 75) = 1.48$, $p = .288$, $\eta_p^2 = .019$), condition ($F(2, 75) = .49$, $p = .614$, $\eta_p^2 = .013$), and the interaction effect of time and condition ($F(2, 75) = .79$, $p = .458$, $\eta_p^2 = .021$) were not statistically significant.

For *Errors*, the main effect of time ($F(1, 75) = 3.82$, $p = .054$, $\eta_p^2 = .048$) was found as marginally significant. Accordingly, the mean of errors in baseline level (M = .89, SD =.55, *Min.* = .13, *Max.*= 2.25) is significantly higher than follow-up level (M = .78, *SD.*= .50, *Min.* = .00, *Max.*= 2.13). The main effect of condition ($F(2, 75) = 1.72$, p = .187, $\eta_p^2 = .044$) and the interaction effect of time and condition ($F(2, 75) = .14$, p = .871, $\eta_p^2 = .004$) were not statistically significant.

For *Aggressive Violations*, the main effects of time ($F(1, 75) = 2.10$, $p = .151$, η_p^2 = .027), condition ($F(2, 75) = .63$, $p = .536$, $\eta_p^2 = .016$), and the interaction effect of time and condition ($F(2, 75) = .33$, $p = .716$, $\eta_p^2 = .009$) were not statistically significant.

For *Ordinary Violations*, the main effects of time ($F(1, 75) = .39$, $p = .534$, $\eta_p^2 = .005$), condition ($F(2, 75) = .17$, $p = .843$, $\eta_p^2 = .005$), and the interaction effect of time and condition ($F(2, 75) = 1.15$, $p = .323$, $\eta_p^2 = .030$) were not statistically significant

For *Positive Driver Behaviors*, the main effects of time ($F(1, 75) = .41$, $p = .525$, $\eta_p^2 = .005$), condition ($F(2, 75) = 2.32$, $p = .105$, $\eta_p^2 = .058$), and the interaction effect of time and condition ($F(2, 75) = .64$, $p = .531$, $\eta_p^2 = .017$) were not statistically significant.

2.3.4 Results of the Driving Simulation Data

2.3.4.1 Results of the 2 (Experimental vs. Control) x 2 two-way mixed ANOVA

Separate 2 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of condition and time; and the interaction effect between time and condition on different simulated driver behaviors. The condition includes three levels as approaching goals, avoidance goals and control, and the time consist of two levels as baseline and follow-up. Since the 'time' condition has only two levels, the Mauchly's test of Sphericity was not calculated for the rest of the analyses.

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = 1.90$, $p = .172$, $\eta_p^2 = .024$), condition ($F(1, 76) = .30$, $p = .587$, $\eta_p^2 = .004$) and the interaction effect of time and condition ($F(1, 76) = 1.02$, $p = .317$, $\eta_p^2 = .013$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 76) = 7.56$, $p = .007$, $\eta_p^2 = .09$) was statistically significant. Accordingly, the standard deviation of the longitudinal acceleration in baseline level ($M = 1.16$, $SD = .30$, *Min.* = .02, *Max.*= .24) is significantly lower than follow-up level ($M = 1.22$, $SD = .36$, *Min.* = .01, *Max.*= .35). The main effect of condition was not statistically significant ($F(1, 76) = 1.06$, $p = .306$, $\eta_p^2 = .014$). The interaction effect of time and condition ($F(1, 76) = 5.88$, $p = .018$, $\eta_p^2 = .072$) was found as statistically significant.

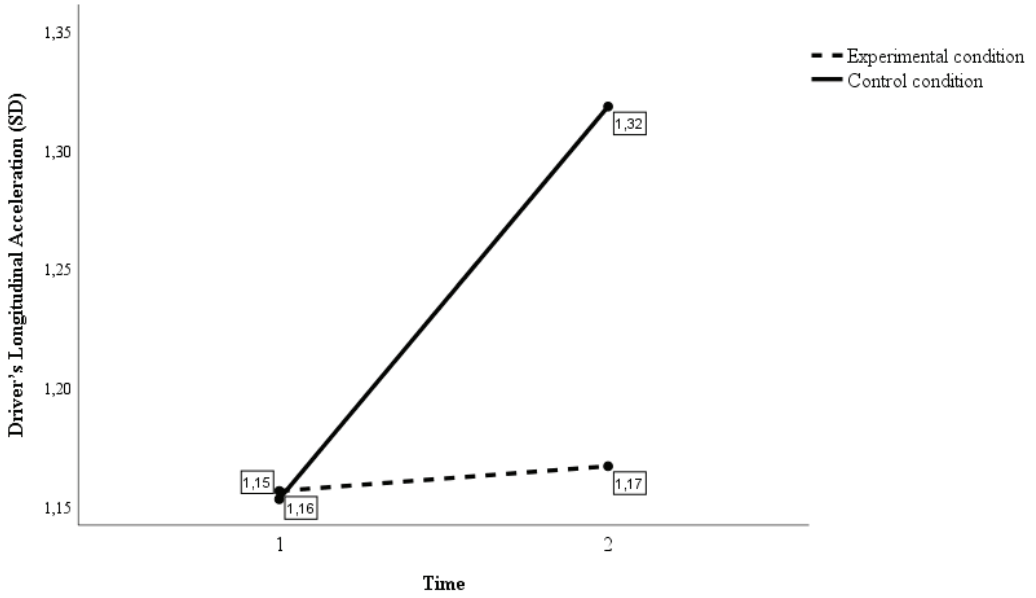

Figure 6. The Interaction Effect of Time and Condition on the Standard Deviation of Driver's Longitudinal Acceleration (SD)

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = .24$, $p = .625$, $\eta_p^2 = .003$), condition ($F(1, 76) = .02$, $p = .887$, $\eta_p^2 = .00$) and the interaction effect of time and condition ($F(1, 76) = .00$, $p = .984$, $\eta_p^2 = .00$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 76) = 20.36$, $p = .000$, $\eta_p^2 = .211$) was statistically significant. Accordingly, the standard deviation of the lateral acceleration in baseline level ($M = .42$, $SD = .15$, *Min.* = .11, *Max.*= .86) is significantly lower than follow-up level ($M = .46$, $SD = .19$, *Min.* = .11, *Max.*= 1.09). The main effect of condition was found as non-significant ($F(1, 76) = .392$, $p = .533$, $\eta_p^2 = .005$). The interaction effect of time and condition ($F(1, 76) = 4.20$, $p = .044$, $\eta_p^2 = .052$) was found as significant.

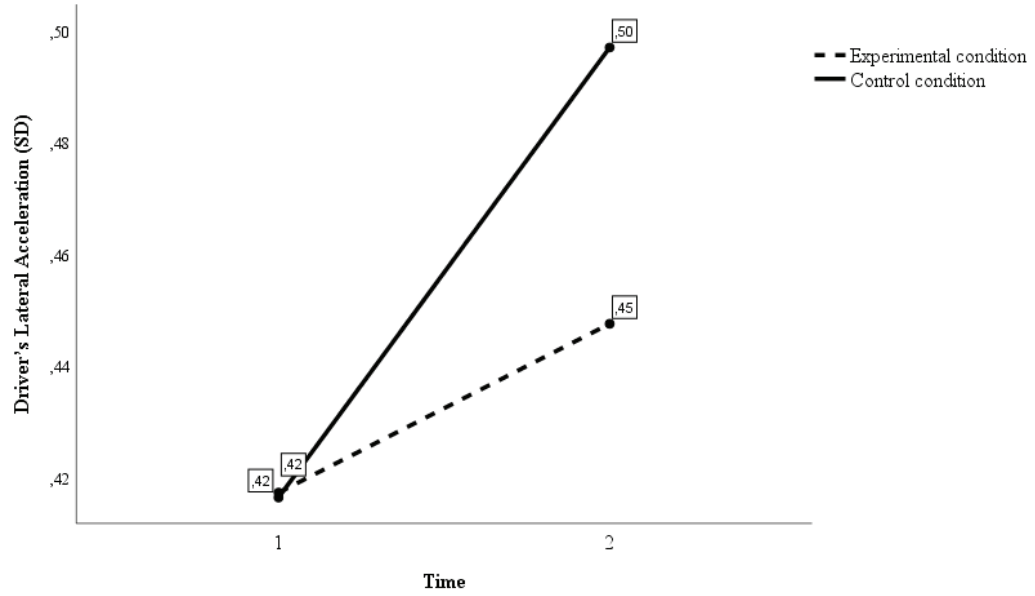

Figure 7. The Interaction Effect of Time and Condition on the Standard Deviation of Driver's Lateral Acceleration (SD)

For *Driver's longitudinal velocity (km/s),* the main effect of time ($F(1, 76) = 5.83$, $p = .018$, $\eta_p^2 = .071$) was statistically significant. Accordingly, the mean of the longitudinal velocity in baseline level ($M = 64.25$, $SD = 9.78$, *Min.* = 34.53, *Max.*= 90.77) is significantly lower than follow-up level ($M = 65.77$, $SD = 10.65$, *Min.* = 33.86, *Max.*= 93.38). The main effect of condition ($F(1, 76) = .01$, $p = .970$, $\eta_p^2 = .000$) was not statistically significant. The interaction effect of time and condition ($F(1, 76) = 3.03$, $p = .086$, $\eta_p^2 = .038$) was marginally significant.

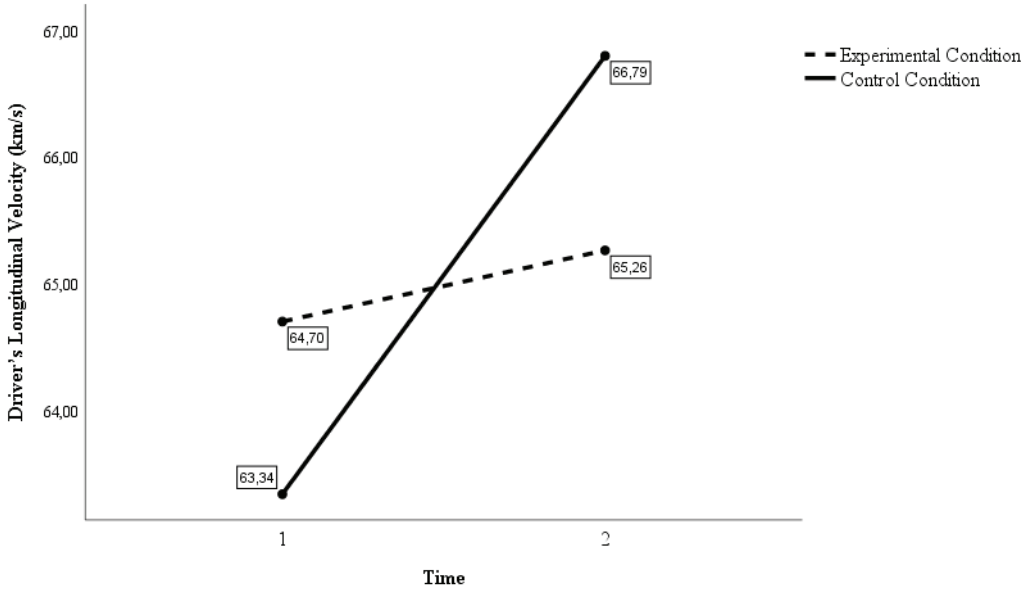

Figure 8. The Interaction Effect of Time and Condition on the Mean of Driver's Longitudinal Velocity (km/s)

In terms of standard deviations, the main effect of time ($F(1, 76) = 7.19$, $p = .009$, $\eta_p^2 = .086$) was statistically significant. Accordingly, the standard deviation of the longitudinal velocity in baseline level ($M = 15.94$, $SD = 3.76$, *Min.* = 7.57, *Max.*= 26.09) is significantly lower than follow-up level ($M = 16.60$, $SD = 4.39$, *Min.* = 7.59, *Max.*= 27.21). The main effect of condition ($F(1, 76) = .15$, $p = .700$, $\eta_p^2 = .002$) was not statistically significant. The interaction effect of time and condition ($F(1, 76) = 4.65$, $p = .034$, $\eta_p^2 = .058$) was statistically significant.

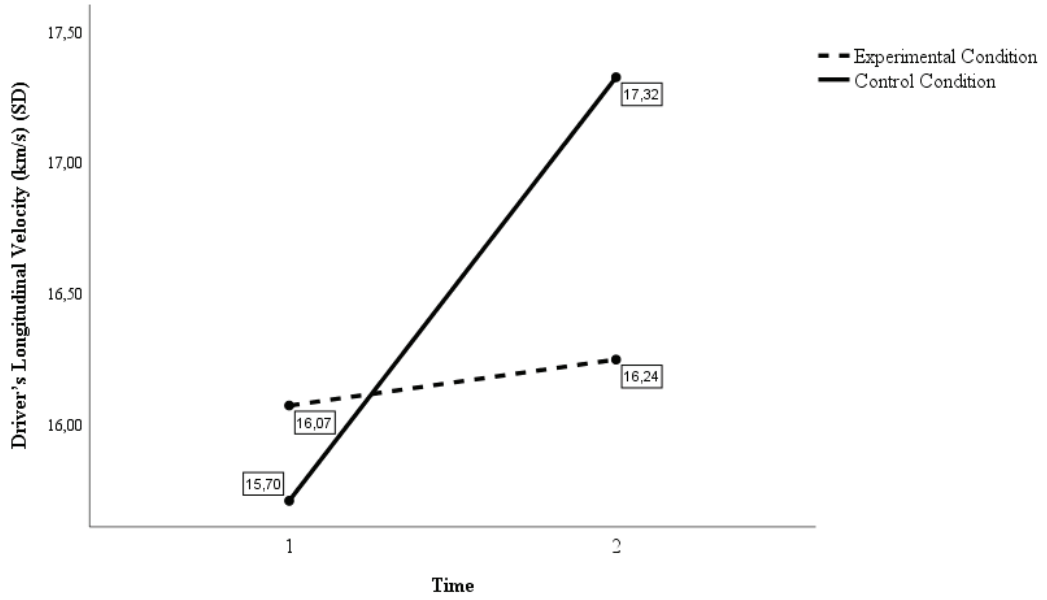

Figure 9. The Interaction Effect of Time and Condition on the Standard Deviation of Driver's Longitudinal Velocity (km/s) (SD).

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = 1.76$, $p = .189$, $\eta_p^2 = .023$), condition ($F(1, 76) = .02$, $p = .884$, $\eta_p^2 = .00$) and the interaction effect of time and condition ($F(1, 76) = 3.20$, $p = .077$, $\eta_p^2 = .04$) were not statistically significant. In terms of standard deviations, the main effects of time ($F(1, 76) = .18$, $p = .675$, $\eta_p^2 = .002$), condition ($F(1, 76) = 3.11$, $p = .082$, $\eta_p^2 = .039$), and the interaction effect of time and condition ($F(1, 76) = .76$, $p = .386$, $\eta_p^2 = .01$) were not statistically significant.

For *Driver's longitudinal acceleration due to throttle,* the main effect of time ($F(1, 76) = 9.26$, $p = .003$, $\eta_p^2 = .109$) was significant. Accordingly, the mean of the longitudinal acceleration due to throttle in baseline level ($M = .74$, $SD = .15$, *Min.* = .50, *Max.*= 1.18) is significantly lower than follow-up level ($M = .79$, $SD = .20$, *Min.* = .48, *Max.*= 1.46). The main effect of condition ($F(1, 76) = .48$, $p = .490$, $\eta_p^2 = .006$) and the interaction effect of time and condition ($F(1, 76) = 1.86$, $p = .177$, $\eta_p^2 = .024$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 76) = 5.68$, $p = .020$, $\eta_p^2 = .069$) was statistically significant. Accordingly, the standard deviation of the

longitudinal acceleration due to throttle in baseline level (M = .65, SD = .19, *Min.* = .23, *Max.*= 1.22) is significantly lower than follow-up level (M = .68, SD = .24, *Min.* = .21, *Max.*= 1.32). The main effect of condition ($F(1, 76) = .40$, $p = .527$, $\eta_p^2 = .005$) was not statistically significant. The interaction effect of time and condition ($F(1, 76) = 3.29$, $p = .074$, $\eta_p^2 = .041$) was marginally significant.

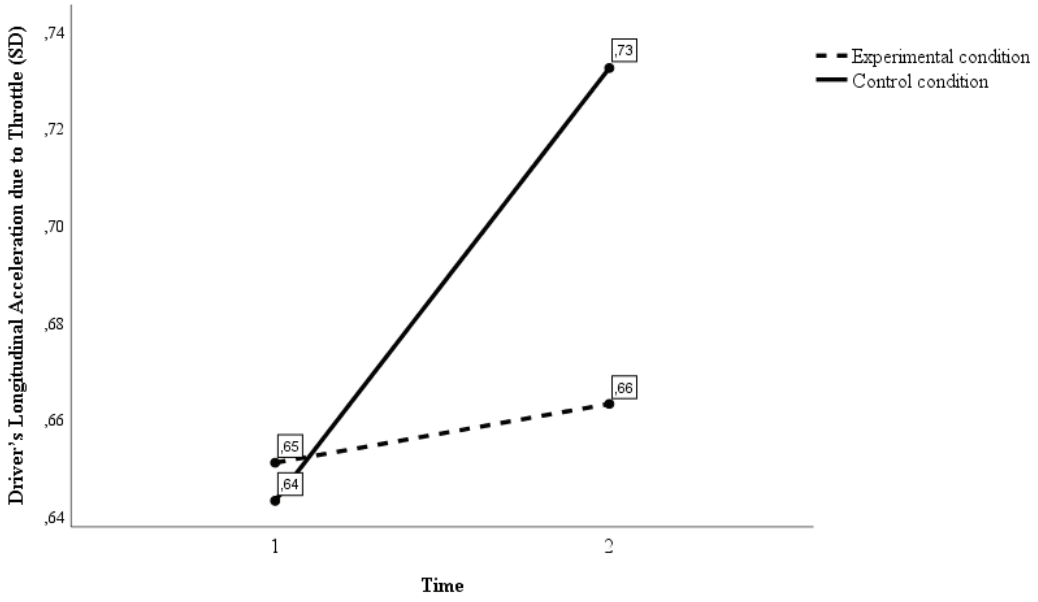

Figure 10. The Interaction Effect of Time and Condition on the Standard Deviation of Driver's Longitudinal Acceleration due to Throttle (SD)

For *Driver's longitudinal acceleration due to brake,* the main effect of time ($F(1, 76) = 5.07$, $p = .027$, $\eta_p^2 = .062$) was significant. Accordingly, the mean of the longitudinal acceleration due to brake in baseline level (M = -.23, SD = .08, *Min.* = -.53, *Max.*= -.11) is significantly higher than follow-up level (M = -.25, SD = .12, *Min.* = -.92, *Max.*= -.10). The main effect of condition ($F(1, 76) = .93$, $p = .339$, $\eta_p^2 = .012$) and the interaction effect of time and condition ($F(1, 76) = .36$, $p = .547$, $\eta_p^2 = .005$) were not statistically significant. In terms of standard deviations, the main effects of time ($F(1, 76) = 2.55$, $p = .114$, $\eta_p^2 = .033$) and condition ($F(1, 76) = 1.24$, $p = .270$, $\eta_p^2 = .016$)

were not statistically significant. The interaction effect of time and condition ($F(1, 76) = 6.98$, $p = .010$, $\eta_p^2 = .084$) was found as significant.

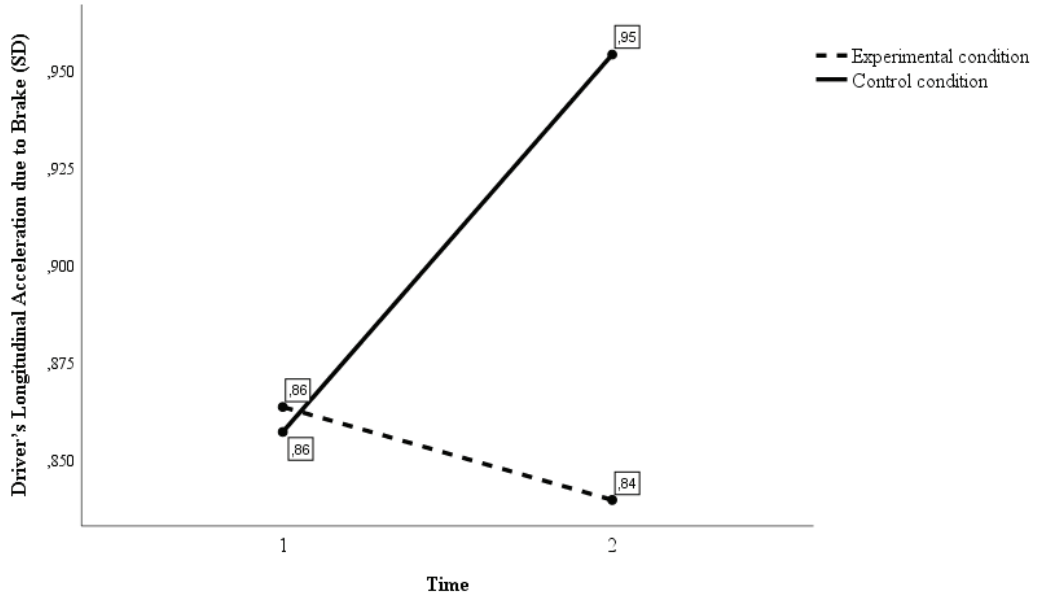

Figure 11. The Interaction Effect of Time and Condition on the Standard Deviation of Driver's Longitudinal Acceleration due to Brake (SD)

For *Total number of collisions,* the main effect of time ($F(1, 76) = .31$, $p = .576$, $\eta_p^2 = .004$), condition ($F(1, 76) = .03$, $p = .860$, $\eta_p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = .87$, $p = .353$, $\eta_p^2 = .011$) were not statistically significant.

2.3.4.2 Results of the 3 (Avoidance vs. Approach vs. Control) x 2 two-way mixed ANOVA

Separate 3 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of condition and time; and the interaction effect between time and condition on different simulated driver behaviors. The condition includes three levels as avoidance goals, approaching goals, and control, and the time consist of two levels as baseline and follow-up. Since the 'time' condition has only two levels, the Mauchly's test of Sphericity was not calculated for the rest of the analyses.

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = 1.28$, $p = .262$, $\eta_p^2 = .017$), and condition ($F(2, 75) = .20$, $p = .817$, $\eta_p^2 = .005$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 2.63$, $p = .080$, $\eta_p^2 = .065$) was marginally significant.

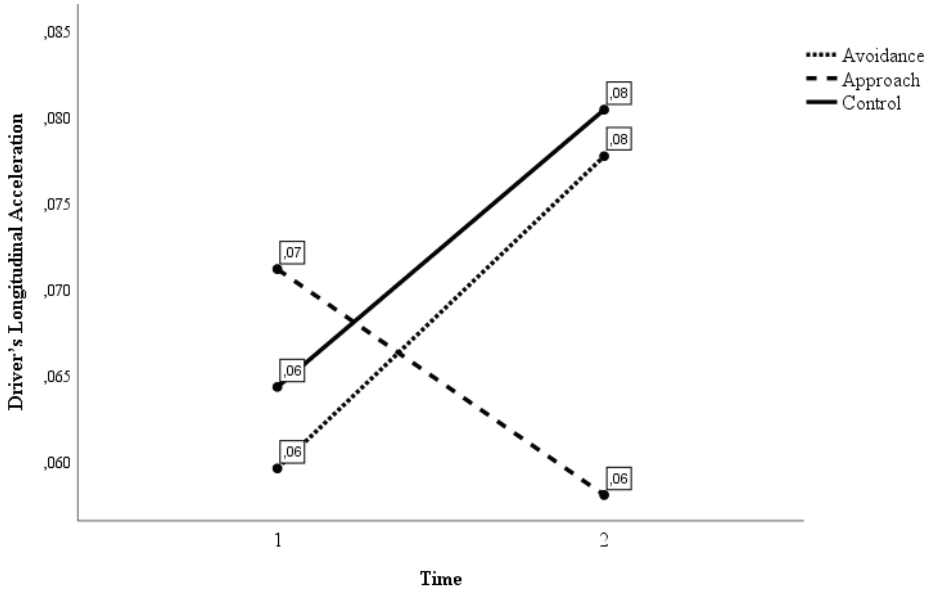

Figure 12. The Interaction Effect of Time and Condition on the Mean of Driver's Longitudinal Acceleration

In terms of standard deviations, the main effect of time ($F(1, 75) = 4.19$, $p = .044$, $\eta_p^2 = .053$) was statistically significant. Accordingly, the standard deviation of the longitudinal acceleration in baseline level ($M = 1.16$, $SD = .30$, *Min.* = .02, *Max.*= .24) is significantly lower than follow-up level ($M = 1.22$, $SD = .36$, *Min.* = .01, *Max.*= .35). The main effect of condition was not statistically significant ($F(2, 75) = .53$, $p = .588$, $\eta_p^2 = .014$). The interaction effect of time and condition ($F(2, 75) = 2.91$, $p = .061$, $\eta_p^2 = .072$) was found as marginally significant.

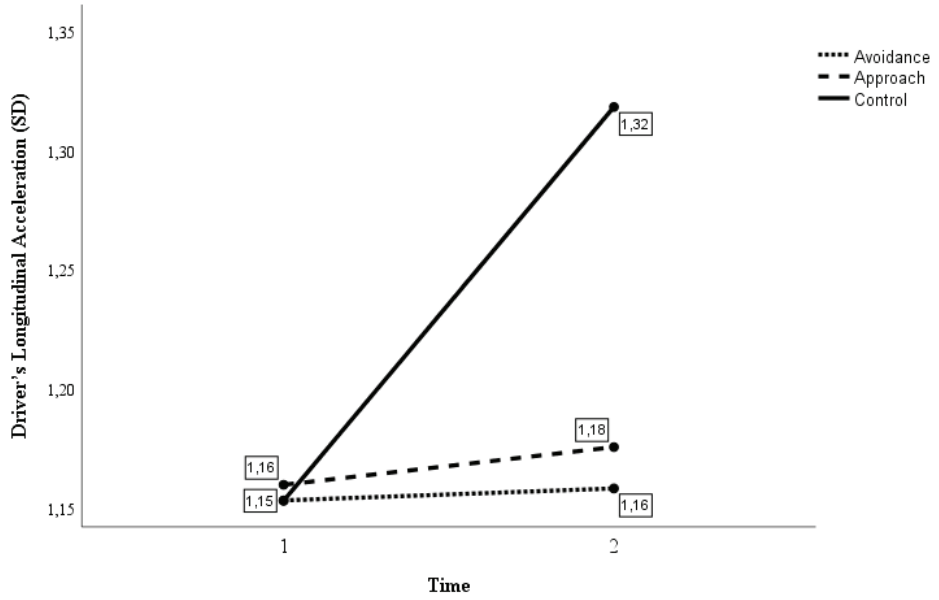

Figure 13. The Interaction Effect of Time and Condition on the Standard Deviations of Driver's Longitudinal Acceleration

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = .28$, $p = .598$, $\eta_p^2 = .004$), condition ($F(2, 75) = .59$, $p = .559$, $\eta_p^2 = .015$), and the interaction effect of time and condition ($F(2, 75) = .89$, $p = .416$, $\eta_p^2 = .023$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 75) = 16.29$, $p = .000$, $\eta_p^2 = .178$) was statistically significant. Accordingly, the standard deviation of the lateral acceleration in baseline level ($M = .42$, $SD = .15$, *Min.* = .11, *Max.*= .86) is significantly lower than follow-up level ($M = .46$, $SD = .19$, *Min.* = .11, *Max.*= 1.09). The main effect of condition ($F(2, 75) = .26$, $p = .770$, $\eta_p^2 = .007$) and the interaction effect of time and condition ($F(2, 75) = 2.12$, $p = .127$, $\eta_p^2 = .054$) were not statistically significant.

For *Driver's longitudinal velocity (km/s) ,* the main effects of time ($F(1, 75) = 3.76$, $p = .056$, $\eta_p^2 = .048$) was found as marginally significant. Accordingly, the mean of the longitudinal velocity in baseline level ($M = 64.25$, $SD = 9.78$, *Min.* = 34.53, *Max.*= 90.77) is significantly lower than follow-up level ($M = 65.77$, $SD = 10.65$, *Min.* = 33.86, *Max.*= 93.38). The main effect of condition ($F(2, 75) = .13$, $p = .879$, $\eta_p^2 = .003$), and

the interaction effect of time and condition ($F(2, 75) = 1.68$, $p = .194$, $\eta_p^2 = .043$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 75) = 4.28$, $p = .042$, $\eta_p^2 = .054$) was statistically significant. Accordingly, the standard deviation of the longitudinal velocity in baseline level ($M = 15.95$, $SD = 3.76$, *Min.* = 7.57, *Max.*= 26.09) is significantly lower than follow-up level ($M = 16.60$, $SD = 4.39$, *Min.* = 7.59, *Max.*= 27.21). The main effect of condition ($F(2, 75) = .14$, $p = .867$, $\eta_p^2 = .004$) and the interaction effect of time and condition ($F(2, 75) = 2.30$, $p = .108$, $\eta_p^2 = .058$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = .63$, $p = .431$, $\eta_p^2 = .008$) and condition ($F(2, 75) = .09$, $p = .916$, $\eta_p^2 = .002$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 4.18$, $p = .019$, $\eta_p^2 = .10$) was statistically significant.

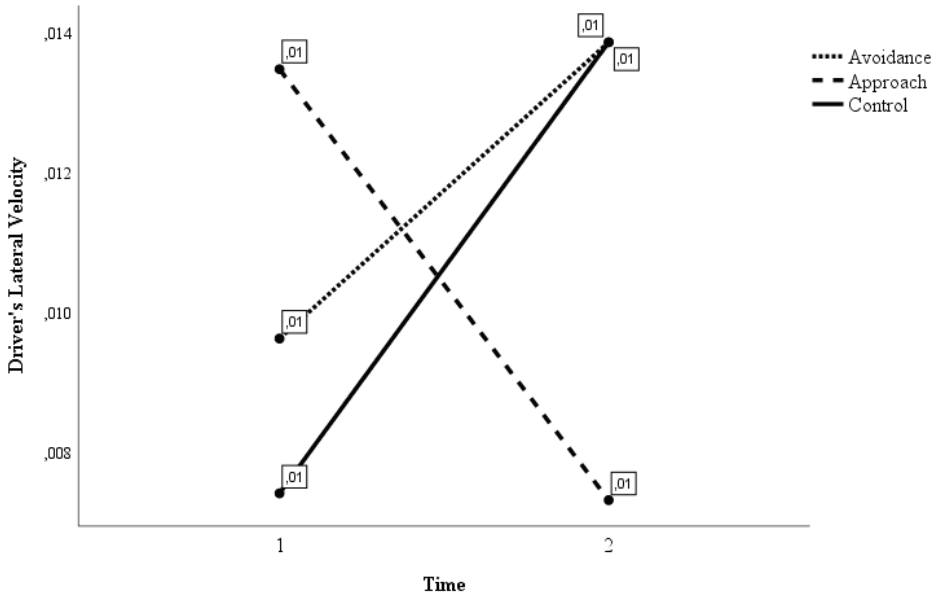

Figure 14. The Interaction Effect of Time and Condition on the Mean of Driver's Lateral Velocity

In terms of standard deviations, the main effects of time ($F(1, 75) = .02$, $p = .891$, $\eta_p^2 = .00$), condition ($F(2, 75) = 1.56$, $p = .217$, $\eta_p^2 = .04$), and the interaction effect of time and condition ($F(2, 75) = .42$, $p = .66$, $\eta_p^2 = .011$) were not statistically significant.

For *Driver's longitudinal acceleration due to throttle,* the main effects of time ($F(1, 75) = 7.53$, $p = .008$, $\eta_p^2 = .091$) was found as significant. Accordingly, the mean of the longitudinal acceleration due to throttle in baseline level ($M = .74$, $SD = .15$, *Min.* = .50, *Max.*= 1.18) is significantly lower than follow-up level ($M = .79$, $SD = .20$, *Min.* = .48, *Max.*= 1.46). The main effect of condition ($F(2, 75) = .24$, $p = .787$, $\eta_p^2 = .006$), and the interaction effect of time and condition ($F(2, 75) = 1.40$, $p = .253$, $\eta_p^2 = .036$) were not statistically significant. In terms of standard deviations, the main effects of time ($F(1, 75) = 3.51$, $p = .065$, $\eta_p^2 = .045$) and condition ($F(2, 75) = .20$, $p = .82$, $\eta_p^2 = .005$) and the interaction effect of time and condition ($F(2, 75) = 1.64$, $p = .201$, $\eta_p^2 = .042$) were not statistically significant.

For *Driver's longitudinal acceleration due to brake,* the main effects of time ($F(1, 75) = 4.67$, $p = .034$, $\eta_p^2 = .059$) was found as significant. Accordingly, the mean of the longitudinal acceleration due to brake in baseline level ($M = -.23$, $SD = .08$, *Min.* = -.53, *Max.*= -.11) is significantly higher than follow-up level ($M = -.25$, $SD = .12$, *Min.* = -.92, *Max.*= -.10). The main effect of condition ($F(2, 75) = .48$, $p = .618$, $\eta_p^2 = .013$), and the interaction effect of time and condition ($F(2, 75) = .25$, $p = .78$, $\eta_p^2 = .007$) were not statistically significant. In terms of standard deviations, the main effect of time ($F(1, 75) = .57$, $p = .452$, $\eta_p^2 = .008$) and condition ($F(2, 75) = .73$, $p = .487$, $\eta_p^2 = .019$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 3.46$, $p = .036$, $\eta_p^2 = .085$) was found as statistically significant.

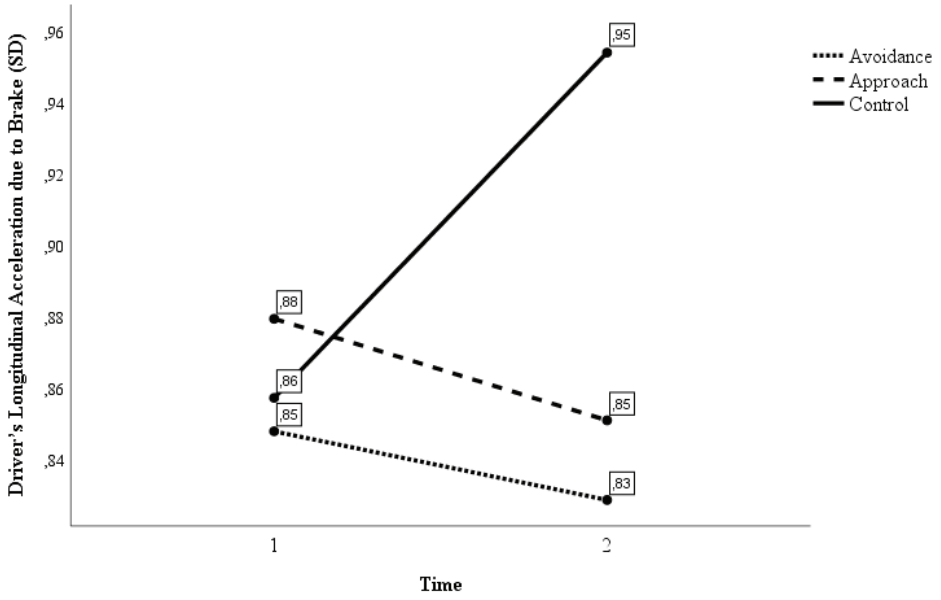

Figure 15. The Interaction Effect of Time and Condition on the Standard Deviations of Driver's Longitudinal Acceleration due to Brake

For *Total number of collisions,* the main effects of time ($F(1, 75) = .95$, $p = .332$, $\eta_p^2 = .013$) and condition ($F(2, 75) = .44$, $p = .647$, $\eta_p^2 = .012$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 5.21$, $p = .008$, $\eta_p^2 = .122$) was found as statistically significant.

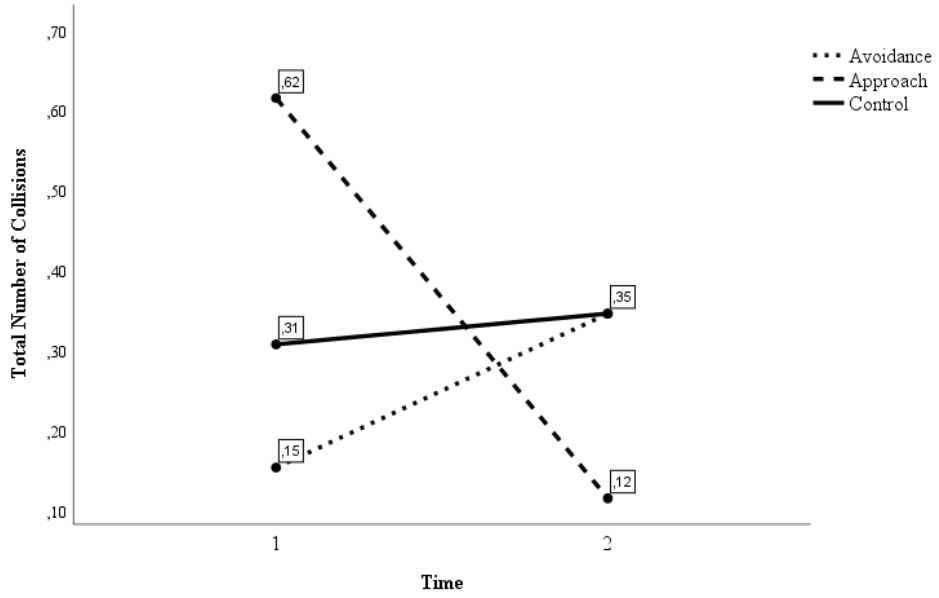

Figure 16. The Interaction Effect of Time and Condition on the Total Number of Collisions

Table 7. *The Post-hoc analyses results of the overall simulated driver behaviors in 3 x 2 Two-way Mixed ANOVA.*

Simulated Driver Behaviors	Data	Avoidance	Approach	Control	Post-hoc significance
Driver's longitudinal acceleration	Mean	*increase*	*n.s.*	*n.s.*	Avoidance, $p = .097$
Driver's longitudinal acceleration	SD	*n.s.*	*n.s.*	*increase*	Control, $p = .002$
Driver's lateral velocity	Mean	*n.s.*	*decrease*	*increase*	Approach, $p = .065$ Control, $p = .054$
Driver's longitudinal acceleration due to brake	SD	*n.s.*	*n.s.*	*increase*	Control, $p = .086$
Total number of collisions		*n.s.*	-	*n.s.*	Approach, $p = .002$

2.3.5 Results of the Events of Simulated Driving Behaviors

As it was stated in the method section, a total of ten events were placed in the driving scenario. Events were created in accordance to three categories which drivers can face with in daily traffic; events regarding pedestrians crossing the street, events regarding other vehicles' actions in traffic, and events regarding traffic light changes. In the driving scenario, five signalized intersections were created considering the length of the road in scenario.

Separate 2 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of condition and time; and the interaction effect between time and condition on simulated driver behaviors. The condition includes two levels as experimental (approaching and avoidance goals were combined) and control and the time consist of two levels as baseline and follow-up. Also, 3 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the main effects of both experimental conditions and time; and the interaction effect between time and condition on simulated driver behaviors. First two events were not covered by this section since they occurred in the begging of the scenario to avoid any bias related to familiarity. Similarly, the last event in the scenario was not included to this section to avoid the boredom effect. Yet, the results of these events were summarized in the end of this section below, in Table 8. Additionally, two events were not analyzed since they didn't interfere the driving experience of the participants (e.g. a parked car on the right pavement enters the road), and only placed to enrich the scenario.

2.3.5.1 Signalized intersections

2.3.5.1.1. Signalized intersection 2: 2 x 2 mixed ANOVA results (Event 3).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = 2.56$, $p = .114$, $\eta_p^2 = .033$), condition ($F(1, 76) = 1.11$, $p = .296$, $\eta_p^2 = .014$), and the interaction effect of time and condition ($F(1, 76) = 1.58$, $p = .212$, $\eta_p^2 = .020$) were not statistically significant.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = .64$, $p = .428$, $\eta_p^2 = .008$) and condition ($F(1, 76) = .05$, $p = .820$, $\eta_p^2 = .001$) were not significant. The interaction effect of time and condition ($F(1, 76) = 5.06$, $p = .027$, $\eta_p^2 = .062$) was found as statistically significant.

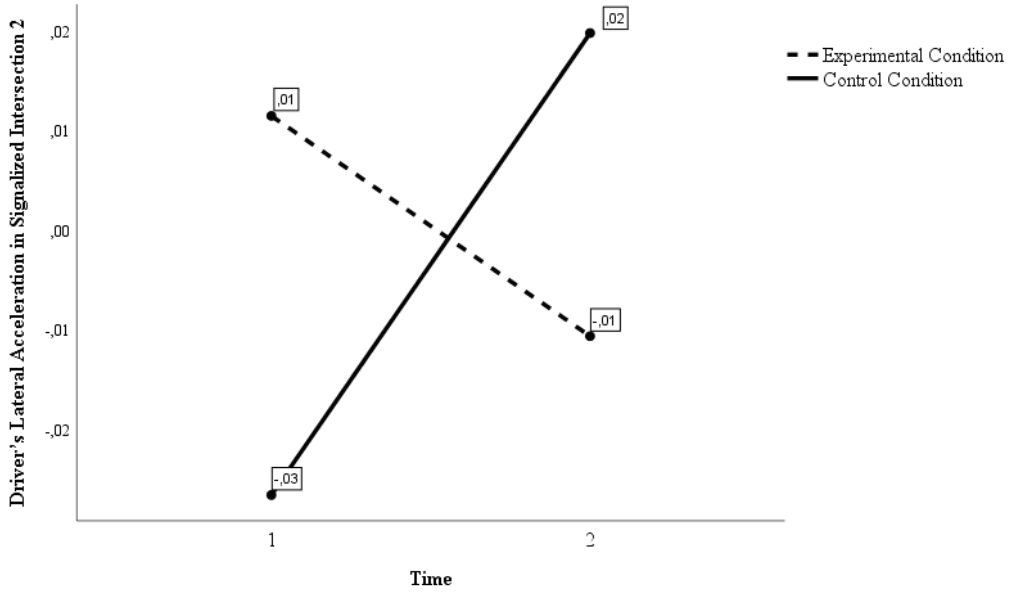

Figure 17. The Interaction Effect of Time and Condition on the Driver's Lateral Acceleration in Signalized Intersection 2.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 76) = .40$, $p = .536$, $\eta_p^2 = .005$), condition ($F(1, 76) = .26$, $p = .611$, $\eta_p^2 = .003$), and the interaction effect of time and condition ($F(1, 76) = .19$, $p = .664$, $\eta_p^2 = .002$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = 1.21$, $p = .274$, $\eta_p^2 = .016$), condition ($F(1, 76) = .89$, $p = .347$, $\eta_p^2 = .012$), and the interaction effect of time and condition ($F(1, 76) = .15$, $p = .697$, $\eta_p^2 = .002$) were not statistically significant.

2.3.5.1.2. Signalized intersection 2: 3 x 2 mixed ANOVA results (Event 3).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = 1.56$, $p = .216$, $\eta_p^2 = .02$), condition ($F(2, 75) = 1.20$, $p = .308$, $\eta_p^2 = .031$), and the interaction effect of time and condition ($F(2, 75) = .96$, $p = .387$, $\eta_p^2 = .025$) were not statistically significant.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = .00$, $p = .960$, $\eta_p^2 = .000$) and condition ($F(2, 75) = .60$, $p = .554$, $\eta_p^2 = .016$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 2.77$, $p = .069$, $\eta_p^2 = .069$) was marginally significant.

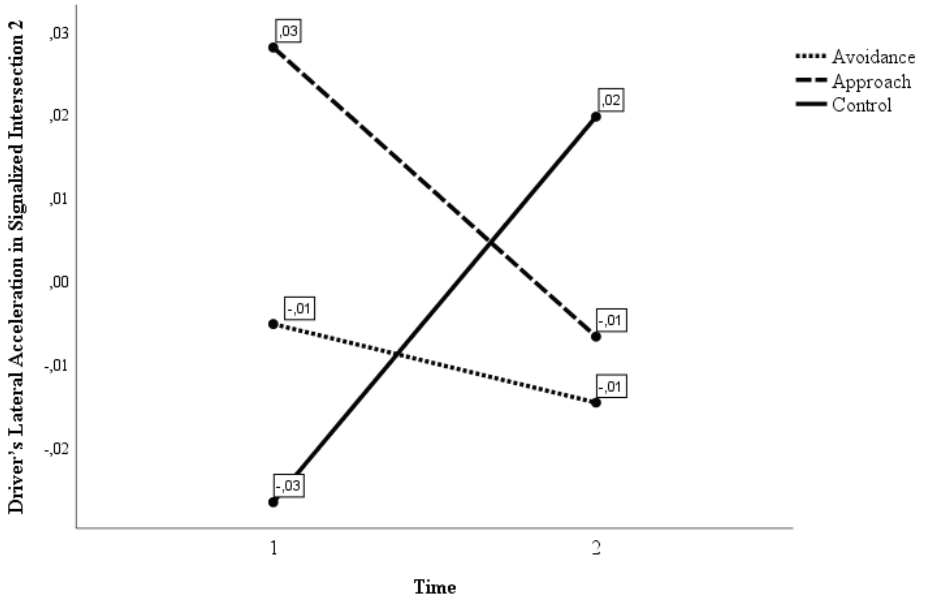

Figure 18. The Interaction Effect of Time and Condition on the Driver's Lateral Acceleration in Signalized Intersection 2.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 75) = .25$, $p = .616$, $\eta_p^2 = .003$), condition ($F(2, 75) = .15$, $p = .859$, $\eta_p^2 = .004$), and the interaction effect of time and condition ($F(2, 75) = .40$, $p = .670$, $\eta_p^2 = .011$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = 1.05$, $p = .310$, $\eta_p^2 = .014$), condition ($F(2, 75) = .45$, $p = .638$, $\eta_p^2 = .012$), and the interaction effect of time and condition ($F(2, 75) = .08$, $p = .927$, $\eta_p^2 = .002$) were not statistically significant.

2.3.5.1.3. Signalized intersection 3: 2 x 2 mixed ANOVA results (Event 4).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = .01$, $p = .906$, $\eta_p^2 = .000$) and condition ($F(1, 76) = .87$, $p = .353$, $\eta_p^2 = .011$) were not statistically significant. The interaction effect of time and condition ($F(1, 76) = 3.22$, $p = .077$, $\eta_p^2 = .041$) was marginally significant.

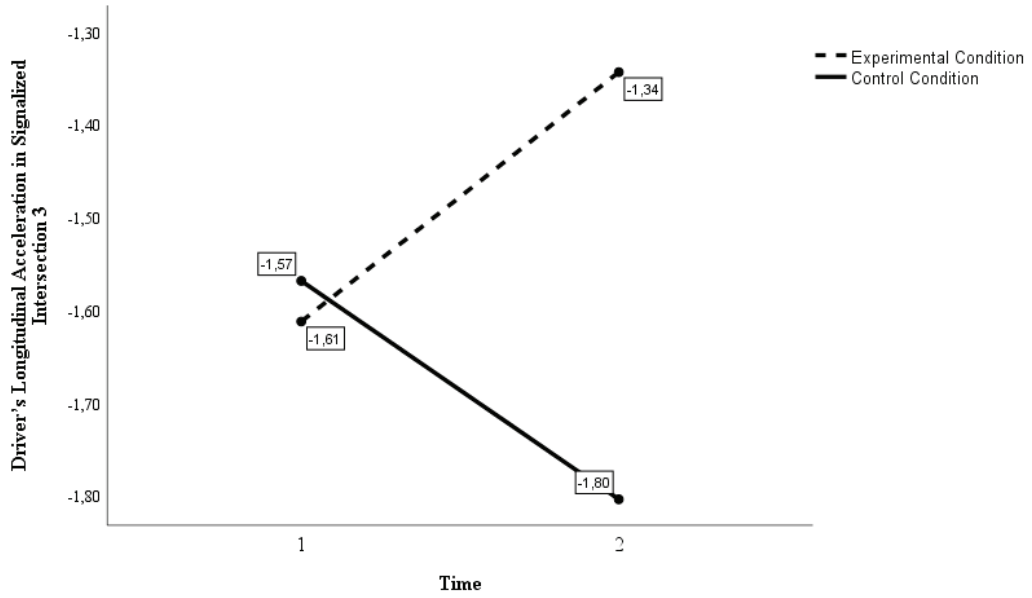

Figure 19. The Interaction Effect of Time and Condition on the Driver's Longitudinal Acceleration in Signalized Intersection 3.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = .29$, $p = .592$, $\eta_p^2 = .004$), condition ($F(1, 76) = .00$, $p = .973$, $\eta_p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = 2.25$, $p = .138$, $\eta_p^2 = .029$) were not significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 76) = .01$, $p = .936$, $\eta_p^2 = .000$) and condition ($F(1, 76) = .03$, $p = .854$, $\eta_p^2 = .000$) were not statistically significant. The interaction effect of time and condition ($F(1, 76) = 7.18$, $p = .009$, $\eta_p^2 = .086$) was statistically significant.

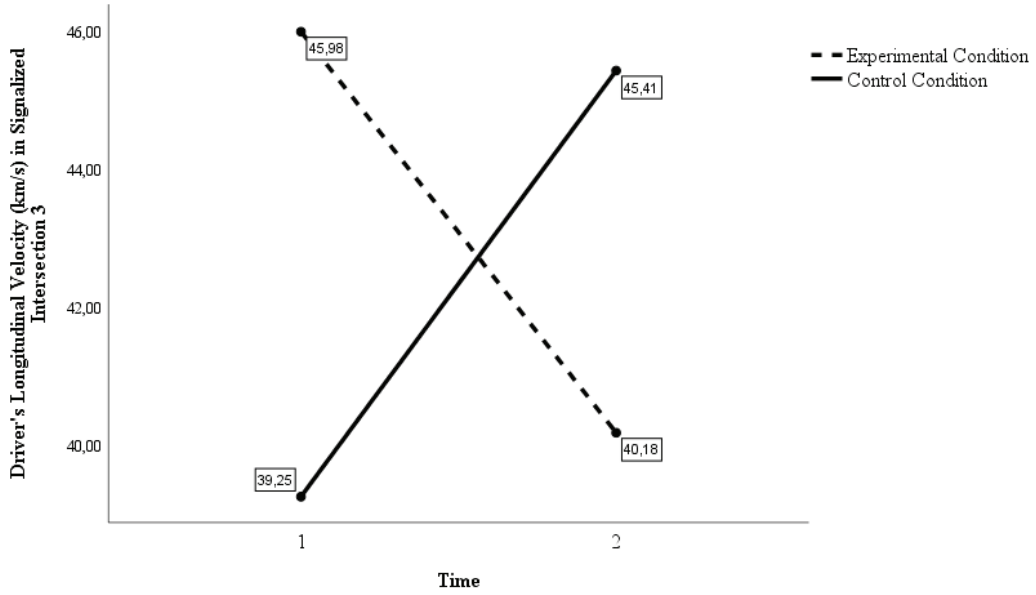

Figure 20. The Interaction Effect of Time and Condition on the Driver's Longitudinal Velocity in Signalized Intersection 3.

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = 1.73$, $p = .193$, $\eta_p^2 = .022$) and condition ($F(1, 76) = .00$, $p = .962$, $\eta_p^2 = .000$) were not statistically significant. The interaction effect of time and condition ($F(1, 76) = 4.32$, $p = .041$, $\eta_p^2 = .054$) was statistically significant.

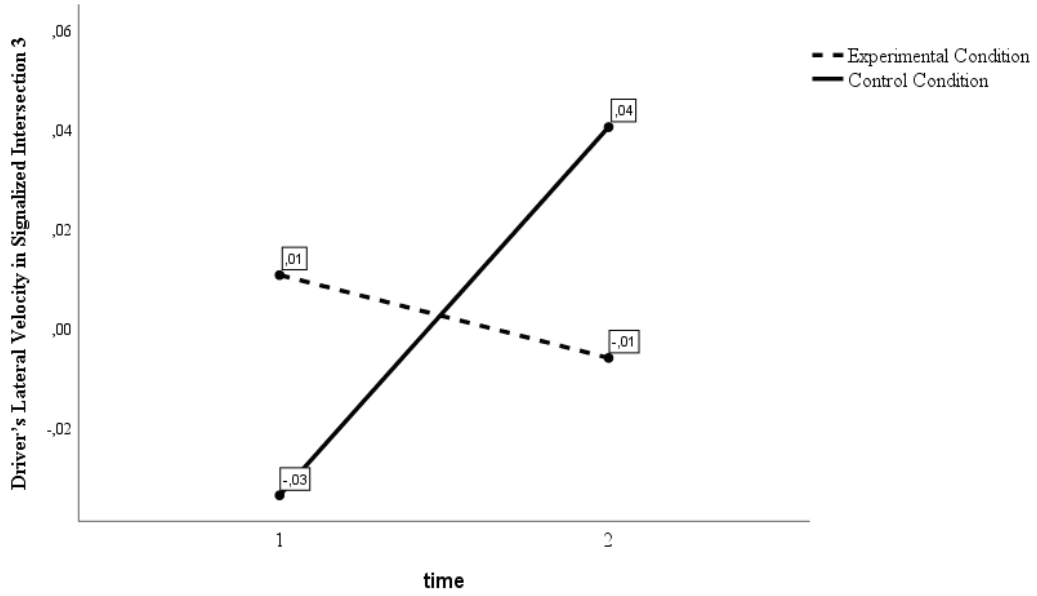

Figure 21. The Interaction Effect of Time and Condition on the Driver's Lateral Velocity in Signalized Intersection 3.

2.3.5.1.4. Signalized intersection 3: 3 x 2 mixed ANOVA results (Event 4).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = .57$, $p = .452$, $\eta_p^2 = .008$), condition ($F(2, 75) = .72$, $p = .490$, $\eta_p^2 = .019$), and the interaction effect of time and condition ($F(2, 75) = 1.61$, $p = .208$, $\eta_p^2 = .041$) were not statistically significant.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = .00$, $p = .967$, $\eta_p^2 = .000$), condition ($F(2, 75) = 2.74$, $p = .071$, $\eta_p^2 = .068$), and the interaction effect of time and condition ($F(2, 75) = 1.93$, $p = .152$, $\eta_p^2 = .049$) were not statistically significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 75) = .74$, $p = .393$, $\eta_p^2 = .010$) and condition ($F(2, 75) = .13$, $p = .876$, $\eta_p^2 = .004$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 3.93$, p .024, $\eta_p^2 = .095$) was found as significant.

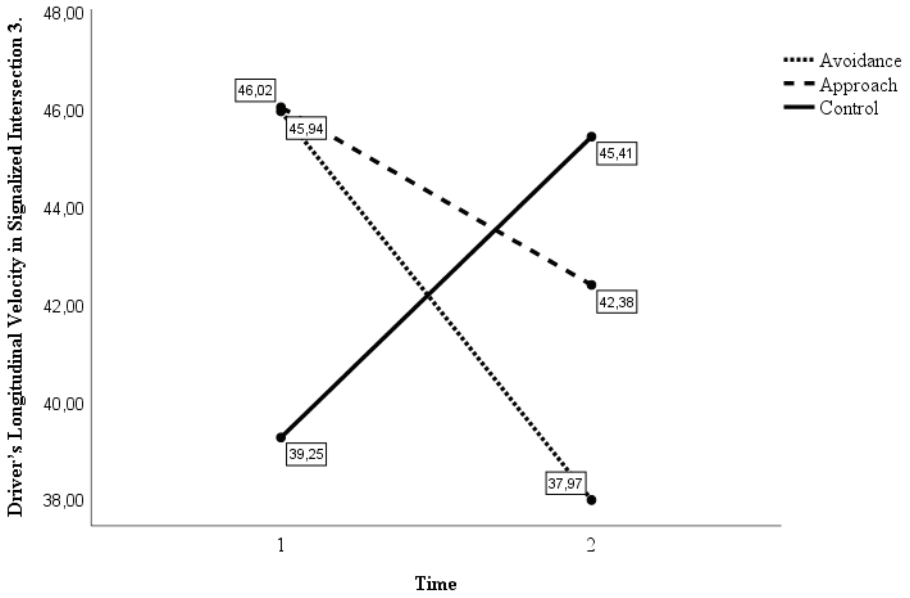

Figure 22. The Interaction Effect of Time and Condition on the Driver's Longitudinal Velocity in Signalized Intersection 3.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = .44$, $p = .509$, $\eta_p^2 = .006$) and condition ($F(2, 75) = .29$, $p = .751$, $\eta_p^2 = .008$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 3.13$, $p = .049$, $\eta_p^2 = .077$) was found as significant.

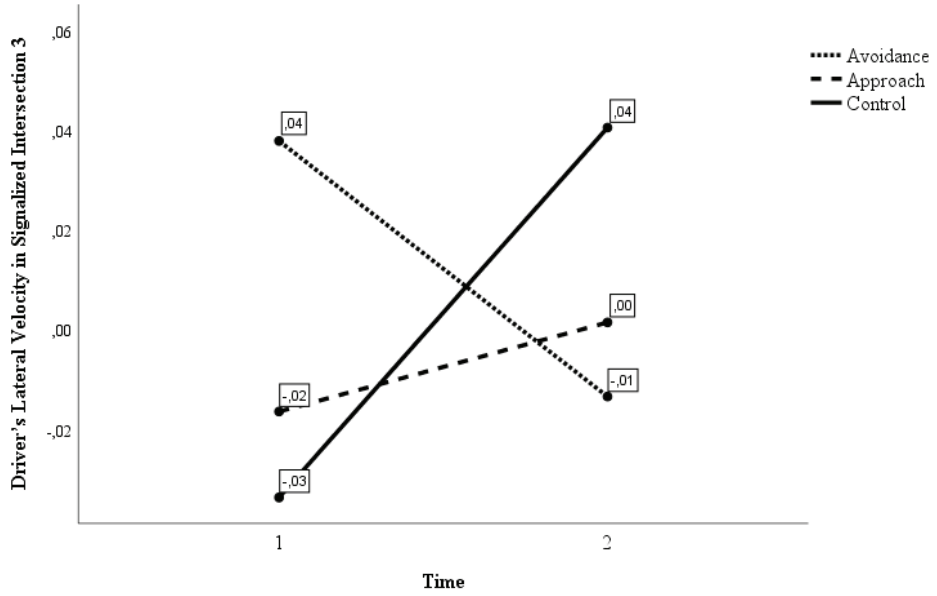

Figure 23. The Interaction Effect of Time and Condition on the Driver's Lateral Velocity in Signalized Intersection 3.

2.3.5.1.5. Signalized intersection 4: 2 x 2 mixed ANOVA results (Event 8).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = .02$, $p = .898$, $\eta p^2 = .000$), condition ($F(1, 76) = .00$, $p = .965$, $\eta p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = .16$, $p = .689$, $\eta p^2 = .002$) were not statistically significant

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = 2.26$, $p = .137$, $\eta_p^2 = .029$), condition ($F(1, 76) = .08$, $p = .782$, $\eta_p^2 = .001$) and the interaction effect of time and condition ($F(1, 76) = .45$, $p = .506$, $\eta_p^2 = .006$) were not significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 76) = .50$, $p = .449$, $\eta p^2 = .006$), condition ($F(1, 76) = .03$, $p = .863$, $\eta p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = .25$, $p = .621$, $\eta p^2 = .003$) were not significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = .36$, $p = .550$, $\eta p^2 = .005$), condition ($F(1, 76) = .89$, $p = .349$, $\eta p^2 = .012$), and the interaction effect of time and condition ($F(1, 76) = .08$, $p = .783$, $\eta p^2 = .001$) were not statistically significant.

2.3.5.1.6. Signalized intersection 4: 3 x 2 mixed ANOVA results (Event 8).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = .00$, $p = .995$, $\eta p^2 = .000$) and condition ($F(2, 75) = 1.09$, $p = .342$, $\eta p^2 = .028$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 2.54$, $p = .086$, $\eta p^2 = .063$) was found as statistically significant.

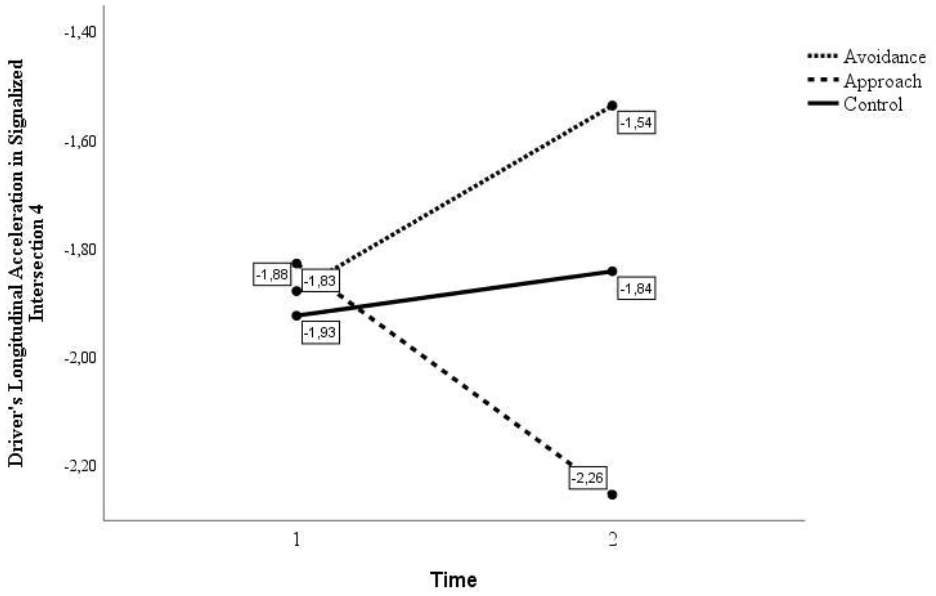

Figure 24. The Interaction Effect of Time and Condition on the Driver's Lateral Velocity in Signalized Intersection 4.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = 3.32$, $p = .072$, $\eta_p^2 = .042$) and condition ($F(2, 75) = .11$, $p = .849$, $\eta p^2 = .003$), and the interaction effect of time and condition ($F(2, 75) = .41$, $p = .663$, $\eta p^2 = .011$) were not statistically significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 75) = .79$, $p = .376$, $\eta p^2 = .010$), condition ($F(2, 75) = .22$, $p = .802$, $\eta p^2 = .006$), and the interaction effect of time and condition ($F(2, 75) = .19$, $p = .825$, $\eta p^2 = .005$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = .29$, $p = .595$, $\eta p^2 = .004$), condition ($F(2, 75) = 1.17$, $p = .315$, $\eta p^2 = .030$), and the interaction effect of time and condition ($F(2, 75) = .05$, $p = .949$, $\eta p^2 = .001$) were not statistically significant.

2.3.5.2 Pedestrian crossings

2.3.5.2.1. Pedestrian crossing 1: 2 x 2 mixed ANOVA results (Event 5).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = .15$, $p = .695$, $\eta_p^2 = .002$), condition ($F(1, 76) = .00$, $p = .973$, $\eta_p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = .19$, $p = .662$, $\eta_p^2 = .003$) were not significant.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = .10$, $p = .754$, $\eta_p^2 = .001$), condition ($F(1, 76) = .55$, $p = .462$, $\eta_p^2 = .007$) and the interaction effect of time and condition ($F(1, 76) = .44$, $p = .510$, $\eta_p^2 = .006$) were not significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 76) = .01$, $p = .91$, $\eta_p^2 = .000$), condition ($F(1, 76) = .62$, $p = .433$, $\eta_p^2 = .008$) and the interaction effect of time and condition ($F(1, 76) = 2.85$, $p = .095$, $\eta_p^2 = .036$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = .29$, $p = .594$, $\eta_p^2 = .004$), condition ($F(1, 76) = .92$, $p = .34$, $\eta_p^2 = .012$) and the interaction effect of time and condition ($F(1, 76) = 1.43$, $p = .235$, $\eta_p^2 = .018$) were not significant.

2.3.5.2.2. Pedestrian crossing 1: 3 x 2 mixed ANOVA results (Event 5).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = .07$, $p = .795$, $\eta_p^2 = .001$), condition ($F(2, 75) = .07$, $p = .932$, $\eta_p^2 = .002$), and the interaction

effect of time and condition ($F(2, 75) = .52$, $p = .595$, $\eta_p^2 = .014$) were not statistically significant.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = .01$, $p = .919$, $\eta_p^2 = .000$) and condition ($F(2, 75) = .40$, $p = .672$, $\eta_p^2 = .011$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 2.59$, $p = .082$, $\eta_p^2 = .065$) was found as marginally significant.

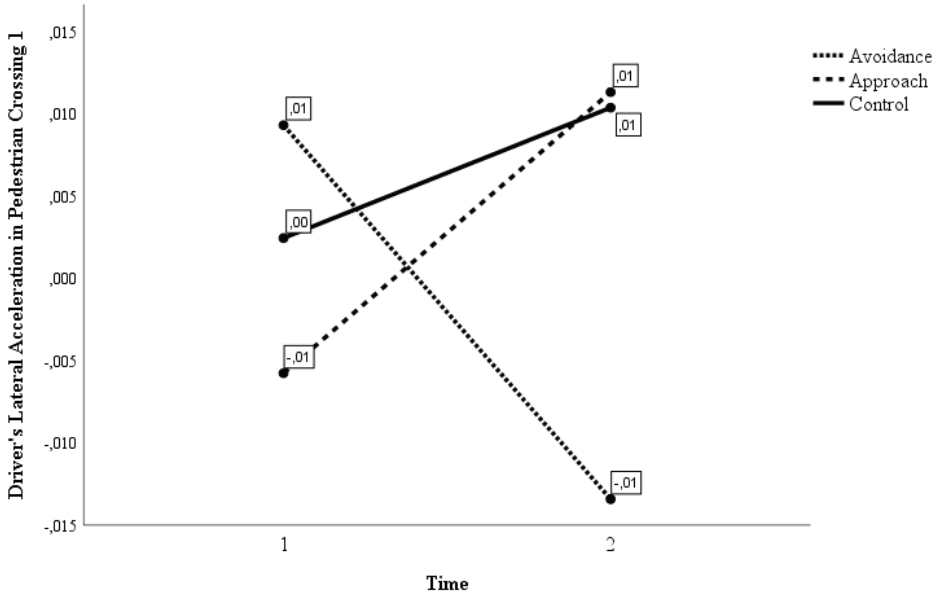

Figure 25. The Interaction Effect of Time and Condition on the Driver's Lateral Acceleration in Pedestrian Crossing 1.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 75) = .23$, $p = .637$, $\eta_p^2 = .003$), condition ($F(2, 75) = .48$, $p = .620$, $\eta_p^2 = .013$), and the interaction effect of time and condition ($F(2, 75) = 1.57$, $p = .215$, $\eta_p^2 = .040$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = .02$, $p = .885$, $\eta_p^2 = .000$), condition ($F(2, 75) = .72$, $p = .49$, $\eta_p^2 = .019$) and the interaction effect of time and condition ($F(2, 75) = 1.60$, $p = .210$, $\eta_p^2 = .041$) was not significant.

2.3.5.2.3. Pedestrian crossing 2: 2 x 2 mixed ANOVA results (Event 6).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 76) = 1.11$, $p = .296$, $\eta_p^2 = .014$) and condition ($F(1, 76) = 2.11$, $p = .150$, $\eta_p^2 = .027$) were not statistically significant. The interaction effect of time and condition ($F(1, 76) = 3.66$, $p = .060$, $\eta_p^2 = .046$) was marginally significant.

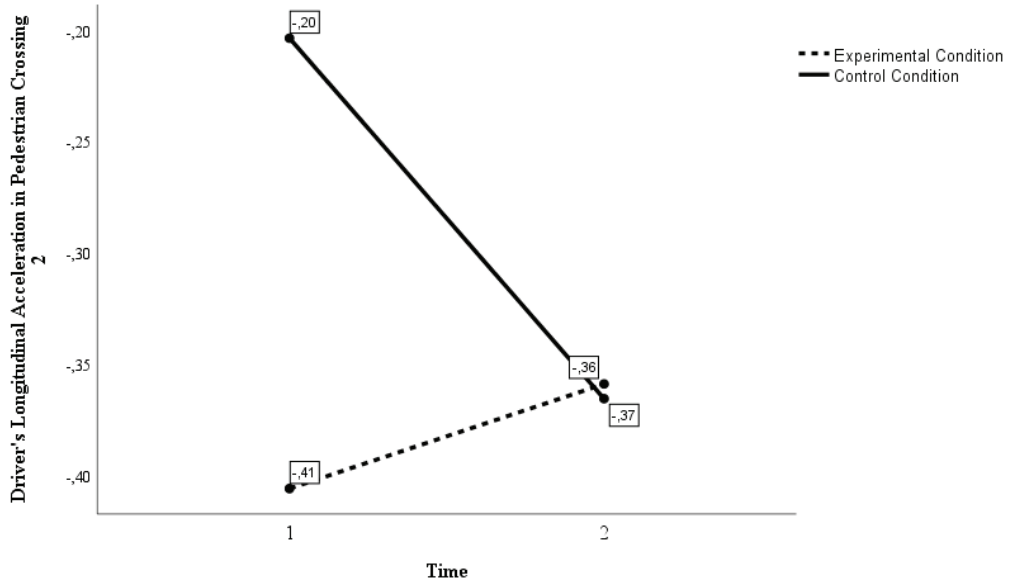

Figure 26. The Interaction Effect of Time and Condition on the Driver's Longitudinal Acceleration in Pedestrian Crossing 2.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 76) = .45$, $p = .506$, $\eta_p^2 = .006$), condition ($F(1, 76) = .02$, $p = .888$, $\eta_p^2 = .000$) and the interaction effect of time and condition ($F(1, 76) = .15$, $p = .704$, $\eta_p^2 = .002$) were not significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 76) = .71$, $p = .402$, $\eta_p^2 = .009$), condition ($F(1, 76) = .21$, $p = .648$, $\eta_p^2 = .003$) and the interaction effect of time and condition ($F(1, 76) = .31$, $p = .577$, $\eta_p^2 = .004$) were not significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 76) = 2.40$, $p = .126$, $\eta_p^2 = .031$), condition ($F(1, 76) = 2.46$, $p = .121$, $\eta_p^2 = .031$) and the interaction effect of time and condition ($F(1, 76) = 1.24$, $p = .270$, $\eta_p^2 = .016$) were not significant.

2.3.5.2.4. Pedestrian crossing 2: 3 x 2 mixed ANOVA results (Event 6).

For *Driver's longitudinal acceleration,* the main effects of time ($F(1, 75) = .20$, $p = .659$, $\eta_p^2 = .003$) and condition ($F(2, 75) = 1.06$, $p = .35$, $\eta_p^2 = .028$) were not statistically significant. The interaction effect of time and condition ($F(2, 75) = 2.78$, $p = .069$, $\eta_p^2 = .069$) was marginally significant.

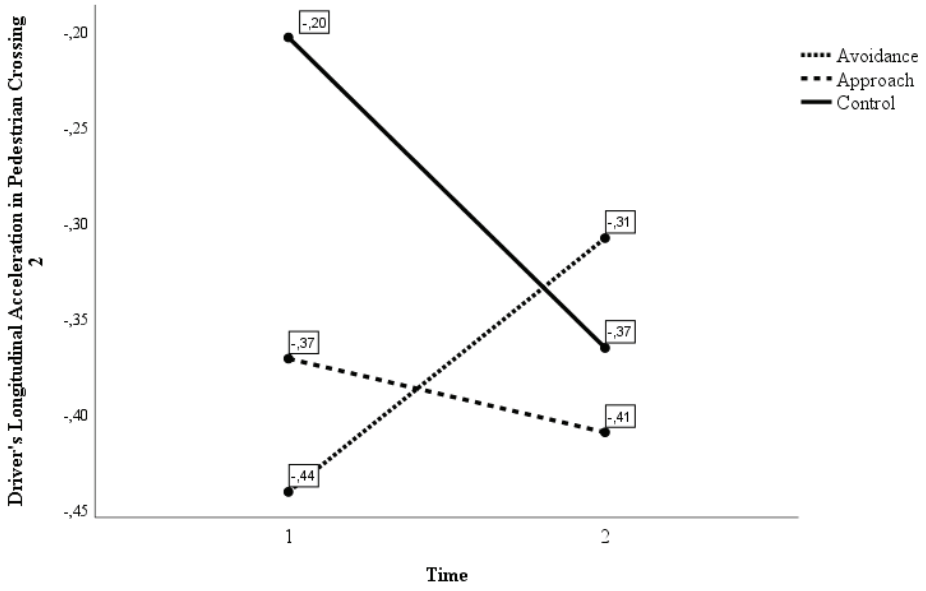

Figure 27. The Interaction Effect of Time and Condition on the Driver's Longitudinal Acceleration in Pedestrian Crossing 2.

For *Driver's lateral acceleration,* the main effects of time ($F(1, 75) = .33$, $p = .566$, $\eta_p^2 = .004$), condition ($F(2, 75) = .11$, $p = .899$, $\eta_p^2 = .003$), and the interaction effect of time and condition ($F(2, 75) = .79$, $p = .458$, $\eta_p^2 = .021$) were not statistically significant.

For *Driver's longitudinal velocity (km/s),* the main effects of time ($F(1, 75) = .48$, $p = .489$, $\eta_p^2 = .006$), condition ($F(2, 75) = .15$, $p = .860$, $\eta_p^2 = .004$), and the interaction effect of time and condition ($F(2, 75) = .48$, $p = .621$, $\eta_p^2 = .013$) were not statistically significant.

For *Driver's lateral velocity,* the main effects of time ($F(1, 75) = 1.57$, $p = .215$, $\eta_p^2 = .020$), condition ($F(2, 75) = 1.32$, $p = .274$, $\eta_p^2 = .034$) and the interaction effect of time and condition ($F(2, 75) = 1.25$, $p = .292$, $\eta_p^2 = .032$) was not significant.

Table 8. *The Post-hoc analyses results of the event-based simulated driver behaviors in 3 x 2 Two-way Mixed ANOVA.*

Events	Simulated Driver Behaviors	Avoidance	Approach	Control	Post-hoc significance
Signalized Intersection-1 (*event 1*) There was not a significant interaction in both 2 x 2 and 3 x 2 two-way Mixed ANOVA results					
Signalized Intersection-2	*Driver's lateral acceleration*	*n.s.*	*n.s.*	*increase*	Control, $p = .067$
Signalized Intersection-3	*Driver's longitudinal velocity*	*decrease*	*n.s.*	*increase*	Avoidance, $p = .032$ Control, $p = .096$
	Driver's lateral velocity	*n.s.*	*n.s.*	*increase*	Control, $p = .040$
Signalized Intersection-4	*Driver's longitudinal acceleration*	*n.s.*	*increase*	*n.s.*	Approach, $p = .035$
Signalized Intersection-5 (*event 10*) There was not a significant interaction in both 2 x 2 and 3 x 2 two-way Mixed ANOVA results					
Vehicle ahead (*event 2*) There was not a significant interaction in both 2 x 2 and 3 x 2 two-way Mixed ANOVA results					
Pedestrian Crossing 1	*Driver's lateral acceleration*	*decrease*	*n.s.*	*n.s.*	Avoidance, $p = .083$
Pedestrian Crossing 2	*Driver's longitudinal acceleration*	*n.s.*	*n.s.*	*increase*	Control, $p = .072$

2.3.6 Results of the Three-way Interactions between Speed Limit Compliance, Condition and Time

Separate 2 x 2 x 2 and 3 x 2 x 2 mixed model analysis of variances (ANOVAs) were conducted to compare the interaction effects between preferred speed limit compliance, condition and time on both self-reported and simulated driver behaviors. The preferred speed limit compliance was categorized into two levels as 'compliance' and 'non-compliance', considering the 10 % speed limit tolerance. The condition factor includes three levels as 'approach', 'avoidance' and 'control' in 3 x 2 x 2 interaction, by combining the levels of goal types, the condition factor in 2 x 2 x 2 interaction consist of two levels as 'experimental' and 'control'. Lastly, the time consist of two levels as baseline and follow-up. Since the 'time' condition has only two levels, the Mauchly's test of Sphericity was not calculated for the rest of the analyses. The significant interaction effects and the marginally significant effects on the means of variables were presented in Table 9 below. The post-hoc analyses of the significant interactions and the behavioral change over time were summarized in the Table 10.

For *lapses*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance in *urban roads,* condition and time was found as marginally significant, ($F(1, 72) = 3.84$, $p = .054$, $\eta_p^2 = .051$). Accordingly, there is a decrease in the means on the participants in compliance x control conditions between baseline ($M = 1.00$, $SD = .31$) and follow-up conditions ($M = .54$, $SD = .29$).

For *ordinary violations*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as marginally significant, ($F(1, 73) = 3.28$, $p = .074$, $\eta_p^2 = .043$). Accordingly, there is a increase in the means on the participants in non-compliance x control conditions between baseline ($M = 2.52$, $SD = .29$) and follow-up conditions ($M = 2.85$, $SD = .32$).

For *positive driver behaviors*, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 90 km/h*, condition and time was found as significant, ($F(2, 71) = 3.50$, $p = .035$, $\eta_p^2 = .090$). Accordingly, there is a decrease in the means on

the participants in non-compliance x avoidance conditions between baseline (M = 3.53, SD = .15) and follow-up conditions (M = 3.24, SD = .16). Also, there is a decrease in the means on the participants in non-compliance x control conditions between baseline (M = 3.55, SD = .18) and follow-up conditions (M = 3.31, SD = .19).

For *longitudinal acceleration*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as significant, (F(1, 73) = 8.13, p = .006, η_p^2 = .100). Accordingly, there was an increase in the means on the participants in non-compliance x control conditions between baseline (M = .10, SD = .02) and follow-up conditions (M = .20, SD = .03). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as significant, (F(2, 71) = 4.64, p = .013, η_p^2 = .116). There was an increase in the means on the participants in compliance x avoidance conditions between baseline (M = .05, SD = .01) and follow-up conditions (M = .08, SD = .01), Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline (M = .10, SD = .02) and follow-up conditions (M = .20, SD = .03).

For *longitudinal acceleration*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 110 km/h*, condition and time was found as significant, (F(1, 73) = 8.38, p = .005, η_p^2 = .103). Accordingly, there was an increase in the means on the participants in non-compliance x experimental conditions between baseline (M = .07, SD = .01) and follow-up conditions (M = .10, SD = .02). The 3 x 2 x 2 interaction effect of preferred speed limit compliance where the limit is 110 km/h, condition and time was found as significant, (F(2, 71) = 5.03, p = .009, η_p^2 = .124). Accordingly, there was a decrease in the means on the participants in compliance x approach conditions between baseline (M = .07, SD = .01) and follow-up conditions (M = .05, SD = .01). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline (M = .11, SD = .03) and follow-up conditions (M = .27, SD = .04).

For *longitudinal velocity*, the 3 x 2 x 2 interaction effect of preferred speed limit compliance in *rural roads*, condition and time was found as significant, ($F(2, 70) = 3.16$, $p = .048$, $\eta_p^2 = .083$). Accordingly, there was a decrease in the means on the participants in compliance x approach conditions between baseline ($M = 68.25$, $SD = 4.76$) and follow-up conditions ($M = 62.03$, $SD = 5.34$). Also, there was an increase in the means on the participants in compliance x control conditions between baseline ($M = 51.18$, $SD = 4.76$) and follow-up conditions ($M = 57.22$, $SD = 5.34$). Lastly, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = 65.86$, $SD = 2.08$) and follow-up conditions ($M = 68.67$, $SD = 2.33$).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as marginally significant, ($F(1, 73) = 3.77$, $p = .056$, $\eta_p^2 = .049$). Accordingly, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .83$, $SD = .05$) and follow-up conditions ($M = .99$, $SD = .07$). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where the limit is 50 km/h, condition and time was found as marginally significant, ($F(2, 71) = 2.74$, $p = .071$, $\eta_p^2 = .072$). Accordingly, there was an increase in the means on the participants in compliance x avoidance conditions between baseline ($M = .70$, $SD = .04$) and follow-up conditions ($M = .79$, $SD = .05$). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .83$, $SD = .05$) and follow-up conditions ($M = .99$, $SD = .07$).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as significant, ($F(1, 73) = 3.99$, $p = .049$, $\eta_p^2 = .052$). Accordingly, there was an increase in the means on the participants in compliance x control conditions between baseline ($M = .72$, $SD = .03$) and follow-up conditions ($M = .78$, $SD = .04$). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .91$, $SD = .08$) and follow-up conditions ($M = 1.17$, $SD = .11$).

Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where the limit is 82 km/h, condition and time was found as marginally significant, ($F(2, 71) = 2.58$, $p = .083$, $\eta_p^2 = .068$). Accordingly, there was an increase in the means on the participants in compliance x avoidance conditions between baseline ($M = .70$, $SD = .03$) and follow-up conditions ($M = .76$, $SD = .04$). Also, there was an increase in the means on the participants in compliance x control conditions between baseline ($M = .72$, $SD = .03$) and follow-up conditions ($M = .78$, $SD = .04$). Lastly, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .91$, $SD = .08$) and follow-up conditions ($M = 1.17$, $SD = .11$).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 110 km/h*, condition and time was found as significant, ($F(1, 73) = 6.28$, $p = .014$, $\eta_p^2 = .079$). Accordingly, there was an increase in the means on the participants in compliance x control conditions between baseline ($M = .73$, $SD = .03$) and follow-up conditions ($M = .78$, $SD = .04$). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .96$, $SD = .10$) and follow-up conditions ($M = 1.34$, $SD = .13$). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where the limit is 110 km/h, condition and time was found as significant, ($F(2, 71) = 3.58$, $p = .033$, $\eta_p^2 = .092$). Accordingly, there was an increase in the means on the participants in compliance x avoidance conditions between baseline ($M = .70$, $SD = .03$) and follow-up conditions ($M = .76$, $SD = .04$). Also, there was an increase in the means on the participants in compliance x control conditions between baseline ($M = .73$, $SD = .03$) and follow-up conditions ($M = .78$, $SD = .04$). Lastly, there was an increase in the means on the participants in non-compliance x control conditions between baseline ($M = .96$, $SD = .10$) and follow-up conditions ($M = 1.34$, $SD = .13$).

For *longitudinal acceleration due to throttle,* the 3 x 2 x 2 interaction effect of preferred speed limit compliance in *rural roads*, condition and time was found as marginally significant, ($F(2, 70) = 2.52$, $p = .087$, $\eta_p^2 = .067$). Accordingly, there was a decrease in the means on the participants in compliance x approach conditions between baseline (*M*

= .84, *SD* = .07) and follow-up conditions (*M* = .66, *SD* = .10). Also, there was an increase in the means on the participants in non-compliance x avoidance conditions between baseline (*M* = .74, *SD* = .03) and follow-up conditions (*M* = .80, *SD* = .05). Lastly, there was an increase in the means on the participants in non-compliance x control conditions between baseline (*M* = .77, *SD* = .03) and follow-up conditions (*M* = .85, *SD* = .05).

For *longitudinal acceleration due to brake,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as marginally significant, ($F(1, 73) = 3.01$, $p = .087$, $\eta_p^2 = .040$). Accordingly, there was an increase in the means on the participants in compliance x experimental conditions between baseline (*M* = -.21, *SD* = .01) and follow-up conditions (*M* = -.24, *SD* = .01). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline (*M* = -.27, *SD* = .03) and follow-up conditions (*M* = -.35, *SD* = .04). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as marginally significant, ($F(2, 71) = 2.62$, $p = .080$, $\eta_p^2 = .069$). Accordingly, there was an increase in the means on the participants in compliance x avoidance conditions between baseline (*M* = -.20, *SD* = .02) and follow-up conditions (*M* = -.28, *SD* = .03). Also, there was an increase in the means on the participants in non-compliance x control conditions between baseline (*M* = -.27, *SD* = .03) and follow-up conditions (*M* = -.35, *SD* = .04).

Table 9. *The interaction effect of speed limit compliance (compliance vs. non-compliance), conditions (experimental (approach vs. avoidance) vs. control), and time (baseline vs. follow-up) on the means of variables*

	Prefered speed where the limit is 50 km/h		Prefered speed where the limit is 82 km/h		Prefered speed where the limit is 90 km/h		Prefered speed where the limit is 110 km/h		Average speed preference in urban roads		Average speed preference in rural roads	
	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2
Lapses	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	$F(1, 72) = 3.84$, $p = .054$	*n.s.*	*n.s.*	*n.s.*
Errors	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Aggressive Violations	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Ordinary Violations	*n.s.*	*n.s.*	$F(1, 73) = 3.28$, $p = .074$	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Positive Driver Behaviors	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	**$F(2, 71) = 3.50$, $p = .035$**	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Acceleration	*n.s.*	*n.s.*	**$F(1, 73) = 8.13$, $p = .006$**	**$F(2, 71) = 4.64$, $p = .013$**	*n.s.*	*n.s.*	**$F(1, 73) = 8.38$, $p = .005$**	**$F(2, 71) = 5.03$, $p = .009$**	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Lateral Acceleration	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Velocity	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	**$F(2, 70) = 3.16$, $p = .048$**
Lateral Velocity	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Acceleration due to Throttle	$F(1, 73) = 3.77$, $p = .056$	$F(2, 71) = 2.74$, $p = .071$	**$F(1, 73) = 3.99$, $p = .049$**	$F(2, 71) = 2.58$, $p = .083$	*n.s.*	*n.s.*	**$F(1, 73) = 6.28$, $p = .014$**	**$F(2, 71) = 3.58$, $p = .033$**	*n.s.*	*n.s.*	*n.s.*	$F(2, 70) = 2.52$, $p = .087$
Longitudinal Acceleration due to Brake	$F(1, 73) = 3.01$, $p = .087$	$F(2, 62) = 2.74$, $p = .080$	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*

Table 10. *The post-hoc analyses for the mean changes between baseline and follow-up levels*

	3 x 2 Experimental Conditions						2 x 2 Experimental Conditions			
	Approach		Avoidance		Control		Experiment		Control	
	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance
Lapses *(M) Average speed preference in urban roads*	*n.s.*						*n.s.*	*n.s.*	Decrease (p = .007)	*n.s.*
Ordinary violations *(M) Prefered speed where the limit is 82 km/h*	*n.s.*						*n.s.*	Increase (p = .096)	*n.s.*	*n.s.*
Positive Driver Behaviors *(M) Prefered speed where the limit is 90 km/h*	*n.s.*	*n.s.*	*n.s.*	Decrease (p = .018)	*n.s.*	*n.s.*	*n.s.*			
Longitudinal Acceleration *(M) Prefered speed where the limit is 82 km/h*	*n.s.*	*n.s.*	Increase (p = .071)	*n.s.*	*n.s.*	Increase (p = .001)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)
Longitudinal Acceleration *(M) Prefered speed where the limit is 110 km/h*	Decrease (p = .072)	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Increase (p = .000)	*n.s.*	Increase (p = .072)	*n.s.*	Increase (p = .000)

Table 10. *The post-hoc analyses for the mean changes between baseline and follow-up levels*

	3 x 2 Experimental Conditions						2 x 2 Experimental Conditions			
	Approach		Avoidance		Control		Experiment		Control	
	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance
Longitudinal Velocity *(M) Average speed preference in rural roads*	Decrease (p = .075)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .083)	Increase (p = .066)			*n.s.*	
Longitudinal Acceleration due to Throttle *(M) Prefered speed where the limit is 50 km/h*	*n.s.*	*n.s.*	Increase (p = .028)	*n.s.*	*n.s.*	Increase (p = .002)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .002)
Longitudinal Acceleration due to Throttle *(M) Prefered speed where the limit is 82 km/h*	*n.s.*	*n.s.*	Increase (p = .049)	*n.s.*	Increase (p = .073)	Increase (p = .004)	*n.s.*	*n.s.*	Increase (p = .073)	Increase (p = .004)
Longitudinal Acceleration due to Throttle *(M) Prefered speed where the limit is 110 km/h*	*n.s.*	*n.s.*	Increase (p = .080)	*n.s.*	Increase (p = .069)	Increase (p = .000)	*n.s.*	*n.s.*	Increase (p = .068)	Increase (p = .000)

Table 10. *The post-hoc analyses for the mean changes between baseline and follow-up levels (continued)*

	3 x 2 Experimental Conditions						2 x 2 Experimental Conditions			
	Approach		Avoidance		Control		Experiment		Control	
	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance
Longitudinal Acceleration due to Throttle *(M) Average speed preference in rural roads*	Decrease (p = .012)	*n.s.*	*n.s.*	Increase (p = .068)	*n.s.*	Increase (p = .008)	*n.s.*			
Longitudinal Acceleration due to Brake *(M) Prefered speed where the limit is 50 km/h*	*n.s.*	*n.s.*	Increase (p = .028)	*n.s.*	*n.s.*	Increase (p = .002)	Increase (p = .079)	*n.s.*	*n.s.*	Increase (p = .034)

In Table 11, the interaction effects of the aforementioned variables conducted for the standard deviations of the variables. The post-hoc analyses results of of the significant interactions and the behavioral change over time were summarized in the Table 12.

For *lapses*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance in *urban roads,* condition and time was found as significant, ($F(1, 72) = 5.60$, $p = .021$, $\eta_p^2 = .072$). Accordingly, there is a decrease in the standard deviations of participants in compliance x control conditions between baseline ($M = 1.09$, $SD = .25$) and follow-up conditions ($M = .68$, $SD = .25$). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance in *urban roads,* condition and time was found as marginally significant, ($F(2, 70) = 2.79$, $p = .068$, $\eta_p^2 = .074$). Accordingly, there is a decrease in the standard deviations of participants in compliance x control conditions between baseline ($M = 1.09$, $SD = .25$) and follow-up conditions ($M = .68$, $SD = .25$).

For *aggressive violations*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 90 km/h,* condition and time was found as marginally significant, ($F(1, 73) = 3.20$, $p = .078$, $\eta_p^2 = .042$). Accordingly, there was a decrease in the standard deviations of participants in non-compliance x experimental conditions between baseline ($M = 1.47$, $SD = .13$) and follow-up conditions ($M = 1.29$, $SD = .13$). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 90 km/h,* condition and time was found as marginally significant, ($F(2, 71) = 2.61$, $p = .081$, $\eta_p^2 = .068$). Accordingly, there was a decrease in the standard deviations of participants in non-compliance x avoidance conditions between baseline ($M = 1.55$, $SD = .17$) and follow-up conditions ($M = 1.46$, $SD = .17$).

For *longitudinal acceleration*, the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as marginally significant, ($F(1, 73) = 3.66$, $p = .060$, $\eta_p^2 = .048$). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline ($M = 1.29$, $SD = .10$) and follow-up conditions ($M = 1.60$, $SD = .11$). The 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*,

condition and time was found as marginally significant, ($F(2, 71) = 2.87$, $p = .063$, $\eta_p^2 = .075$). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline ($M = 1.29$, $SD = .10$) and follow-up conditions ($M = 1.60$, $SD = .11$).

For *longitudinal acceleration*, the 3 x 2 x 2 interaction effect of preferred speed limit compliance in *rural roads*, condition and time was found as marginally significant, ($F(2, 70) = 6.88$, $p = .002$, $\eta_p^2 = .164$). Accordingly, there was a decrease in the standard deviations of participants in compliance x approach conditions between baseline ($M = 1.41$, $SD = .15$) and follow-up conditions ($M = .97$, $SD = .18$). Additionally, there was an increase in the standard deviations of participants in non-compliance x approach conditions between baseline ($M = 1.11$, $SD = .06$) and follow-up conditions ($M = 1.21$, $SD = .08$). Lastly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline ($M = 1.18$, $SD = .06$) and follow-up conditions ($M = 1.38$, $SD = .08$).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as significant, ($F(1, 73) = 5.83$, $p = .018$, $\eta_p^2 = .074$). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline ($M = .71$, $SD = .06$) and follow-up conditions ($M = .91$, $SD = .08$). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 50 km/h*, condition and time was found as significant, ($F(2, 71) = 3.21$, $p = .046$, $\eta_p^2 = .083$). There was an increase in the standard deviations of participants in non-compliance x control conditions between baseline ($M = .71$, $SD = .06$) and follow-up conditions ($M = .91$, $SD = .08$).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as significant, ($F(1, 73) = 5.24$, $p = .025$, $\eta_p^2 = .067$). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between

baseline (M = .71, SD = .11) and follow-up conditions (M = 1.06, SD = .13). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 82 km/h*, condition and time was found as marginally significant, ($F(2, 71) = 3.94$, p = .024, η_p^2 = .100). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline (M = .71, SD = .11) and follow-up conditions (M = 1.06, SD = .13).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 90 km/h*, condition and time was found as significant, ($F(1, 73) = 4.27$, p = .042, η_p^2 = .055). Accordingly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline (M = .72, SD = .07) and follow-up conditions (M = .96, SD = .09).

For *longitudinal acceleration due to throttle,* the 2 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 110 km/h*, condition and time was found as significant, ($F(1, 73) = 4.17$, p = .045, η_p^2 = .054). Accordingly, there was an increase in the standard deviations of participants in compliance x control conditions between baseline (M = .63, SD = .04) and follow-up conditions (M = .69, SD = .04). Also, there was an increase in the standard deviations of participants in non-compliance x experiment conditions between baseline (M = .74, SD = .07) and follow-up conditions (M = .85, SD = .08). Lastly, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline (M = .77, SD = .14) and follow-up conditions (M = 1.23, SD = .16). Also, the 3 x 2 x 2 interaction effect of preferred speed limit compliance where *the limit is 110 km/h*, condition and time was found as marginally significant, ($F(2, 71) = 2.86$, p = .064, η_p^2 = .075). Accordingly, there was an increase in the standard deviations of participants in compliance x control conditions between baseline (M = .63, SD = .04) and follow-up conditions (M = .69, SD = .04). Also, there was an increase in the standard deviations of participants in non-compliance x approach conditions between baseline (M = .78, SD = .11) and follow-up conditions (M = .98, SD = .13). Lastly, there was an increase in the standard deviations

of participants in non-compliance x control conditions between baseline (M = .77, SD = .14) and follow-up conditions (M = 1.23, SD = .16).

For *longitudinal acceleration due to brake,* the 3 x 2 x 2 interaction effect of preferred speed limit compliance in *rural roads*, condition and time was found as marginally significant, (F(2, 70) = 7.29, p = .001, η_p^2 = .172). Accordingly, there was a decrease in the standard deviations of participants in compliance x approach conditions between baseline (M = 1.06, SD = .11) and follow-up conditions (M = .73, SD = .11). Also, there was an increase in the standard deviations of participants in non-compliance x control conditions between baseline (M = .87, SD = .05) and follow-up conditions (M = .99, SD = .05).

Table 11. *The interaction effect of conditions (experimental (approach vs. avoidance) vs. control), time (baseline vs. follow-up) and speed compliance (low vs. high) on the standard deviations of variables*

	Prefered speed where the limit is 50 km/h		Prefered speed where the limit is 82 km/h		Prefered speed where the limit is 90 km/h		Prefered speed where the limit is 110 km/h		Average speed preference in urban roads		Average speed preference in rural roads	
	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2	2 x 2 x 2	3 x 2 x 2
Lapses	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	**$F(1, 72) = 5.60$, $p = .012$**	$F(2, 70) = 2.79$, $p = .068$	*n.s.*	*n.s.*
Errors	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Aggressive Violations	*n.s.*	*n.s.*	*n.s.*	*n.s.*	$F(1, 73) = 3.20$, $p = .078$	$F(2, 71) = 2.61$, $p = .081$	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Ordinary Violations	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Positive Driver Behaviors	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Acceleration	$F(1, 73) = 3.66$, $p = .060$	$F(2, 71) = 2.87$, $p = .063$	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	**$F(2, 71) = 6.88$, $p = .002$**
Lateral Acceleration	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Velocity	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Lateral Velocity	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Acceleration due to Throttle	**$F(1, 73) = 5.83$, $p = .018$**	**$F(2, 71) = 3.21$, $p = .046$**	**$F(1, 73) = 5.24$, $p = .025$**	**$F(2, 71) = 3.94$, $p = .024$**	**$F(1, 73) = 4.27$, $p = .042$**	*n.s.*	**$F(1, 73) = 4.17$, $p = .045$**	**$F(2, 71) = 2.86$, $p = .064$**	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Longitudinal Acceleration due to Brake	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	**$F(2, 71) = 7.29$, $p = .001$**

Table 12. *The post-hoc analyses for the standard deviations of changes between baseline and follow-up level*

	3 x 2 Experimental Conditions						2 x 2 Experimental Conditions			
	Approach		Avoidance		Control		Experiment		Control	
	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance
Lapses *(SD) Average speed preference in urban roads*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Decrease (p = .057)	*n.s.*	*n.s.*	*n.s.*	Decrease (p = .053)	*n.s.*
Aggressive Violations *(SD) Prefered speed where the limit is 90 km/h*	*n.s.*	*n.s.*	*n.s.*	Decrease (p = .050)	*n.s.*	*n.s.*	*n.s.*	Decrease (p = .090)	*n.s.*	*n.s.*
Longitudinal Acceleration *(SD) Prefered speed where the limit is 50 km/h*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)
Longitudinal Acceleration *(SD) Average speed preference in rural roads*	Decrease (p = .000)	Increase (p = .056)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .000)	*n.s.*			

Table 12. *The post-hoc analyses for the standard deviations of changes between baseline and follow-up levels (continue)*

	3 x 2 Experimental Conditions						2 x 2 Experimental Conditions			
	Approach		Avoidance		Control		Experiment		Control	
	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance	Compliance	Non-compliance
Longitudinal Acceleration due to Throttle *(SD) Prefered speed where the limit is 50 km/h*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Increase (p = .000)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)
Longitudinal Acceleration due to Throttle *(SD) Prefered speed where the limit is 82 km/h*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)	*n.s.*	*n.s.*	*n.s.*	Increase (p = .001)
Longitudinal Acceleration due to Throttle *(SD) Prefered speed where the limit is 90 km/h*	*n.s.*						*n.s.*	*n.s.*	*n.s.*	Increase (p = .000)
Longitudinal Acceleration due to Throttle *(SD) Prefered speed where the limit is 110 km/h*	*n.s.*	Increase (p = .037)	*n.s.*	*n.s.*	Increase (p = .088)	Increase (p = .000)	*n.s.*	Increase (p = .052)	Increase (p = .087)	Increase (p = .000)
Longitudinal Acceleration due to Brake *(SD) Average speed preference in rural roads*	Decrease (p = .020)	*n.s.*	*n.s.*	*n.s.*	*n.s.*	Increase (p = .003)	*n.s.*			

2.4 Discussion

2.4.1. Overview

The present dissertation study aimed to investigate the effect of implementation intention on speeding behavior. In order to test the expectations, both self-reported and simulated driver behaviors were investigated. Additionally, simulated driver behaviors were investigated based on the specific actions in the scenarios. For the first time in the related literature, the effect of implementation intention on a driver behavior was investigated by manipulating the goal type as approach and avoidance goals. As another contribution to the literature, the interaction effect of predicted compliance and non-compliance to the speed limits and the goal type on speeding were investigated.

In the following section, the summary and discussion of the results in terms of correlations between variables in baseline and follow-up levels, the interaction effect of implementation intention and time, and lastly, the interaction effect of implementation intention, speed compliance and time were discussed. Additionally, the contributions of the present study, limitations, and suggestions for future studies were also referred.

2.4.2. Summary and Discussion of the Results

2.4.2.1 Correlation Analyses between variables in baseline and follow-up levels

In the present study, two correlation analyses were conducted for the variables in baseline and follow-up levels. According to the results, age was positively correlated with only total mileage in baseline level. In follow-up level, it was positively correlated with total mileage, whereas it was negatively correlated with the lateral velocity and longitudinal acceleration due to throttle. In other words, younger age can be linked to a greater change in lateral velocity and longitudinal acceleration due to throttle.

According to the correlation analyses, both annual and total mileages increase with the speed preferences at different speed limits, as well as participants' previous speed

violations. Similarly, annual mileage was related to the total number of accidents, whereas total mileage was related to both the number of active and passive accidents. Also, annual and total mileage is positively correlated with both aggressive and ordinary violations in baseline level, whereas only annual mileage is positively correlated with aggressive and ordinary violations in follow-up level. In both of baseline and follow-up levels, annual and total mileage were found as important contributors of both self-reported and simulated driver behaviors consistent with the related literature (e.g. Martinussen, Hakamies-Blomqvist, Møller, Özkan, & Lajunen, 2013). These findings can be explained by the perceived ability of the experienced drivers. In other words, the more drivers have higher mileage and experience, the more they tend to overestimate their abilities and show higher violations (de Winter & Dodou, 2010; Guého et al., 2014; Zhang, Jiang, Zheng, Wang, & Man, 2013).

The annual mileage positively correlated with longitudinal velocity and the longitudinal acceleration due to throttle in baseline level. Similarly, the standard deviations of lateral acceleration and longitudinal acceleration due to throttle was positively linked to annual mileage, and the deviation of lateral acceleration was positively linked to total mileage. In the follow-up level, annual mileage was positively correlated with both the simulated driver behaviors regarding speeding and their standard deviations. All in all, in accordance to the related literature, drivers' experience increases with speeding and their speeding behavior variate when they gain more experience (de Winter & Dodou, 2010; Guého et al., 2014; Zhang et al, 2013). On the other hand, total mileage did not associate with the simulated driver behaviors regarding speeding both in baseline and follow-up levels. As it was stated before, the difference between annual and total mileage can be explained by the young participant group of the study who are active drivers for a short time period. Considering their average driving experience, they were inexperienced and novice drivers until recently. It can be concluded that their previous experience may not reflect their actual driver behaviors. As many scholars suggested (e.g. Elander et al., 1993; Parker & Stradling, 2001), driver behaviors related to what we usually want to do, rather than what we able to do. Thus, total mileage of young

drivers may not represent solid results, since they didn't enough time to build a driving style.

As an important point which should be highlighted, speed preferences in different speed limits strongly associated with different simulated driver behaviors in both baseline and follow-up levels. These associations were not only valid for the means of the driving simulation, but also for the standard deviations. These positive correlations between speed preferences in daily-life circumstances and simulated behaviors provide an evidence for the validity of driving simulator (Öztürk, 2017).

2.4.2.2 The effect of implementation intention on driver behaviors

2.4.2.2.1 Implementation intention without manipulating the goal type

Separate mixed model ANOVAs were conducted to see the effect of implementation intention on self-reported driver behaviors. In the first set of analyses, the implementation intention was not manipulated based on the goal type, instead, analyses were conducted by combining avoidance and approach conditions (i.e. experimental condition) and comparing them to control condition. In terms of means, none of the subscales of both driver behavior and positive driver behavior questionnaires revealed significant results for interaction effects.

There are several possible explanations for this result. A possible explanation for this might be that both driver behavior questionnaire and positive driver behaviors scale measure a general driving style (Özkan & Lajunen, 2005; Reason et al., 1990). Thus, a manipulation of the speeding behavior may not have an impact on the general driving style, and also both questionnaires were not designed to detect the impact of specific actions. As another explanation, a social desirability bias might influence the results. Similarly, knowing that the study is conducted on the driver behaviors and traffic safety, participants in follow-up condition might be affected by social desirability (van de Mortel, 2008).

The main effect of condition was only significant for positive driver behaviors, accordingly, participants in experimental conditions were lower in positive driver behaviors than control level. Although participants randomly assigned to the conditions, this significant comparison is a limitation of the study. However, none of the other group comparisons revealed such main effect.

2.4.2.2.2 Implementation intention with the manipulating of goal type

Separate mixed model ANOVAs were conducted to see the effect of different implementation intention types (i.e. approach and avoidance) on self-reported driver behaviors. Accordingly, none of the interactions revealed significant results for the means of self-reported driver behaviors. As stated above, the effect of social desirability can be considered as an explanation of the non-significant results (van de Mortel, 2008). Although self-reported measurements are widely used and accepted in psychology, they have some limitations regarding reliability and validity. Thus, experimental approaches were believed to be more precise, and eliminate many issues of recall and response bias (Prince et al., 2008). Consistently, in the following sections, driver behaviors measured by a driving simulator were discussed.

On the other hand, some of the non-significance results of the driver behaviors match with the expectations. As it was stated in Chapter 1, the definition of aberrant driver behaviors (Özkan, 2006; Reason et al., 1990) should be classified based on the intentionality of the behavior. Accordingly, the non-significance results regarding errors and lapses consist with expectations of the present study. Given the fact that implementation intention is a manipulation of the intentions, a change in errors and lapses cannot be expected since both behaviors are not intentional.

2.4.2.3 The effect of implementation intention on simulated driver behaviors

2.4.2.3.1 Implementation intention without manipulating the goal type

Similar with previous analyses, separate mixed model ANOVAs were conducted to see the effect of implementation intention on speeding-related simulated driver behaviors. In the first set of analyses, the implementation intention was not manipulated based on the goal type, instead, analyses were conducted by combining avoidance and approach conditions (i.e. experimental condition) and comparing them to control condition. Accordingly, the time interval between baseline and follow-up levels (i.e. the main effect of time) revealed some significant results for the investigated variables. In detail, the means of longitudinal velocity, longitudinal acceleration due to throttle and longitudinal acceleration due to brake, the standard deviations of longitudinal acceleration, lateral acceleration, longitudinal velocity, longitudinal acceleration due to throttle revealed significant main effects of time. Accordingly, participants in baseline levels were lower in simulated driver behaviors than follow-up levels. This finding was consistent with the related literature on the familiarity effect of driving simulator. Results of both driving simulation (Yanko & Spalek, 2013) and real-life (Intini, Colonna, Berloco, & Ranieri, 2016) studies indicated that being familiar to a route are linked to driving in higher speed. Given the fact that the within-subject design of the study, participants came to the human factor laboratory and drove the same driving scenario twice. Thus, it can be concluded that participants became familiar with the process and to the route presented in the driving scenario in their second visit. Thus, this familiarity can have an impact on their driving and may lead them to speed. In accordance to this conclusion, Charness et al. (2012) suggested that multiple participation to a study might help the participants become more skilled on the specific task. Taking into account the simulated driver behaviors investigated in the present study was related to speeding, it was not surprising that all of the group comparisons pointed out such difference between baseline and follow-up levels.

The interaction between experimental conditions and time revealed similar results for the simulated driver behaviors. Accordingly, the mean of longitudinal velocity and the standard deviations of longitudinal acceleration, lateral acceleration, longitudinal velocity, longitudinal acceleration due to throttle, and longitudinal acceleration due to brake of the experimental and control groups changed between baseline and follow-up levels.

All of the aforementioned driver behaviors pointed same results; the control groups significantly increased their speeds and accelerations in the follow-up levels. In other words, they both speed more and speeding-up more and faster. Also, the significances of the standard deviations indicated that the control groups showed higher speed changes in their simulated driving than experimental group. Lastly, the interaction effects of experimental conditions and time on the deviation of longitudinal acceleration due to throttle and brake provide some notable knowledge. In control group, participants' deviation of speed-up was higher than experimental conditi

on for the longitudinal acceleration due to brake. In other words, their brake use was both higher and more frequently. On the other hand, participants in experimental condition have lower brake change in time, namely, their brake use was both less and less frequently. This finding pointed a pattern consistent with the data of longitudinal acceleration due to throttle. Accordingly, the throttle use of control group points higher and faster speed-up than experimental condition.

All in all, it can be concluded that the participants in control group used both the throttle and brake irregularly. In other words, they speed more, speed-up more and faster, and they slow-down more and faster than experimental group. On the other hand, experimental group maintained a more stable pattern in terms of speed and speed-up. As the literature suggested, multiple uses of the driving simulator can create a familiarity effect on the participants (Aginsky, Harris, Rensink, & Beusmans, 1997; Yanko & Spalek, 2013). Also, speeding was found as related to route familiarity both in real-life studies (Intini et al., 2016) and studies using driving simulation (Yanko & Spalek,

2013). Accordingly, participants who were familiar with the route drove in higher speed. Thus, the stability of the speed in experimental group within time provide us an insight regarding experimental manipulation. Although there was not a decrease between two levels (except the longitudinal acceleration due to brake), it can be concluded that the experimental manipulation prevented the increase due to familiarity of the driving simulation.

2.4.2.3.2 Implementation intention with the manipulating of goal type

Similar with previous analyses, separate mixed model ANOVAs were conducted to see the effect of implementation intention on speeding-related simulated driver behaviors. In the second set of analyses, the implementation intention was divided based on the goal type as avoidance and approach conditions. Similar to the previous analyses, the main effects of time revealed significant results for the simulated driver behaviors, based on the familiarity to the laboratory and driving simulation.

According to the longitudinal acceleration, the interaction effect of condition and time have significant effects on both the mean and the standard deviation of the variable. Although the interactions of variables were not statistically significant, there was a trend in support of the effect of approach condition. The participants in approach condition were lower in speed in follow-up condition. On the contrary, participants in avoidance condition increased their speed in follow-up condition. In terms of standard deviation, none of the experimental groups show change within time, while control group significantly increased their speed-up.

According to the analyses regarding lateral velocity, the interaction effect of the condition and time have a significant effect on the mean of the variable. Accordingly, there was on the margin of significance between baseline and follow-up levels in both approach and control conditions. To sum up, participants in approach condition decreased their speed over time, while participants in control condition increased their

speed. Along with the non-significance of the avoidance condition, there was a trend regarding an increase in avoidance condition in the follow-up level.

On the longitudinal acceleration due to brake, the interaction between condition and time revealed significant results on the standard deviation of the variable. Accordingly, a control condition was on the edge of significance of an increase in follow-up level. Namely, control group used more and more frequently the brake in follow-up level, whereas experimental groups did not change within time. Considering the fact that unsafe drivers had higher rates of brake use, this finding also consisted with the expectations (Klauer, Dingus, Neale, Sudweeks, & Ramsey, 2009; Simons-Morton et al., 2009).

Lastly, the interaction between condition and time on the total number of accidents was found as significant. Accordingly, the total number of accidents in driving simulation of participants in approach condition significantly decreased between two measurements of time.

All in all, aforementioned group differences indicate three points which should be highlighted. First, there were increases in control conditions, which might be explained by the familiarity of the driving simulator and the laboratory (Yanko & Spalek, 2013), did not share by other groups. The non-significance of the experimental conditions does not necessarily mean the lack of effect of implementation intention. Instead, this finding provides an evidence by suppressing the familiarity effect in control condition. In other words, the lack of the increase in the experimental condition provides support for the investigated hypotheses. Second, implementation intentions which are using approach goals as goal type can have a greater impact on the speeding than avoidance goals. This finding is consistent with the health psychology literature which suggested approaching type of goals are more suitable for health-related goals (Elliot et al., 1997; Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). And lastly, although the significance levels are only on the edge, there was a trend regarding avoidance types of implementation intention has a deteriorating effect on the behavior. In detail, avoidance condition can be

linked to more speeding, as well as more and faster speeding-up. This finding also matches with the literature which suggested that avoidance goals are not suitable for health-related behaviors (Elliot et al., 1997).

2.4.2.4 The effect of implementation intention on event-based simulated driver behaviors

In the present study, driving simulation data was aimed to investigate with two different approaches. First, the means and standard deviations for the overall driving simulation data which was presented above were aimed to analyzed. Second, the means of the specific events in the scenario were analyzed. In this section, the results of event-based driving scenario were summarized and discussed. As it was mentioned in the method section, events in the driving scenario indicated small movements in a specified meter range. Thus, the standard deviations of the events were not analyzed. Additionally, five of the ten events were not included in the analyses for two reasons. First, two of the events were not related to the participants driving experience and they were located to enrich the driving scenario. In detail, a parked car on the right pavement enters the road which did not interfere with the participants' driving in both events. Second, first two events and the last event were not included to the discussion, since they were covered within the very beginning and the end of the scenario considering the drivers' familiarity and the boredom effects to the scenario. Consistently, the analyses of these three events did not reveal significant results. Events were discussed below according to the order presented in results section.

The first event (*event 3*) was a signalized intersection (*the signalized intersection-2*) which included both car passing and pedestrians use the crossing from both sides. Consistent with the pattern revealed in the previous section, control group increased their lateral acceleration in time whereas a decrease in lateral acceleration in experimental group was found. In other words, drivers in experimental condition tend to speed-up in the baseline level, however, it can be seen that they slowed down in the follow-up level (see Figure 18). When the experimental group was divided into two as

approach and avoidance conditions, both of the experimental groups yielded non-significant results. However, there was a trend regarding approach condition to decrease in side-by-side acceleration in follow-up level, but avoidance condition remained the same. In detail, participants in approach condition tend to speed-up in the baseline level, however, it can be seen that they slowed down their speed in the follow-up level (see Figure 19).

Next event (*event 4*) was also a signalized intersection (*the signalized intersection-3*) which includes pedestrians use the crossing from right side, but there were no cars passing. It revealed consistent results match with the expectations of the present study. Before to summarize and discuss the results, the concepts velocity and acceleration need to be explained, since the present results revealed negative values. In order to talk about velocity, first, a positive and negative direction should be defined. Then the velocity can be written with respect to this direction as positive or negative. Positive velocity means, the vehicle is moving towards this direction and likely, negative velocity means that the vehicle moves against that direction. In a similar concept, acceleration is the change rate of the velocity and just like the velocity, its notification also includes the direction. In general, a negative acceleration does not mean the vehicle is slowing down and likely, an object with positive acceleration doesn't need to be speeding up. However, since conducted experiment did not include any direction changes, it can be assumed that the negative results for acceleration mean deceleration and vice versa (Beer, Johnston, Clausen, & Staab, 2004). As it was noted above, if acceleration points in the same direction as the velocity, it means that the object was speeding up. And if the acceleration points in the opposite direction of the velocity, the object will be slowing down. For instance, a driver with 5.6 m^2/s acceleration means that the driver was speeding up and another driver with -3.4 m^2/s means that the second driver slowed down.

Since the sign convention shows the direction, deceleration is a little harder concept to apprehend. In the present analysis, -1.80 m^2/s acceleration means a higher acceleration in a negative direction –or in this case deceleration- than -1.34 m^2/s acceleration.

Therefore, even though in mathematically -1.34 is larger than -1.80, latter should be considered as the larger deceleration (see Figure 20).

All in all, in the analyses of longitudinal acceleration, velocity, and lateral velocity control group was found as higher in speed. Thus, when they see the red light, they made a sudden and hard brake and slow down with higher acceleration. On the other hand, experimental group had a lower speed compared to the control group. Thus, their deceleration was lower while approaching to the red light.

In regard to the analysis conducted with the goal type, both approach and avoidance groups provided a significant decrease between baseline and follow-up levels. Different from previous findings, avoidance condition seems to lead a greater decrease in speeding than approach condition. Similarly, the side-by-side speeding of experimental condition also revealed significant results. There was an increase in control condition, whereas created only a slightly degree of decrease occurred in experimental group. In terms of goal type, the increase in control condition was significant. Although the post-hoc analyses above on the significance level, avoidance condition showed a trend to decrease in speeding side-by-side. In brief, avoidance condition seems to have a greater impact to decrease speeding in the present event.

As it was mentioned above, approach goals were more effective on health-related goals in the literature. However, there were estimations that avoidance type of goals can be linked to specific personality characteristics such as neuroticism (Elliot & Trash, 2002). In this event, six pedestrians were crossing from the right side, but there were no cars passing. Considering that approaching goals were proved to be better in health-related goals (Elliot, Sheldon, & Church, 1997), it was assumed that avoidance goals might be more suitable for circumstances involve others such as vulnerable road users. Consistently with the present results, an approaching goal such as aiming to be a better, safer driver might be perceived as indirectly related to the specific act. In this particular case, the possibility of harming others can be linked by participants better with

avoidance type of goals than approaching goals. Thus, as a conclusion, avoidance goals can be linked to not only the personality as the literature suggested but also the context.

The next signalized intersection event (*event 8, the signalized intersection-4)* included car passing but there were no pedestrians use the crossing. Results revealed significant results for the analyses conducted with two different goal types. In detail, drivers in approach condition tend to decrease their speed at the baseline level, however, they slowed down even more in the follow-up level. In other words, they increased their deceleration in the follow-up level. In the plot of the present analysis (see Figure 25), 2.26 m^2/s acceleration means a higher acceleration in a negative direction –or in this case deceleration- than -1.83 m^2/s acceleration. Therefore, even though in mathematically -1.83 is larger than -2.26, latter should be considered as the larger deceleration. Thus, it should be concluded that in follow-up condition, when participants in approach condition saw the red light, they made a sudden and hard brake and slow down with higher acceleration. This finding was contradictory with both the previous results and expectations of the present study since the greater acceleration indicates slowing down from a greater speed. The contradictory finding can be explained by the location of event in driving scenario. Event 8 was the last investigated event in the scenario, and it occurs when participants cover a distance of 3500 meters. Thus, participants might increase their speed based on the idea that they approached the end of the scenario. When they approached the red light, participants in approach condition tend to stop with a higher acceleration, whereas avoidance and control conditions didn't stop at the traffic light.

Additionally, two events included pedestrians were investigated (*event 5 & 6*). According to the results of the pedestrian crossing I (*event 5*), participants in avoidance condition had a significant decrease in their lateral acceleration between baseline and follow-up levels, whereas participants in control condition increased their speed-up. However, it should be noted that the differences in both control and approach conditions were not significant.

In pedestrian crossing II (*event 6*), the participants in control group increased their deceleration, whereas the experimental group decreased it (see Figure 27). In the plot of the present analysis (see Figure 27), -.37 m^2/s acceleration means a higher acceleration in a negative direction–or in this case deceleration- than -.20 m^2/s acceleration in control group. Therefore, even though in mathematically -.20 is larger than -.37, latter should be considered as the larger deceleration. Similarly, -.41 m^2/s acceleration means a higher acceleration in negative direction than -.36 m^2/s acceleration in experimental group. To sum up, the control group was speeding in the follow-up level, thus, when they saw the pedestrians crossing the street, they made a sudden and hard brake and slow down with higher acceleration. On the other hand, the experimental group had a decrease in their deceleration between two levels. In other words, they decreased their speed based on experimental manipulation, thus they did not have to make a sudden and hard brake and finally, they slowed down with lower acceleration.

These findings were also found support in the analysis of different goal types. Right along with the higher slow down of the control group, avoidance group was found as lower in deceleration. In the plot of the present analysis (see Figure 28), -.44 m^2/s acceleration means a higher acceleration in a negative direction –or in this case deceleration- than -.31 m^2/s acceleration. Therefore, even though in mathematically -.31 is larger than -.44, latter should be considered as the larger deceleration. In other words, experimental manipulation can be accepted as successful in avoidance condition, since they decreased their deceleration in follow-up level.

Until this point, approach goals were found as more effective on speeding and the findings were consistent with the health psychology literature, suggesting that avoidance goals may have a deteriorating effect on health behavior (Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). However, aforementioned events regarding pedestrians indicated a different direction and suggested that avoidance type of implementation intention was more effective on speeding behavior. As it was stated above, the results of the signalized intersection 3 *(event 4)*, which was also related to pedestrians, revealed consistent findings with the present results. All in all, it can be

suggested that all of the analyses regarding pedestrians pointed a similar direction as discussed above.

It can be concluded that the idea of harming someone may be directed by avoidance goals, considering the context of harm. This finding is one of the important outcomes of the present study and it requires further investigation. In brief, the possibility of harming others seems to be linked with avoidance type of goals than approaching goals. Thus, it can be noted that designing an implementation intention context (e.g. situations include vulnerable road users) can be an important factor to be considered. Not only in the literature of driver behaviors, but also in the general context of implementation intention, there was not enough solid evidence that which goal type yield better results. Since it needs further investigation, maybe the first thing to implement intention is to describe the desired behavior and secondly, proper way to manipulate intention should be decided next.

2.4.2.5 The speed limit compliance on the effect of implementation intention

In this present study, analyses conducted to compare the interaction effects between preferred speed limit compliance, condition and time on both self-reported and simulated driver behaviors. The preferred speed limit compliance was categorized into two levels as 'compliance' and 'non-compliance', considering the 10 % speed limit tolerance. Results can be summarized as follows: First, consistent with the aforementioned analyses in the previous sections, drivers in control condition increased their mean speed and speed-up within time for all of the significant analyses. This finding was consistent with the previous explanation of the increase caused by the familiarity in the control group (Intini et al., 2016; Yanko & Spalek, 2013). Although both compliance and non-compliance groups increased their speed, a slight difference appeared. All of the non-compliance conditions in control group increased their speed in driving simulator, whereas some of the compliance conditions did not. These results may be helpful to interpret that a prior preference to non-compliance of the speed limit may have a deteriorating effect. This finding can be discussed within the framework of

Bamberg's (2013) theory. According to the Stage Model of Self-Regulated Behavioral Change, individuals can be at different stages regarding their intention to change a specific behavior. Thus, a premature intervention can lead to resistance to change behavior.

In avoidance condition, even if participants stated that they prefer to comply with speed limits, they showed higher speed in a driving simulation. Given the fact that approach goals are more suitable for health-related behaviors, many studies in the literature suggested that avoidance goals are difficult to follow and have a deteriorating effect on the motivation to the behavioral change (Elliot et al., 1997; Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). Consistently, approach condition leads to a decrease in behavior, as expected in speed limit compliance condition. Unlike the previous findings regarding approach condition, it was found that the interactions of non-compliance of speed limit and approach condition were not significant for none of the analyses. Thus, it can be concluded that even if the present study provide support regarding the approach condition of implementation intention, previous preferences may block the effectiveness of the technique.

Lastly, the interaction effects of preferred speed limit compliance and experimental manipulations and time were analyzed with the standard deviations of the investigated variables. In terms of control group, similar findings were revealed above. Participants who were both in control and non-compliance groups had higher speed and speed-up deviations. This might indicate that participants who do not have a preference to comply speed limits and not subjected to the experimental manipulation were faster and showed higher speed changes. The avoidance condition revealed significant results only for aggressive violations. Accordingly, participants in avoidance group, which did not prefer to comply speed limit of 90 km/h, decrease their deviation of aggressive violations. In terms of approach condition, participants who were in the speed limit compliance group decreased their linear speeding-up change within time. On the contrary, participants who are in the non-compliance group increased their linear

speeding-up change over time. Similar pattern revealed in the analyses of both throttle and brake data.

All in all, the preferences regarding complying speed limits seems to have an important impact on the behavior. Especially, the differences between comply and non-comply groups in approach condition support the idea of Bamberg (2013). As it was mentioned above, Bamberg suggested that there were four stages to change a behavior in a desirable way, and these stages were complementary. In order to change a behavior, people need to follow decisional stages, which were started with goal intentions and followed by behavioral intentions. As a sum, each stage has its own requirements to move on to the next stage. Thus, present analysis results match with the idea, since the prior preferences regarding a behavior, reflect a mental preparedness to change it. As a conclusion, implementation intention to people who declared themselves as a non-complier to the speed limit may not reveal significant results, since they were simply not ready to change their behavior and show reactance to change. Thus, to create a greater behavioral change than it was supported by this study, interventions need to conducted within longer time periods.

2.4.3 Overall Discussion

All in all, the present study's findings provided some major contributions to the related literature: (i) As it was supported in Chapter 1, the link between intention and subsequent behavior is the primary predictor of behavior. Thus, any kind of intervention to the link between intention and behavior can create an impact in the desired direction. (ii) The implementation intention can promote a goal attainment in the context of speeding, which is important for road safety (iii) The differentiation between approach and avoidance goals in speeding was found as effective in support of approach goals. (iv) The efficacy of avoidance goals was found as context-specific which covers situations related to pedestrians (v) Lastly, the previous preferences on speed choices can affect the goal attainment and both reduce or increase the efficacy of implementation intention.

In detail, present dissertation aimed to test the link between implementation intention and speeding behavior. Consistent with a great number of studies in the literature, the effectiveness of implementation intention was supported (e.g. Armitage et al., 2011; Brewster et al., 2015). The link between implementation intention and speeding, consist with the Bamberg's The Stage Model of Self-Regulated Behavioral Change (2013). However, there are some points which should be highlighted. First of all, present results revealed small to medium effect sizes for the change in speeding behavior. As a similar recently published study (Brewster et al., 2015) found stronger effect sizes for the experimental manipulation. The difference in the magnitude of effect sizes can be explained by the methodological differences. In the study of Brewster et al. (2015), a self-reported speeding was measured and the participants reported speeding more than they intended were excluded from the study. In other words, the study was conducted with whom reported speeding less often than they intended. Both the self-reported measurement and the participant selection criteria were considered to cause an increase in the effect size. Additionally, Bamberg (2013) found a similar effect size of implementation intention in his model testing with the present study.

Not only TRA and TPB, but also many other theories (e.g. protection-motivation theory of Roger et al.'s (1983), or the prototype/willingness model of Gibbons et al. (1998), focused on the role of intention on behavior, and the strong link between them was repeatedly supported; a strong intention indicates a strong possibility to perform the behavior. As a solid evidence, in the meta-analysis of Sheeran (2002) which is conducted on 10 meta-analysis studies, a large effect size to interpret the link between intention and actual behavior was found. Ajzen (1991) state that goal intentions are self-instructions to perform a behavior and they imply a commitment between intention and act. Goal intentions were accepted as the conclusions of the decision-making process and they were accepted as a good predictor of actual behavior. However, Bamberg's The Stage Model of Self-Regulated Behavioral Change (2013) took this idea one step further. Bamberg define behavioral intention in a preaction stage, which is different from goal intentions in predecisional stage. Accordingly, goal intentions

reflect intentions related to habitual actions. They did not represent a strong will for the behavioral change, they formed as simple as "I intend to perform X". Consist with this idea, a meta-analysis study (Webb & Sheeran, 2006) investigated the effect of experimental manipulations in goal intentions on subsequent behaviors found a modest behavioral change in subsequent behavior, even though there was a significant, but small-to-medium effect size. Based on the literature, it is known that goal intention is simple forms of behavioral change. They are necessary and provide the baseline of the behavioral change process, however, they did not provide sufficient background for the change.

On the other hand, preaction stage of the behavioral change requires behavioral intentions, which are higher goal intentions and calculations of pros and cons of the strategies to achieve a behavioral change. Consistently, implementation intentions were the next stage which combine both of the previous stages. Thus, manipulating goal intentions can be evaluated as not sufficient to provide desired behavioral change.

2.4.4 Limitations and Suggestions for Future Studies

The present study had some limitations and suggestions for future studies. First of these limitations was the sample size of the present study. According to Gollwitzer and Sheeran (2006), in order to achieve .80 power, Cronbach's alpha .05, and the effect size as .65, 30 participants required per condition. In the present study participants were asked to participate to the study twice within a two-weeks of time interval. As a limitation, the aforementioned criteria cannot be met and the analyses were conducted with 26 participants per condition, since there was some drop-outs in the participant pool. Although 30 participants per cell provide a larger effect size, the present study had sufficient number of participants with a slightly lowered effect size (Cohen, 1988; Wilson-Van Voorhis, & Morgan, 2007).

As another limitation, the effects of age and gender was not statistically controlled. However, it should be noted that both the age and gender were considered as selection criteria of the participants. In other words, participants were included in the study

considering their age and gender, both experimental groups and control group had equal numbers of female and male, and very close mean ages.

Although it was not hypothesized in the study and they are not necessarily should be investigated together (e.g. Sullivan & Rothman, 2008), lack of a measurement regarding intention was a limitation of the study. Consistent with the previous findings, a goal intention to comply speed limits can be investigated as a factor which interacts with the experimental manipulation of intention implementation and time. Based on the fact that implementation intentions are more effective when the goal intention was strong (Elliott Armitage, 2006; Webb & Sheeran, 2006), the moderator role of goal intention on the link between implementation intention and behavior can be investigated in future studies.

As another suggestion to the future studies, the benefits of implementation intention can be investigated in a longitudinal design. There are very limited studies in the literature on the long-lasting effect of implementation intentions, but Sullivan and Rothman (2008) found some support for its benefits regarding fat consumption. Additionally, Sheeran and Orbell (1999) found a long-term effect of implementation intention on cervical cancer screening. All in all, there is room for development in the literature for the long-lasting effect of implementation intentions both in driver behavior context and the differentiation of goal types as approach and avoidance.

2.4.5 Implications

The overall findings of the present study have some practical implications. First of all, the Turkish version of volitional help sheet was found as an effective tool which can be easily and practically used. As the previous studies stated (Brewster et al., 2015), it is a cost-free, not time consuming, very practical and easy to use tool. Thus, it can be used by the different professions in the field to improve road safety, such as in psychotechnics or educational purposes in schools or driving schools. Second, the approach vs. avoidance differentiation of the goal type provided some important insight for both further studies and applications. To be more specific, implementation

intentions based on approach goals seem to be more useful in preventing speeding, whereas avoidance goals found as more functional in terms of situations include vulnerable road users. This kind of knowledge not only can be used to implement intention, but also can help to design new campaigns and increase their effectiveness.

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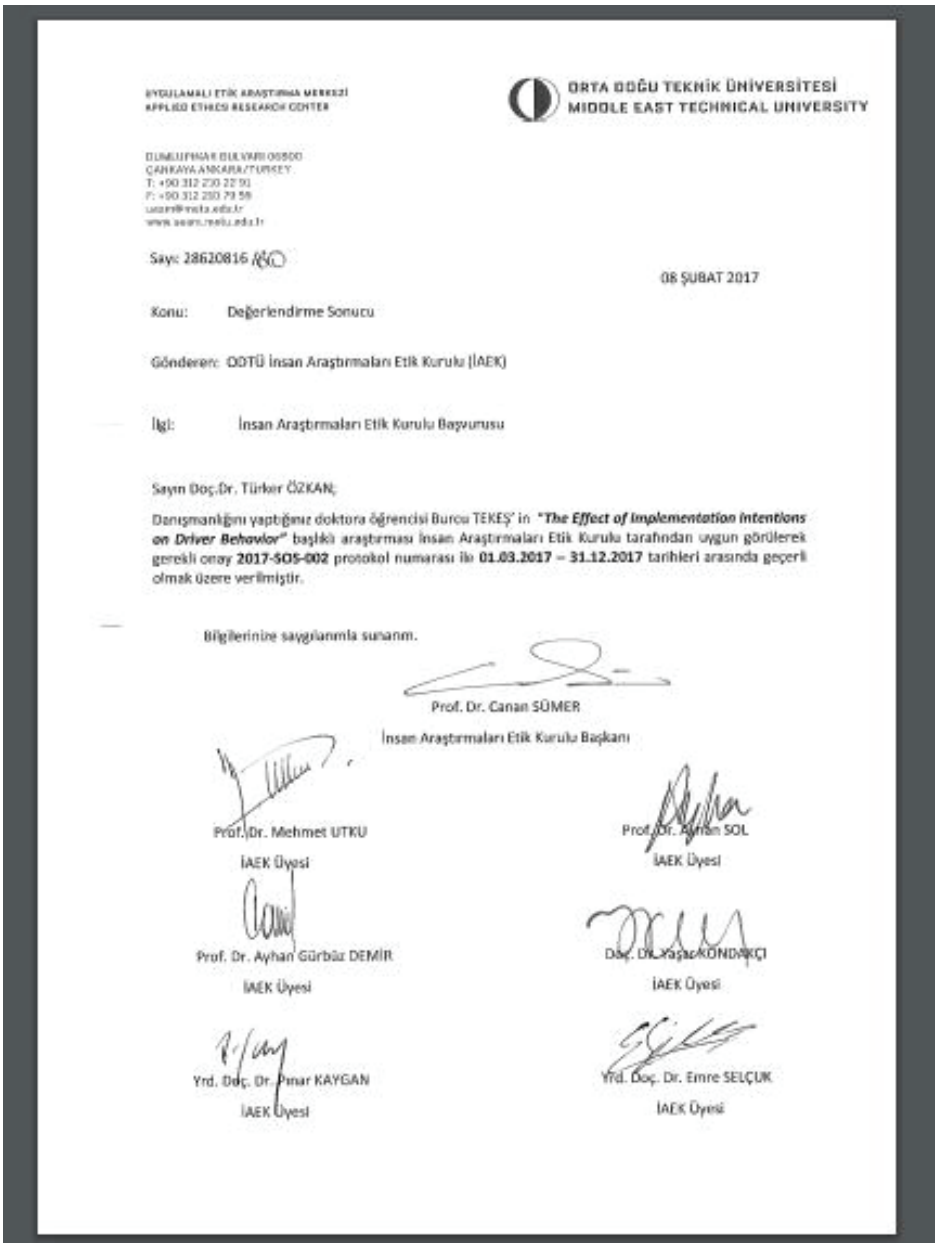
APPENDICES

A: Human Subjects Ethics Committee Form



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08 ŞUBAT 2017

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Doç.Dr. Türker ÖZKAN;

Danışmanlığını yaptığınız doktora öğrencisi Burcu TEKEŞ' in ***"The Effect of Implementation Intentions on Driver Behavior"*** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay **2017-SOS-002** protokol numarası ile **01.03.2017 – 31.12.2017** tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Canan SÜMER
İnsan Araştırmaları Etik Kurulu Başkanı

Prof. Dr. Mehmet UTKU
İAEK Üyesi

Prof. Dr. Ayhan SOL
İAEK Üyesi

Prof. Dr. Ayhan Gürbüz DEMİR
İAEK Üyesi

Doç. Dr. Yaşar KONDAKÇI
İAEK Üyesi

Yrd. Doç. Dr. Pınar KAYGAN
İAEK Üyesi

Yrd. Doç. Dr. Emre SELÇUK
İAEK Üyesi

B: Questionnaire Package and Experimental Manipulation

Araştırma Duyurusu

Bu çalışma, Orta Doğu Teknik Üniversitesi Trafik ve Ulaşım Psikolojisi doktora öğrencisi Burcu Tekeş tarafından, Doç. Dr. Türker Özkan danışmanlığında doktora tezi kapsamında yürütülmektedir. Çalışmanın amacı, katılımcıların görüş bildirimlerinin sürücü davranışları üzerindeki etkisinin incelenmesidir. Çalışmaya ehliyet sahibi olup aktif araç kullanan katılımcılar dahil edilecektir. Çalışma, her biri yaklaşık 20 dakika süren iki oturumdan oluşmakta olup, elde edilen sonuçların yorumlanabilmesi için katılımcıların her iki oturuma da katılmaları gerekmektedir. Çalışma, Modsimmer binası içerisindeki "İnsan Faktörü" laboratuvarında gerçekleştirilecektir. Çalışmanın ilk oturumuna katılan katılımcılar, iki hafta sonra tekrar İnsan Faktörü laboratuvarına davet edilerek, deneyin ikinci oturumuna dahil edileceklerdir. Her iki oturuma da katılan katılımcılar, ikinci oturumun sonunda 20 TL ile ödüllendirilecektir.

Çalışmaya katılım için burcu.tekes@metu.edu.tr adresinden randevu alabilirsiniz.

Katkılarınız için şimdiden teşekkür ederiz…

Araştırmaya Gönüllü Katilim Formu

Bu çalışma, ODTÜ Psikoloji Bölümü doktora öğrencilerinden Burcu TEKEŞ tarafından, Doç. Dr. Türker ÖZKAN danışmanlığında, doktora tezi kapsamında yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir?

Araştırmanın amacı, sürücü davranışları üzerinde görüş bildiriminin etkisine ilişkin bilgi toplamaktır.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz?

Bu çalışma, her biri yaklaşık 20 dakika süren iki oturumdan oluşmakta olup, elde edilen sonuçların yorumlanabilmesi için katılımcıların her iki oturuma da katılmaları gerekmektedir. İkinci oturum, ilk oturumdan iki hafta sonra gerçekleştirilecektir. Araştırmaya katılmayı kabul ederseniz, sizden beklenen, MODSIMMER binasında yer almakta olan "İnsan Faktörü" laboratuarına gelerek, araç simülasyonunda araç kullanmanız ve verilen ölçeklerdeki soruları derecelendirme ölçeği üzerinde yanıtlamanızdır.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız?

Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Ankette, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak, sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayımlarda kullanılacaktır. Sağladığınız veriler gönüllü katılım formlarında toplanan kimlik bilgileri ile eşleştirilmeyecektir.

Katılımınızla ilgili bilmeniz gerekenler:

Anket, genel olarak kişisel rahatsızlık verecek sorular içermemektedir. Ancak, katılım sırasında herhangi bir nedenden ötürü kendinizi rahatsız hissederseniz deneyi yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda araştırmacıya, deneyi/anketi tamamlamadığınızı söylemeniz yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz:

Anket sonunda, bu çalışmayla ilgili sorularınız cevaplanacaktır. Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Psikoloji Bölümü öğretim üyelerinden Prof. Dr. Türker ÖZKAN (E-posta: ozturker@metu.edu.tr) ya da tez öğrencisi Burcu TEKEŞ (E-posta: burcu.tekes@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

İsim Soyad Tarih İmza

Demografik Bilgi Formu

Deneyin iki oturumunda vereceğiniz yanıtları eşleştirebilmemiz için bir rumuz yazmanız gerekmektedir. Lütfen soyadınızın ilk iki harfi ile doğum gününüzü gün ve ay olarak birleştirerek rumuzunuzu yazınız: _____

Örneğin, TEKEŞ ve 28 Mayıs için, rumuz, **te2805** olacaktır.

1. Cinsiyetiniz: ☐ Kadın ☐ Erkek

2. Yaşınız: _____

3. Eğitim Durumunuz:

☐ Okur-Yazar
☐ İlkokul
☐ Ortaokul
☐ Lise
☐ Üniversite (lisans)
☐ Yüksek Lisans/Doktora

4. Ehliyetiniz var mı? ☐ Evet ☐ Hayır

5. Kaç yıldır ehliyet sahibisiniz? _____ yıl _____ ay

6. Kaç yıldır aktif olarak araç kullanıyorsunuz? _____ yıl _____ ay

7. Genel olarak, ne sıklıkla araç kullanırsınız?

☐ Hemen hemen her gün

☐ Haftada 3-4 gün

☐ Haftada 1-2 gün

☐ Ayda birkaç kez

☐ Çok nadir

8. Sürekli kullandığınız bir arabanız var mı? ☐ Evet ☐ Hayır

9. Günlük hayatınızda kullandığınız aracınızın vites türü nedir?
☐ Manuel
☐ Yarı otomatik
☐ Otomarik

10. Ticari (profesyonel) amaçla araç kullanıyor musunuz? ☐ Evet ☐ Hayır
Evet ise türünü belirtiniz: _____

11. Ehliyetinizi aldığınızdan bu yana yaklaşık kaç km araç kullandınız?
_____km.

12. Son bir yılda yaklaşık olarak toplam kaç kilometre araç kullandınız?
_____km.

13. Son üç yıl içerisinde **küçük ya da büyüklüğüne bakmaksızın, nedeni ne olursa olsun**, başınızdan geçen **kaza sayısı kaçtır**? _____

14. Son üç yılda kaç kez araç kullanırken aktif olarak (sizin bir araca, bir yayaya veya herhangi bir nesneye çarptığınız durumlar) kaza yaptınız? (hafif kazalar dahil)
_____ kez

15. Son üç yılda kaç kez araç kullanırken pasif olarak (bir aracın ya da bir yayanın size çarptığı durumlar) kaza geçirdiniz? (hafif kazalar dahil)_____ kez

16. Son üç yılda aşağıdaki trafik cezalarını kaç kere aldığınızı belirtiniz (Eğer hiç almadıysanız lütfen sıfır yazınız).

a) Yanlış park etme_____
b) Hatalı Sollama_____
c) Hız ihlali _____
d) Kırmızı Işıkta Geçme_____
e) Emniyet Kemeri_____
f) Alkol_____
g) Trafik İşaretlerine Uymama_____
h) Diğer_____

17. Şu ana kadar toplam kaç ceza puanı aldınız? _____ Puan

18. Hava ve yol koşulları uygun olduğunda şehiriçi yollarda yaklaşık ortalama kaç km hızla gidersiniz? _____ km/saat

19. Hava ve yol koşulları uygun olduğunda şehirlerarası yollarda yaklaşık ortalama kaç km hızla gidersiniz? _____ km/saat

20. Hız limitinin 50 km/s olduğu yollarda kaç km/s hızla gitmeyi tercih edersiniz?
_____ km/saat

21. Hız limitinin 82 km/s olduğu yollarda kaç km/s hızla gitmeyi tercih edersiniz?
_____ km/saat

22. Hız limitinin 90 km/s olduğu yollarda kaç km/s hızla gitmeyi tercih edersiniz?
_____ km/saat

23. Hız limitinin 110 km/s olduğu yollarda kaç km/s hızla gitmeyi tercih edersiniz?
_____ km/saat

Driver Behavior Questionnaire

Aşağıda verilen durumları ne sıklıkta yaparsınız ?
Lütfen her bir madde için verilen durumun ne sıklıkta başınızdan geçtiğini belirtiniz. Soruları, nasıl araç kullandığınızı düşünerek cevaplandırınız ve her bir soru için sizi tam olarak yansıtan cevabı, yanındaki kutudaki uygun rakamı daire içine alarak belirtiniz.

0= HİÇ BİR ZAMAN
1= NADİREN
2= BAZEN
3= OLDUKÇA SIK
4= SIK SIK
5= HER ZAMAN

		Hiçbir zaman	**Nadiren**	**Bazen**	**Oldukça sık**	**Sık sık**	**Her zaman**
1	Geri geri giderken önceden fark etmediğiniz birşeye çarpmak	0	1	2	3	4	5
2	Trafikte, diğer sürücülere engel teşkil etmemeye gayret göstermek	0	1	2	3	4	5
3	A yönüne gitmek amacıyla yola çıkmışken kendinizi daha alışkın olduğunuz B yönüne doğru araç kullanırken bulmak	0	1	2	3	4	5
4	Geçiş hakkı sizde dahi olsa diğer sürücülere yol vermek	0	1	2	3	4	5
5	Yasal alkol sınırlarının üzerinde alkollü olduğunuzdan şüphelenseniz de araç kullanmak	0	1	2	3	4	5
6	Aracınızı kullanırken yol kenarında birikmiş suyu ve benzeri maddeleri yayaların üzerine sıçratmamaya dikkat etmek	0	1	2	3	4	5
7	Dönel kavşakta dönüş istikametinize uygun olmayan şeridi kullanmak	0	1	2	3	4	5
8	Anayoldan sola dönmek için kuyrukta beklerken, anayol trafiğine dikkat etmekten neredeyse öndeki araca çarpacak duruma gelmek	0	1	2	3	4	5
9	Trafikte, herhangi bir sürücü size yol verdiğinde veya anlayış gösterdiğinde, elinizi sallayarak, korna çalarak vb. şekilde teşekkür etmek	0	1	2	3	4	5

		Hiçbir zaman	Nadiren	Bazen	Oldukça sık	Sık sık	Her zaman
10	Anayoldan bir sokağa dönerken karşıdan karşıya geçen yayaları fark edememek	0	1	2	3	4	5
11	Başka bir sürücüye kızgınlığı belirtmek için korna çalmak	0	1	2	3	4	5
12	Karşıdan gelen araç sürücüsünün görüş mesafesini koruyabilmesi için uzunları mümkün olduğunca az kullanmak	0	1	2	3	4	5
13	Bir aracı sollarken ya da şerit değiştirirken dikiz aynasından yolu kontrol etmemek	0	1	2	3	4	5
14	Kaygan bir yolda ani fren veya patinaj yapmak	0	1	2	3	4	5
15	Arkanızdan hızla gelen aracın yolunu kesmemek için sollamadan vazgeçip eski yerinize dönmek	0	1	2	3	4	5
16	Kavşağa çok hızlı girip geçiş üstünlüğü olan aracı durmak zorunda bırakmak	0	1	2	3	4	5
17	Şehir içi yollarda hız sınırını aşmak	0	1	2	3	4	5
18	Önünüzdeki aracın sürücüsünü, onu rahatsız etmeyecek bir mesafede takip etmek	0	1	2	3	4	5
19	Sinyali kullanmayı niyet ederken silecekleri çalıştırmak	0	1	2	3	4	5
20	Sağa dönerken yanınızdan geçen bir bisiklet ya da araca neredeyse çarpmak	0	1	2	3	4	5
21	"Yol ver" işaretini kaçırıp, geçiş hakkı olan araçlarla çarpışacak duruma gelmek	0	1	2	3	4	5
22	Yeşil ışık yandığı halde hareket etmekte geciken öndeki araç sürücüsünü korna çalarak rahatsız etmemek	0	1	2	3	4	5
23	Trafik ışıklarında üçüncü vitesle kalkış yapmaya çalışmak	0	1	2	3	4	5
24	Yayaların karşıdan karşıya geçebilmeleri için geçiş hakkı sizde dahi olsa durarak yol vermek	0	1	2	3	4	5
25	Sola dönüş sinyali veren bir aracın sinyalini fark etmeyip onu sollamaya çalışmak	0	1	2	3	4	5

		Hiçbir zaman	Nadiren	Bazen	Oldukça sık	Sık sık	Her zaman
26	Trafikte sinirlendiğiniz bir sürücüyü takip edip ona haddini bildirmeye çalışmak	0	1	2	3	4	5
27	Arkanızdaki aracın ileriyi iyi göremediği durumlarda sinyal vb. ile işaret vererek sollamanın uygun olduğunu belirtmek	0	1	2	3	4	5
28	Otoyolda ileride kapanacak bir şeritte son ana kadar ilerlemek	0	1	2	3	4	5
29	Sollama yapan sürücüye kolaylık olması için hızınızı onun geçiş hızına göre ayarlamak	0	1	2	3	4	5
30	Aracınızı park alanında nereye bıraktığınızı unutmak	0	1	2	3	4	5
31	Solda yavaş giden bir aracın sağından geçmek	0	1	2	3	4	5
32	Trafik ışığında en hızlı hareket eden araç olmak için yandaki araçlarla yarışmak	0	1	2	3	4	5
33	Trafik işaretlerini yanlış anlamak ve kavşakta yanlış yöne dönmek	0	1	2	3	4	5
34	Acil bir durumda duramayacak kadar, öndeki aracı yakın takip etmek	0	1	2	3	4	5
35	Trafik ışıkları sizin yönünüze kırmızıya döndüğü halde kavşaktan geçmek	0	1	2	3	4	5
36	Otobanda trafik akışını sağlayabilmek için en sol şeridi gereksiz yere kullanmaktan kaçınmak	0	1	2	3	4	5
37	Bazı tip sürücülere kızgın olmak (illet olmak) ve bu kızgınlığı bir şekilde onlara göstermek	0	1	2	3	4	5
38	Seyahat etmekte olduğunuz yolu tam olarak hatırlamadığınızı fark etmek	0	1	2	3	4	5
39	Sollama yaparken karşıdan gelen aracın hızını olduğundan daha yavaş tahmin etmek	0	1	2	3	4	5
40	Gereksiz yere gürültü yapmamak için kornayı kullanmaktan kaçınmak	0	1	2	3	4	5
41	Otobanda hız limitlerini dikkate almamak	0	1	2	3	4	5
42	Aracınızı park ederken diğer yol kullanıcılarının (yayalar, sürücler vb.) hareketlerini sınırlamamaya özen göstermek	0	1	2	3	4	5

Volitional Help Sheet- Approaching Goals

Bütün sürücüler buna niyetli olmasalar bile ara sıra hız yaparlar. Kişiler, kendilerini hız yapmaları yönünde cezbeden durumları ve bununla başa çıkma stratejilerini tanımlamaları durumunda, hız sınırlarına uyma konusunda daha başarılı olma eğilimindedirler. Biz de şimdi sizin bunu aşağıdaki tabloyu kullanarak yapmanızı istiyoruz. Soldaki listeden 4 "cezbedici durum" seçiniz (Hız sınırlarına uyma konusunda en çok zorluk seçtiklerinizi seçiniz). Daha sonra, sağda yer alan "stratejiler" listesinden kendinizi bu durumlarda bulduğunuzda, buna direnç gösterebilmek için ne yapacağınızı seçiniz. Bu seçtiğiniz cezbedici durumlar ve stratejiler arasında bir bağlantı olması önemlidir: Seçtiğiniz her bir cezbedici durumu (solda), bir strateji ile (sağda) eşleştiriniz ve yaptığınız eşleştirmeleri yazınız. Seçtiğiniz durumla başa çıkmak için aynı stratejiyi ya da farklı stratejileri seçebilirsiniz.

Cezbedici durumlar	Stratejiler
Bir başka araç beni solladığında hız yapmak cazip gelirse…	...o zaman hız limitlerine uyma becerimin olduğunu kendime hatırlatacağım.
Bir başka araç bana selektör ya da korna ile baskı yaptığında hız yapmak cazip gelirse…	…o zaman hayatımdaki kişilerin hız sınırlarına uymam konusunda beni ne kadar desteklediklerini hatırlayacağım.
Akmayan bir trafikte takıldıktan sonra hız yapmak cazip gelirse…	…o zaman hız yapmak için duyduğum baskıyı görmezden gelmek için özellikle çaba göstereceğim.
Çok yavaş hareket eden bir aracın arkasında takıldıktan sonra hız yapmak cazip gelirse…	…o zaman hız yapmak yerine, sakinleşmeye ve daha sakin / düşünceli / sorumlu bir şekilde araç kullanmaya çalışacağım.
Trafik ışıkları değişmeden önce geçebilmek için hız yapmak cazip gelirse…	…o zaman hız limitini aşarsam kendimi ne kadar hayal kırıklığına uğratacağımı düşüneceğim.
Daha yüksek hız limitlerine sahip olması gerektiğini düşündüğüm yollarda hız yapmak cazip gelirse…	…o zaman hız yapmaktan kaçınacağıma dair kendime bir söz verdiğimi hatırlayacağım.
Stresli olduğumda hız yapmak cazip gelirse…	…o zaman hayatımdaki insanlardan (örn. daha deneyimli ya da daha sakin şoförlerden) gelecekte böyle durumlarda hız yapmaktan nasıl kaçınacağımla ilgili tavsiye alacağım.
Araçtaki yolcular açıkça ya da ima ederek, beni daha hızlı kullanmam için cesaretlendirdiklerinde hız yapmak cazip gelirse…	…o zaman daha yavaş araç kullanmama yardımcı olması için daha düşük bir viteste araç kullanacağım.
Bir yere (örn., iş, üniversite, bir randevu ya da arkadaşlarla buluşma) geç kaldığım ya da aceleyle gitmek zorunda olduğumda hız yapmak cazip gelirse…	…o zaman hız yapmamın kendimi düşünceli bir insan olarak görmemle çeliştiğini hatırlayacağım.
Aşina olduğum yollarda araç kullanırken hız yapmak cazip gelirse…	…o zaman aracını hız sınırları içinde kontrol edebilen, becerikli bir sürücü olduğumu kendime hatırlatacağım.
Bir okulun yanından geçerken hız yapmak cazip gelirse…	…o zaman eğer hız yapmazsam, iyi bir sürücü olacağımı kendime hatırlatacağım.

Volitional Help Sheet- Avoidance Goals

Bütün sürücüler buna niyetli olmasalar bile ara sıra hız yaparlar. Kişiler, kendilerini hız yapmaları yönünde cezbeden durumları ve bununla başa çıkma stratejilerini tanımlamaları durumunda, hız sınırlarına uyma konusunda daha başarılı olma eğilimindedirler. Biz de şimdi sizin bunu aşağıdaki tabloyu kullanarak yapmanızı istiyoruz. Soldaki listeden 4 "cezbedici durum" seçiniz (Hız sınırlarına uyma konusunda en çok zorluk seçtiklerinizi seçiniz). Daha sonra, sağda yer alan "stratejiler" listesinden kendinizi bu durumlarda bulduğunuzda, buna direnç gösterebilmek için ne yapacağınızı seçiniz. Bu seçtiğiniz cezbedici durumlar ve stratejiler arasında bir bağlantı olması önemlidir: Seçtiğiniz her bir cezbedici durumu (solda), bir strateji ile (sağda) eşleştiriniz ve yaptığınız eşleştirmeleri yazınız. Seçtiğiniz durumla başa çıkmak için aynı stratejiyi ya da farklı stratejileri seçebilirsiniz.

Cezbedici durumlar	Stratejiler
Etraftaki trafiğe ayak uydurmak için hız yapmak cazip gelirse…	…o zaman hız yapmam yüzünden birinin yaralanmasına ya da ölümüne sebep olursam çekeceğim duygusal eziyeti düşüneceğim.
Arkamdan gelen araç beni çok yakından takip ettiğinde hız yapmak cazip gelirse…	…o zaman kendime, hız yapmanın yakıt tüketimimi arttırarak hem çevreye zarar verdiğini hem de bana pahalıya mal olduğunu hatırlatacağım.
Trafiğin olmadığı ya da çok az olduğu sakin yollarda hız yapmak cazip gelirse…	…o zaman kendime, toplumun hız yapmaya karşı artık daha az kabullenici ve hoşgörülü olduğunu hatırlatacağım.
Trafik ışıkları değişmeden önce geçebilmek için hız yapmak cazip gelirse…	…o zaman hız limitinin üzerinde araç kullanırsam kendimi ne kadar hayal kırıklığına uğratacağımı düşüneceğim.
Arabada belirli tür müzikleri dinlerken hız yapmak cazip gelirse…	...o zaman hız yapan sürücülerin yol açtığı trafik kazalarının kurbanlara ve ailelerine verdiği sıkıntıları görmenin/duymanın ne kadar üzücü olduğunu hatırlayacağım.
Uzun bir yolculuk yaparken hız yapmak cazip gelirse…	…o zaman kendime, hız yapmanın aracımın emisyonunu arttırarak çevreyi kirlettiğini hatırlatacağım.
Kendimi göstermek ya da birilerine hava atmak için hız yapmak cazip gelirse…	…o zaman kendime, hız yüzünden yakalanan sürücülerin (örn. polis ya da güvenlik kameraları tarafından) çeşitli yaptırımlarla karşı karşıya geldiklerini hatırlatacağım.
Yakalanma ihtimalimin çok düşük olduğunu hissettiğim için hız yapmak cazip gelirse…	…o zaman hız yaparak aslında zamandan çok da fazla tasarruf etmediğimi kendime hatırlatacağım.
Arabanın daha hızlı gitmek "istediğini" hissettiğim için hız yapmak cazip gelirse…	…o zaman gelecekte kendimi benzer bir duruma sokmaktan kaçınmaya çalışacağım.
Park etmiş araçların olduğu bir yoldan aşağı inerken hız yapmak cazip gelirse…	…o zaman kolay ve eğlenceli bir şey olabilmesine rağmen, hız yapmanın zararlı ve tehlikeli bir alışkanlık olduğunu kendime hatırlatacağım.

Volitional Help Sheet- Control Condition

Aşağıda günlük hayatınızda karşılaşabileceğiniz bazı durumlar ve uygulanabilecek stratejiler verilmiştir. Lütfen soldaki listeden 4 "durum" seçiniz. Daha sonra, sağda yer alan "stratejiler" listesinden kendinizi bu durumlarda bulduğunuzda, bununla başa çıkabilmek için ne yapacağınızı seçiniz. Bu seçtiğiniz durumlar ve stratejiler arasında bir bağlantı olması önemlidir: Seçtiğiniz her bir durumu (solda), bir strateji ile (sağda) eşleştiriniz ve yaptığınız eşleştirmeleri yazınız. Seçtiğiniz durumla başa çıkmak için aynı stratejiyi ya da farklı stratejileri seçebilirsiniz.

Durumlar	Stratejiler
O metroyu kaçırırsam,	…o zaman pikniği iptal etmemiz gerekir
Gökyüzünde gri bulutlar görürsem,	…o zaman öğretmene sorarım
İşlerimi bugün bitirebilirsem,	…o zaman yüksek lisans yapabilirim
Bu kadar çok kahve içersem,	…o zaman ortalamamı yükseltebilirim
Bu dönem o dersi alabilirsem,	…o zaman bu yıl mezun olabilirim
Arkadaşım kitabımı geri getirirse,	…o zaman uyumakta zorluk çekerim
Ödevdeki problemleri çözmekte zorlanırsam,	…o zaman sana ödünç verebilirim
Derslerime yeterince zaman ayırabilirsem,	…o zaman İstanbul'a taşınabilirim
Hafta sonu yağmur yağarsa,	…o zaman yanıma şemsiye alırım
İş teklifini kabul edersem,	…o zaman hafta sonu tiyatroya gidebilirim
Biraz para biriktirebilirsem,	…o zaman taksi tutmam gerekir

Debriefing

Değerli katılımcı,

Bu maili geçen sonbaharda katılmış olduğunuz doktora tezim için sürdürmekte olduğum "Sürücülük ve Görüş Bildirimi" isimli çalışmaya istinaden gönderiyorum. Öncelikle çalışmaya gösterdiğiniz ilgi ve ayırdığınız zaman için çok teşekkür ederim. Çalışmada elde ettiğim bazı bulguları sizinle paylaşmak istiyorum. Sürücü davranışları ile ilgili önceki çalışmalar, niyetin davranışın en önemli belirleyicisi olduğunu göstermektedir. Bu çalışmada da niyet aşılamanın hız yapma davranışının önüne geçmek için kullanılıp kullanılamayacağı test edilmiştir. Buna ek olarak, ulaşılmak istenen hedefin türü yaklaşma ve uzaklaşma türü hedefler olarak ikiye ayrılarak, hedefin davranış üzerindeki etkisi incelenmiştir. İki oturumda gerçekleştirilen deneyin ilk oturumunda sürücülerin herhangi bir manipülasyona maruz bırakılmadan günlük sürücülük becerilerine en yakın hallerinin kaydedilmesi amaçlanmıştır. Sonrasında verilen bir "yardım cetveli" ile deney grubundaki katılımcılar karşılaşabilecekleri kritik durumları uygun olabilecek tepkiler ile eşleştirirken, kontrol grubundaki katılımcılar araştırma hipotezi ile ilgili olmayan günlük cümleleri eşleştirmişlerdir. Deney grubu da kendi içinde yaklaşma türü hedefler verilenler (*Bir başka araç beni solladığında hız yapmak cazip gelirse… …o zaman aracını hız sınırları içinde kontrol edebilen, becerikli bir sürücü olduğumu kendime hatırlatacağım*) ve uzaklaşma türü hedefler verilenler (*Uzun bir yolculuk yaparken hız yapmak cazip gelirse……o zaman kendime, hız yapmanın yakıt tüketimimi arttırarak hem çevreye zarar verdiğini hem de bana pahalıya mal olduğunu hatırlatacağım*) olarak ikiye ayrılmıştır. İki haftalık bir zaman aralığından sonra tekrar ölçümler alınmıştır. Bulgulara göre, niyet aşılama hız yapma davranışı üzerinde etkilidir ve yol güvenliğine katkı sağlayabilmektedir. Ayrıca, yaklaşma ve kaçınma türü hedefler karşılaştırıldığında yaklaşma türü hedeflerin hız yapmayı engellemek üzerinde daha faydalı olduğu, ancak kaçınma türü hedeflerin ise yayaların dahil olduğu senaryolarda daha faydalı olduğu görülmüştür. Son olarak, hız

limitlerine uyma konusundaki önceki tercihlerin hedefe ulaşma üzerinde etkili olduğu ve kişilerin önceki tercihlerine bağlı olarak niyet aşılamaya olumlu ya da olumsuz etki edebildiği görülmüştür.

Eğer araştırma hakkında daha fazla bilgi almak isterseniz, burcutekes@gmail.com adresinden iletişim kurabilirsiniz.

Değerli yardımlarınız için tekrar teşekkür ederim,

Burcu TEKEŞ

C: Driving Simulation Scenario

METRIC
0, BSAV, 0, 0.5, 0, 6, 2, 3, 4, 5, 7, 12, 13, 14, 23, 25, 26, 27, 28, 35, 36, 37, 38, 19, 18
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200, V, 0, 480, 8, 1, *18~35, 50{4}, -6, 15.27, 2
900, I, 0, 0, 0, 4, 4
0, SL, -900, 100{4}, 1, 10, 0, 5, 6, 2, 1
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0, PED, 910, 90{4}, 1.22, -8.53, L, *1~10
0, PED, 895.08, 93{4}, 1.22, 8.53, R, *1~10, Right Ped
0, PED, 915, 93{4}, 1.22, -8.53, L, *1~10
1500, I, 0, 0, 0, 4, 4
0, SL, -1500, 100{4}, 1, 10, 0, 5, 6, 2, 1
0, PED, 1489.86, 110{4}, 1.37, 8.53, R, *1, right PED
0, PED, 1510, 110{4}, 1.22, 8.53, R, *2
0, PED, 1490.86, 114{4}, 1.37, 8.53, R, *3, right PED
0, PED, 1511, 114{4}, 1.22, 8.53, R, *4
0, PED, 1491.86, 116{4}, 1.37, 8.53, R, *5, right PED
0, PED, 1512, 116{4}, 1.22, 8.53, R, *6
0, PED, 1600, 100{4}, 1.22, 8.53, R, *1~6, Right Ped
0, PED, 1980, 160{4}, 1.6, -8.53, L, *8, Left PED
0, PED, 1950, 100{4}, 1.6, 8.53, R, *9, Right Ped
1500, V, 0, 570, 9, 1, *18~35, 75{4}, -2.65, 9, 2
3500, I, 0, 0, 0, 4, 4
2000, SL, -1500, 100{4}, 1, 10, 0, 5, 6, 2, 1
3500, V, 0, 450, 8, 1, *18~35, 75{4}, -2.4,
4250, I, 0, 0, 0, 4, 4
0, SL, -4250, 50{4}, 1, 10, 2, 5, 6, 2, 1
100, V, /30, -250, *0, 1, 13, $1 {0}, /-12, *30
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0, CT, 394.51, 5, -407, 17, L, *19~35;1~4, 1, 1
0, CT, 394.51, 5, -420, 17, L, *19~35;1~4, 1, 1
0, CT, 394.51, 5, -500, 17, L, *19~35;1~4, 1, 1
0, CT, 394.51, 5, -520, 17, L, *19~35;1~4, 1, 1
0, CT, 401.83, 5, 400, 17, R, *19~35;1~4, 1, 1
0, CT, 405.49, 5, 400, 17, R, *19~35;1~4, 1, 1
0, CT, 401.83, 5, 407, 17, R, *19~35;1~4, 1, 1

0, CT, 405.49, 5, 413, 17, R, *19~35;1~4, 1, 1
0, CT, 401.83, 5, 500, 17, R, *19~35;1~4, 1, 1
0, CT, 405.49, 5, 530, 17, R, *19~35;1~4, 1, 1
0, CT, 898.17, 5, -900, 17, L, *19~35;1~4, 1, 1
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0, CT, 901.83, 5, 907, 17, R, *19~35;1~4, 1, 1
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0, CT, 3498.17, 5, -3500, 17, L, *19~35;1~4, 1, 1
0, CT, 3494.51, 5, -3507, 17, L, *19~35;1~4, 1, 1
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0, CT, 3494.51, 5, -3600, 17, L, *19~35;1~4, 1, 1
0, CT, 3494.51, 5, -3620, 17, L, *19~35;1~4, 1, 1
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0, CT, 3501.83, 5, 3600, 17, R, *19~35;1~4, 1, 1
0, CT, 3505.49, 5, 3630, 17, R, *19~35;1~4, 1, 1
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0, V, *13, -360, 2.13, 1, *19~35;1~4
0, V, *13, -400, 2.13, 1, *19~35;1~4
0, V, *12, -50, 5.6, 1, *19~35;1~4
0, V, *12, -150, 5.6, 1, *19~35;1~4
0, V, 14, 150, 5.6, 1, *19~35;1~4
0, V, 14, 200, 5.6, 1, *19~35;1~4
500, V, 18, 300, 5.6, 1, *19~35;1~4
800, V, 18, 300, 5.6, 1, *19~35;1~4
1100, V, 18, 300, 5.6, 1, *19~35;1~4
1200, V, 18, 300, 5.6, 1, *19~35;1~4
800, V, 20, 320, 2.13, 1, *19~35;1~4
1100, V, 20, 320, 2.13, 1, *19~35;1~4
1200, V, 20, 320, 2.13, 1, *19~35;1~4
2300, V, 20, 250, 2.13, 1, *19~35;1~4
2300, V, 20, 300, 2.13, 1, *19~35;1~4
3300, V, 20, 250, 2.13, 1, *19~35;1~4
3300, V, 20, 400, 2.13, 1, *19~35;1~4
4300, V, 20, 300, 5.6, 1, *19~35;1~4
4300, V, 20, 400, 5.6, 1, *19~35;1~4
4300, V, 20, 270, 5.6, 1, *19~35;1~4
4300, V, 20, 340, 5.6, 1, *19~35;1~4

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700, A, 12, 930, -2.13, *19~35;1~4
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1000, A, 12, 850, -2.13, *19~35;1~4
1000, A, 12, 930, -2.13, *19~35;1~4
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1200, A, 12, 930, -2.13, *19~35;1~4
1200, A, 12, 980, -2.13, *19~35;1~4
1800, A, 12, 770, -2.13, 3
1800, A, 12, 850, -2.13, *19~35;1~4
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2000, A, 12, 930, -2.13, *29~34
2200, A, 12, 930, -2.13, *19~35;1~4
2200, A, 12, 1000, -2.13, *19~35;1~4
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4000, A, 12, 980, -2.13, *19~35;1~4
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4100, A, 12, 1130, -2.13, *19~35;1~4

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4500, A, 12, 1230, -2.13, *19~35;1~4
4500, A, 12, 1280, -2.13, *19~35;1~4
5000, A, 12, 2000, -2.13, 3
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5500, A, 12, 770, -2, 3
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6000, A, 12, 930, -2, *29~34
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6200, A, 12, 1000, -2, *19~35;1~4
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7300, A, 12, 1230, -2, *29~34
7400, A, 12, 1130, -2, *19~35;1~4
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1100, A, 12, 1020, -5.6, *1~4
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1180, A, 12, 1060, -5.6, *1~4
1180, A, 12, 1100, -5.6, *29~34
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2200, A, 12, 1000, -5.6, *29~34
2200, A, 12, 1060, -5.6, *1~4
2200, A, 12, 1100, -5.6, *29~34
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0, BLDG, -270, 20, G17
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0, BLDG, 340, 20, G17
0, BLDG, 430, 15, G22
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0, BLDG, 525, 15, s11
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400, BLDG, 720, 15, B22
400, BLDG, 780, 15, G31
400, BLDG, 830, 15, G35
400, BLDG, 910, 15, U4
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5000, ES

D: Turkish Summary/ Türkçe Özet

Giriş

Niyet "*niyet edilen şey, bir hedef ya da plan"* ya da *"Bir şeyi yapmayı önceden isteyip düşünme, maksat"* (Oxford çevrimiçi sözlüğü, 2015; TDK, bt). Psikoloji alanında ise niyet, bir kişinin bir davranışta bulunabilme ihtimali olarak tanımlanmaktadır. Niyet, gelecekteki davranışın bir öncülü ve kişinin o davranışta bulunması için ne kadar çaba göstermeye gönüllü olduğuna dair motivasyonel bir faktördür. Kişinin iradesine bağlı olan koşullarda, niyetin davranışla ile ilişkilenebilmesi beklenmektedir. Diğer bir deyişle, bir kişinin bir davranışta bulunma niyeti arttıkça, o davranışta bulunma ihtimali de artmaktadır (Ajzen, 1991). Psikoloji alanının niyet ile ilgili merakı 70 yıldan fazlasına dayanmaktadır. Lewin, Dembo, Festinger ve Sears (1944) niyet ve davranış arasındaki boşluğu inceleyen ilk çalışmalara imzalarını atmışlardır. Yaptıkları çalışmalar ile niyet edilen her şeyin istenen davranış ile sonuçlanmadığını bulgulamışlardır. Buna göre, hem istem (*irade*) gerektiren hem de beceri ve stratejiler gibi motivasyonel unsurların da davranış için gerekli olduğunu belirtmektedirler. Daha sonraları, niyetin tanımı birbirini tamamlayan iki teori olan "Akla dayalı davranış teorisi" (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) ve Planlı Davranış Teorisi ile (Ajzen, 1985) yeniden yapılmıştır. Söz konusu iki teori, niyetin davranışın en önemli belirleyici olduğunu belirtmekle beraber, varsayımlarının tamamen isteme bağlı olan davranışlar için geçerli olduğunu vurgulamaktadır. Öz olarak, bir davranışa ilişkin niyet arttıkça, o davranışın gerçekleşme olasılığı artmaktadır. "Akla dayalı davranış teorisi" davranışın doğrudan belirleyicisi olarak niyeti tanımlamakla beraber, niyetin de tutumlar ve öznel normlar tarafından belirlendiğini ortaya koymaktadır. Öte yandan, Planlı Davranış Teorisi bu tanıma 'algılanan davranışsal kontrol' öğesini de ekleyerek daha kapsamlı bir model ortaya koymaktadır (Ajzen, 1985, Ajzen, 1991; Schifter & Ajzen, 1985). Algılanan davranışsal kontrol eyleme geçirilmesi planlanan bir davranışın algılanan güçlüğüdür ve davranış üzerinde hem doğrudan hem de niyetler aracılığı ile

dolaylı olarak etkisi bulunmaktadır. Planlı davranış teorisine göre bir davranışı gerçekleştirmenin iki eş unsuru o davranışa ilişkin motivasyon (niyet) ve becerilerdir (davranışsal kontrol). "Akla dayalı davranış teorisi" ile benzer şekilde, planlı davranış teorisi de davranışın gerçekleşme olasılığının güçlü niyet ile birlikte artacağını ileri sürmektedir.

Trafik ve ulaşım psikolojisi, niyet ve davranış arasındaki ilişkiyi açıklamak için planlı davranış teorisinin uygulandığı sağlık ile ilgili birçok alanlardan biridir. Alanda yapılan çalışmalar yayalar (Jalilian, Mostafavi, Mahaki, Delpisheh, & Rad, 2015), bisikletliler (Lajunen & Räsänen, 2004), motosiklet sürücüleri (Aghamolaei, Tavafian, & Madani, 2011), profesyonel sürücüler (Aghamolaei, Ghanbarnejad, Tajvar, Asadiyan, & Ashoogh, 2013) ve araç sürücüleri (Elliott et al., 2003, 2007) gibi farklı gruplar açısından çeşitlilik göstermektedir. Benzer şekilde toplu taşıma kullanımı (Chen & Chao, 2011), elektikli araç kullanımı (Moons & De Pelsmacker, 2015) ya da çeşitli yol ihlalleri (Elliott ve ark., 2003, 2007; Elliott, 2012) de aynı teorik çerçevede incelenmektedir. Bu çalışmada, niyet ile hız yapma davranışı arasındaki ilişki ele alınmaktadır. Reason ve ark. (1990)'ın sınıflamasına göre bir yol ihlali olarak tanımlanan hız yapma, sürüş sırasında belirlenmiş olan yasal sınırın üzerinde hızla araç kullanmak anlamına gelmektedir (Campbell & Stradling, 2003). Hız yapma hem kazaya karışma ihtimalini hem de kazanın verdiği zararın arttırmaktadır (Aarts & Van Schagen, 2006; Elvik, Christensen, & Amundsen, 2004). Planlı davranış teorisi kapsamında yapılmış olan birçok çalışma (örn. Elliott ve ark., 2003, 2007; Elliott, Thomson, Robertson, Stephenson, & Wicks, 2013; Leandro, 2012; Letirand & Delhomme, 2005; Paris, & Van den Broucke, 2008; Warner ve ark., 2009), niyetin ile hız yapma davranışı arasındaki güçlü ilişkiyi tekrarlı bir şekilde ortaya koymaktadır.

Bu çalışmada ilgili alanyazının niyet-hız yapma ilişkisi bağlamında incelenmesi hedeflenmiştir. Sistematik tarama için "intention-traffic-driver behavior", "intention-traffic-driving behavior" ve "intention-traffic-accident" kelime grupları scopus veri tabanında (www.scopus.com) tekrarlı bir şekilde aratılmıştır. Tarama için herhangi bir

zaman kısıtlanması konulmamakla beraber, taramaya sadece İngilizce yazılmış ve tam metin şeklinde yayımlanmış makaleler dahil edilmiştir. Tarama üç anahtar kelime grubu için tekrar edildikten sonra çakışan makaleler dışarıda bırakılmış ve 963 makale çalışmaya dahil edilmiştir. Yapılan tarama sonucunda 18 makale çalışmaya dahil edilmek üzere seçilmiştir. Söz konusu makaleler için kullanılan eleme kriterleri şunlardır:

i.) Niyeti bağımsız değişken olarak ele almış olmak,

ii.) Niyeti aracı ya da yönetici değişken olarak ele almış olmak,

iii.) Hız yapma davranışını çıktı olarak ele almış olmak (örn., kendi-bildirim türünde ya da simülasyonda ölçülerek)

iv.) Nicel bir araştırma yöntemi izlemiş olmak,

v.) Yetişkin ve klinik olmayan bir örneklem grubu kullanmış olmak.

Güncel makalelerin de çalışmaya dahil edilmesi amacıyla daha sonra aynı süreçler takip edilmiştir. Yakın zamanda yayınlanmış olan 3 makaleye daha ulaşılarak toplam 21 makale sürece dahil edilmiştir.

Alan yazın taraması sonucunda niyetin hem kendi-bildirim hem de simülasyon ile yapılan ölçümlerde hız yapma davranışının en önemli belirleyicisi olduğu bulgusuna ulaşılmıştır. Planlı davranış teorisinin diğer unsurları göz önüne alındığında, algılanan davranışsal kontrol ile hız yapma davranışı arasında güçlü bir ilişki olduğu bulgulanmıştır. Ayrıca, iki çalışmada da (De Pelsmacker & Janssens, 2007; Lheureux et al., 2015), alışkanlık niyet ile beraber hız yapma üzerinde belirleyiciliği olan bir değişken olarak tanımlanmıştır. Çalışmanın bulguları göz önüne alındığında, sadece bir çalışmanın niyet ve hız yapma ilişkisini kültürlerarası olarak incelediği ve niyet-davranış ilişkisinin kültürlerarası olarak da korunduğu görülmüştür (Warner ve ark., 2009). Yapılacak farklı kültürlerarası çalışmalar ile söz konusu ilişkiyi incelemenin fayda sağlayacağı düşünülmektedir.

Ek olarak, söz konusu çalışmaların yöntemleri de incelenmiş ve bazı önemli noktalar belirlenmiştir. İlk olarak, beş çalışmada Cronbach alfa içtutarlılık katsayısının verilmediği görülmüştür. İkinci olarak, niyet ölçümünde kullanılan madde sayıları bir ile altı arasında değişmektedir ve sadece iki çalışmada altı maddelik bir form kullanılmıştır. Son olarak, 21 çalışmanın on tanesinde ön ve son ölçümler arasında bir zaman bulunmamaktadır. Diğer bir deyişle, niyet ve davranış eşzamanlı olarak ölçülmüştür. Her iki ölçümün eş zamanlı olarak alınmasının da katılımcılarda bir yanlılığa sebep olduğu ve yapay bir korelasyona yol açtığı düşünülmektedir. Son olarak, niyet ve hız yapma arsındaki ilişkiyi inceleyen deneysel çalışmaların azlığı alanın bir kısıtlılığı olarak görülmektedir. Bu sebeple gözleme dayalı veri kullanacak ileriki çalışmaların faydalı olacağı düşünülmektedir. Öz olarak, sistematik tarama sonucunda niyet ve davranış arasındaki güçlü ilişki doğrulanmakla beraber bazı yöntem problemleri göze çarpmaktadır. Çalışmanın devamında bu güçlü ilişki temel alınarak, niyet ve hız yapma davranışı arasındaki ilişkinin daha güçlü bir deneysel bir desen içinde, sürüş simülatörü kullanılarak test edilmesi amaçlanmaktadır.

Sheeran (2002) tarafından 10 meta analiz çalışması üzerinden yapılan meta-analizde, niyet ve davranış arasındaki ilişkinin büyük bir etki gücüne sahip olduğu bulunmuştur. Tutarlı olarak, alanda yapılan birçok çalışma, davranışta bir değişiklik elde etmek için niyetin manipüle edilmesi gerektiği konusunda hemfikirdir. Bunlardan biri Bamberg (2013)'in "Öz-Düzenlemeli Davranışsal Değişimin Basamak Modeli"dir. Modele göre davranış değişimi zamana göre sıralı olan dört aşamadan oluşmakta ve kişi her aşamada ilgili problemi çözerek bir sonraki aşamaya geçebilmektedir. İlk aşamada kişi, bir 'hedefe yönelik niyeti' belirlemelidir. Bu aşamanın tamamlanmasıyla kişi ikinci aşamaya geçer. İkinci aşamada bu hedeflerin daha netleştirilmiş hale gelmesiyle kişi 'davranışa yönelik hedef' oluşturur. Hedeflenen yeni davranışa giden bu aşamalardan sonuncusu olan 'niyet aşılama' aşamasında kişi davranış ve niyet arasındaki ilişkiyi daha da detaylandırıp kuvvetlendirerek, davranışın görülme olasılığını arttırmaktadır. Niyet aşılama, "ise…/o zaman…" kalıbıyla kurulan planlamalar aracılığı ile yapılmaktadır. Diğer bir deyişle, kişi karşılaşması olası olan bir durumu ve

uygulayabileceği çözümleri düşünerek, "*eğer X gerçekleşirse, o zaman Y'yi uygulayacağım*" şeklinde detaylandırılmış planlar kurar (Gollwitzer, 1993; Gollwitzer & Sheeran, 2006; Prestwich & Kellar, 2014). Bieleke, Legrand, Mignon, ve Gollwitzer (2018) tarafından yapılmış güncel bir çalışmaya göre, niyet aşılama ile kurgulanan niyetler, hedefe yönelik niyetlerden daha etkili olarak bulunmuştur. Niyet aşılama genellikle kritik durumlar ve uygun yanıtları içeren 'niyete yönelik yardım cetveli' aracılığı ile oluşturulmaktadır. Niyete yönelik yardım cetveli içinde bulunan *ise* ve *o zaman* koşulları, iki liste halinde katılımcılara sunulmaktadır. *İse* koşulları sağlığı tehdit edici davranışları içerirken (*Uzun bir yolculuk yaparken hız yapmak cazip gelirse……),o zaman* koşulları sağlığı koruyucu davranışları içermektedir *(o zaman kendime, hız yapmanın yakıt tüketimimi arttırarak hem çevreye zarar verdiğini hem de bana pahalıya mal olduğunu hatırlatacağım)* (Brewster ve ark.., 2015). Niyet aşılama uygulaması oldukça kolay, az zaman alan, masrafsız ve etkililiği kanıtlanmış bir müdahaledir. Bu sebeple tütün ve alkol kullanımı (e.g. Armitage, 2015), yağ alımı (Prestwich, Ayres, & Lawton, 2008) ve kilo kontrolü (e.g. Armitage et al., 2014) gibi sağlık ile birçok alanda kullanılmaktadır. Trafik ve ulaşım psikolojisi alanındaki uygulamaları henüz çok yaygın olmamakla beraber hız kurallarına uyma (Brewster ve ark.., 2015; Elliott ve Armitage, 2006) ve seyahat etme alışkanlıkları (Eriksson, Garvill ve Nordlund, 2008) gibi konular üzerinde çalışılmış ve etkili olduğunu bulgulanmıştır.

İlgili literatür incelendiğinde, odaklanılan hedeflerin yaklaşma veya uzaklaşma türü olmasının, niyet aşılama üzerinde farklı etkiler yaratabildiği görülmüştür. Yaklaşma türü hedefler genellikle başarılmak istenen bir sonuç davranışa odaklanırken, uzaklaşma türü hedefler kaçınımak istenen bir sonuç davranışa işaret etmektedir (Elliot ve Trash, 2002). Sağlık ile ilgili konular söz konusu olduğunda yaklaşma türü hedefler davranış değişimi üzerinde daha etkili olarak bulunmuştur (Elliot, Sheldon ve Church, 1997; Elliot ve Sheldon, 1998; Sullivan ve Rothman, 2008). Uzaklaşma türü hedefler, kişinin ilerlemesinin yeterince gözlemlenememesi, asıl hedefe yönelik küçük adımların daha az oluşu gibi sebeplerle eleştirilmektedir. Buna rağmen, bazı kişilerin kaçınma türü hedeflere yaklaşma türü hedeflerden daha yatkın olduğu bulgulanmıştır. Buna göre

yaklaşma türü hedefler dışadönüklük ve pozitif duygulanım gibi özelliklerle daha çok ilişkiliyken, kaçınma türü hedefler nevrotiklik ve negatif duygulanım gibi özellikle ilişkilidir (Elliot ve Trash, 2002).

Çalışma Amacı

Tüm bu bilgilerin ışığında bu çalışmada niyet aşılamanın hız yapma davranışı çerçevesinde incelenmesi amaçlanmıştır. Niyet aşılama sağlık alanında sıklıkla çalışılan bir konu olmakla beraber, trafik bağlamında ele alan oldukça az sayıda çalışma bulunmaktadır (Elliott ve Armitage, 2006; Brewster ve ark. 2015). Ayrıca, yaklaşma ve uzaklaşma türü hedeflerin niyet aşılama üzerindeki etkisini inceleyen çalışmalar bulunmakla birlikte, bu bağlantı sürücü davranışları açısından hiç ele alınmamıştır. Bu çalışmada farklı türdeki hedeflerin niyet aşılama üzerindeki etkisinin incelenmesi amaçlanmıştır. Son olarak, kişilerin tercih ettikleri hızların da niyetleri üzerinde etkisi olduğu düşünülmüştür. Bu sebeple, tercih edilen hız ile niyet aşılamanın, hız yapma davranışı üzerindeki ortak etkisinin incelenmesi amaçlanmıştır.

Yöntem

Katılımcılar

Çalışmanın örneklemini 18 ile 28 yaşları arasında, düz ya da otomatik vitesli bir araç için ehliyet sahibi olup aktif araç kullanan 78 kişi oluşturmaktadır. Örneklemin % 46.2'si kadın (N = 36), 53.8'i erkek (N = .42) olup, yaş ortalaması 22.35 (SS = 1.95) ve ehliyet süresi 3.78 yıldır (SS = 1.93). Katılımcıların 96.2'sinin kendi aracı varken (N = 75), % 69.2'sinin daha önce bir hız ihlali cezası bulunmamaktadır (N = 54). Yıllık km 150 ile 30000 arasında değişmekle beraber, ortalaması 7878.70'dir (SS = 5951.80).

Ölçekler

*Kişisel Bilgi Formu*nda katılımcılara yaş, cinsiyet, ehliyet süresi, toplam ve yıllık kilometre, aktif ve pasif kaza sayısı gibi sorular sorulmuştur.

Niyete Yönelik Yardım Cetveli, Brewstar (2015) tarafından geliştirilmiş olan formun araştırmacılar tarafından Türkçe'ye uyarlanması ile elde edilmiştir. Niyete yönelik yardım cetveli, 20 kritik durum ve bu durumlarda kullanılabilecek stratejilerden oluşmaktadır. Katılımcıların karşılaşabilecekleri dört koşulu seçip, bu durumlarda uygulayabilecekleri stratejiler ile eşleştirmeleri beklenmektedir. Bu çalışmada niyete yönelik yardım cetveli, katılımcıların tercih edecekleri stratejiler bakımından yaklaşma ve uzaklaşma türü hedefler olmak üzere ikiye bölünmüştür. Kritik bir durum karşısında (örn. *Stresli olduğumda hız yapmak cazip gelirse...*), yaklaşma türü hedeflerle oluşturulmuş olan cetvel "*…o zaman daha yavaş araç kullanmama yardımcı olması için daha düşük bir viteste araç kullanacağım*" gibi maddeleri içerirken (bkz. Ek A), kaçınma türü hedeflerle oluşturulmuş olan cetvel "*…o zaman kendime, hız yüzünden yakalanan sürücülerin (örn. polis ya da güvenlik kameraları tarafından) çeşitli yaptırımlarla karşı karşıya geldiklerini hatırlatacağım*" gibi maddeleri içermektedir (bkz. Ek B).

Sürücü Davranışları Ölçeği, Reason ve ark. (1990) tarafından oluşturulmuş olup Türkçe uyarlaması Sümer, Lajunen ve Özkan (2002); ve Sümer ve Özkan (2002) tarafından yapılmıştır. Toplam 28 maddeden oluşan ölçekte ihlal ve hatalar, 6'lı bir Likert üzerinden davranışın gerçekleştirilme sıklığına göre değerlendirilmektedir.

Pozitif Sürücü Davranışları Ölçeği, Özkan ve Lajunen (2005) tarafından geliştirilmiş olup 14 maddeden oluşmaktadır. 6'lı Likert üzerinden, davranışın gerçekleştirilme sıklığına göre değerlendirilen ölçekten alınan yüksek puan, pozitif sürücü davranışlarının görülme sıklığını arttırmaktadır.

Sürüş Simülatörü olarak STISIM M100W kullanılmış ve katılımcılardan öncelikli olarak simülatöre alışmaları ve hareket/taşıt tutması yaşamadıklarından emin olmak için 3 km'lik bir test sürüşü yapmaları istenmiştir. Daha sonra katılımcılara sunulan sürüş simülasyonu ise 5 km'lik açık havada ve gündüz vaktinde, 3.6 metre genişliğindeki çift şeritli bir yolda gerçekleşmekte olup, virajlar, trafik ışıkları, akan trafik, yayalar, ağaçlar ve binalar gibi öğeler içermektedir. Katılımcılar hem gaz, fren, sinyaller, aynalar, hız ve

kilometre sayacı bulunmaktadır. Hız sınırı 90 km. olup yol boyunca katılımcılara sürüş simülasyonu boyunca dört yol işareti ile hatırlatılmaktadır.

İşlem

Orta Doğu Teknik Üniversitesi Uygulamalı Etik Araştırma Merkezi'nden gerekli izinler alındıktan sonra çalışma ODTÜ Trafik ve Ulaşım Psikolojisi alt alanına bağlı İnsan Faktörü Laboratuvarında iki oturumda gerçekleştirilmiştir. Çalışmanın ilk aşamasında katılımcılara öncelikle bilgilendirilmiş onam formu verilerek çalışma hakkında kısaca bilgi verilmiştir. Katılımcılar deney (yaklaşma ve uzaklaşma) ve kontrol koşullarına seçkisiz olarak atandıktan sonra, test ve sürüş simülasyonları ile ve araştırmada kullanılan ölçekler yanlılık olmaması adına farklı uygulamalarda sırası değiştirilerek katılımcılara sunulmuştur. Daha sonrasında yaklaşma ve uzaklaşma gruplarındaki katılımcılara kritik koşulları tercih ettikleri yanıtlarla eşleştirmeleri gereken farklı niyet aşılama manipülasyonları uygulanmış ve yaptıkları tercihleri manipülasyonun etkisini güçlendirmek adına yazmaları istenmiştir. Kontrol gruplarındaki katılımcılara ise trafik ile ilgisi olmayan cümleleri eşleştirmeleri ve yazmaları gereken bir görev verilmiştir. İki hafta sonra aynı katılımcılar laboratuvara tekrar çağırılarak aynı ölçümler tekrar alınmıştır. Her iki aşamaya da katılan katılımcılara 20 TL ödeme yapılmıştır.

Sonuçlar ve Tartışma

Bu çalışma niyet aşılamanın hız yapma üzerindeki etkisinin incelenmesini amaçlamaktadır. Bu sebeple, hem kendi-bildirim türü ölçümler hem de simülasyondan elde edilen veriler birer çıktı değişken olarak ele alınmıştır. Ek olarak, simülasyon verileri, katılımcılara sunulan olaylar açısından da (örneğin, belirli bir trafik ışığına verilen tepkiler) tek tek değerlendirilmiştir. İlgili literatürde ilk defa olarak, niyet aşılamanın hız yapma davranışı üzerindeki etkisi yöneldiği hedefin türüne göre (yaklaşma ve uzaklaşma türü hedefler) ikiye ayrılarak ayrıca manipüle edilmiş ve etkileri incelenmiştir. Son olarak, katılımcılar verdikleri yanıtlara göre hız kurallarına

uyan ve uymayan olmak üzere iki gruba ayrılmış ve bu ayrımın niyet aşılama manipülasyonu ile ortak etkisinin hız yapma davranışı üzerindeki etkisi incelenmiştir.

Korelasyon Analizine İlişkin Bulgular

Çalışmanın ilk ve ikinci aşamaları için ayrı ayrı yapılmış olan korelasyon analizi sonuçlarına göre yaş ilk aşamada sadece toplam kilometre yaşı ile pozitif yönde ilişkili bulunmuştur. Öte yandan ikinci aşamada toplam kilometre yaşı ile pozitif yönde ilişkiliyken, saldırgan ihlallerin standart sapması, yatay hız ve gaza bağlı dikey hızlanma verileri ile negatif yönde ilişkili bulunmuştur. Diğer bir deyişle, yaşça genç olmak saldırgan ihlallerde daha fazla değişim, daha fazla yatay hız ve gaza bağlı dikey hızlanma ile ilişkilidir.

Toplam ve yıllık kilometre yaşı hem farklı hız limitlerinde tercih edilen hızlar, hem de daha önceki hız ihlalleri ile pozitif yönde ilişkilidir. Benzer şekilde, yıllık kilometre yaşı toplam kaza sayısı ile ilişkili iken, toplam kilometre yaşı hem aktif hem de pasif kaza sayıları ile pozitif yönde ilişkilidir. Ayrıca, yıllık ve toplam kilometre yaşları çalışmanın ilk aşamasındaki agresif ve sıradan ihlaller ile pozitif yönde ilişkiliyken, ikinci aşamada sadece yıllık kilometre yaşı ile pozitif yönde ilişkili bulunmuştur. İlgili literatürle tutarlı olarak, yıllık ve toplam kilometre yaşı hem kendi-bildirim hem de simülasyondan elde edilen sürücü davranışları verileri ile güçlü ilişkiler içindedir (bkz., Martinussen, Hakamies-Blomqvist, Møller, Özkan, & Lajunen, 2013). Bu bulgular deneyimli sürücülerin kendi becerilerini algılayış biçimleri ile açıklanabilir. Diğer bir deyişle, sürücülerin kilometre yaşları ve deneyimleri arttıkça, kendi becerilerini olduğundan daha yüksek algılama ve ihlalde bulunma eğilimleri de artmaktadır (de Winter & Dodou, 2010; Guého ve ark., 2014; Zhang, Jiang, Zheng, Wang, & Man, 2013).

Önemle vurgulanması gereken ayrı bir ilişki, farklı hız limitlerinde tercih edilen hızlar ve her iki aşamadaki simülasyon verileri arasındaki pozitif yöndeki ilişkidir. Buna göre katılımcıların tercih ettikleri hızlar arttıkça, simülasyondaki verilerinin ortalama ve standart sapmaları da artmaktadır. Bu pozitif ilişkiler simülatör verilerinin gerçek

hayattaki hız yapma davranışları ile benzerliği yönünde bir kanıt oluşturmaktadır (Öztürk, 2017).

Ayrıca, kendi bildirim türü sürücü davranışları ile simülasyon verileri arasındaki ilişkilere bakıldığında, sıradan ihlallerin simülasyon verileri ile daha anlamlı ve güçlü ilişkiler içinde olduğu görülmektedir. Simülasyon verilerinin hız yapma ile ilgili bulgular verdiği ve hız yapmanın da ilgili literatürde sıradan ihlallerden olarak tanımlandığı düşünüldüğünde, bu bulgu beklentilerle tutarlıdır (Reason ve ark., 1990).

Niyet Aşılamanın Kendi-Bildirim Türü Sürücü Davranışları Üzerindeki Etkisi

Niyet aşılamanın kendi-bildirim türü sürücü davranışları üzerindeki etkisinin ölçülmesi için karışık dizayn varyans analizi (ANOVA) yapılmıştır. Yapılan ilk set analizlerde, niyet aşılama hedef türüne bağlı olarak yaklaşma ve uzaklaşma olarak ayrılmamış, onun yerine bu iki grup bir araya getirilerek deney grubu olarak isimlendirilmiş ve kontrol grubu ile karşılaştırılmıştır. Gruplar arası ortalamalar arası farklara bakıldığında, sürücü davranışları ölçeğinin alt boyutları ile pozitif sürücü davranışları ölçeğinin, grup (deney ve kontrol) ve zaman (ilk ve son ölçümler) ortak etkisi açısından anlamlı sonuç vermediği görülmüştür. Yapılan analizler hedef türü yaklaşma ve uzaklaşma olarak ikiye ayrılarak tekrarlandığında, önceki bulgular ile benzer şekilde sürücü davranışları ölçeğinin alt boyutları ile pozitif sürücü davranışları ölçeğinin, koşul (yaklaşma, uzaklaşma ve kontrol) ve zaman (ilk ve son ölçümler) ortak etkisi açısından anlamlı sonuç vermediği görülmüştür. Bu bulgular, öncelikli olarak katılımcıların sosyal istenirlik eğilimi ile açıklanabilir (van de Mortel, 2008). Her ne kadar katılımcılar farklı deneysel koşullara atansa da söz konusu çalışmanın sürücü davranışları ve trafik güvenliği üzerine olduğu bilgisinin katılımcılarda bir sosyal istenirlik eğilimi yaratmış olabileceği düşünülmektedir. İkinci bir açıklama olarak, söz konusu ölçeklerin kişilerin genel eğilimlerini ölçek üzere tasarlanmış ölçme materyalleri olduğu, bu sebeple manipülasyona bağlı davranış değişikliklerini saptamak için uygun olmayabilecekleri düşünülebilir. Öte yandan, sürücü davranışları ölçeğinin bazı alt boyutlarına anlamlı bir ortak etkinin görülmemesi beklentilerle tutarlıdır. Daha önce de değinildiği üzere sapkın

sürücü davranışlarının tanımı (Özkan, 2006; Reason ve ark., 1990) davranışın içerdiği niyete göre yapılmaktadır. Buna göre, hataların niyetli davranışlar olmadığı bilgisinden hareketle (Reason ve ark., 1990), niyete yapılan bir manipülasyonun davranışta bir değişiklik yaratmamış olması beklentilerle tutarlıdır. Kendi-bildirim türü ölçekler psikoloji araştırmalarında sıklıkla kullanılmakla beraber, geçerlik ve güvenirlikle ilgili bazı kısıtlılıklar da taşıyabilmektedirler. Bu sebeple deneysel yaklaşımların daha doğru, genellenebilir ve çeşitli yanlılıklardan uzak bulgular verdikleri düşünülmektedir (Prince ve ark., 2008). Bu bilgilerle tutarlı olarak, bu bölümün devamında sürüş simülatörü kullanılarak elde edilen bulguların analizi ve yorumlanmasına değinilecektir.

Niyet Aşılamanın Simülatör ile Elde Edilmiş Hız Yapma Davranışı Üzerindeki Etkisi

Önceki analizlerle tutarlı olarak, niyet aşılamanın simülasyonda ölçülmüş sürücü davranışları üzerindeki etkisinin ölçülmesi için karışık dizayn varyans analizi (ANOVA) yapılmıştır. Yapılan ilk set analizlerde, niyet aşılama hedef türüne bağlı olarak yaklaşma ve uzaklaşma olarak ayrılmamış, onun yerine bu iki grup bir araya getirilerek deney grubu olarak isimlendirilmiş ve kontrol grubu ile karşılaştırılmış ve ilk ve son ölçümler arasında bazı anlamlı farklılıklara rastlanmıştır. İlk olarak, zaman (ilk ve son test) temel etkisi incelendiğinde, çeşitli hız ve ivme ölçümlerinin ortalama ve standart sapmaları açısından anlamlı bir farklılık olduğu bulgulanmıştır. Buna göre, katılımcıların hız ve ivmeye ilişkin çeşitli değerleri çalışmanın ilk aşamasında yapılan ölçümlerde daha düşük düzeyde iken, ikinci ölçümlerde bu değerlerde anlamlı düzeylerde artış olduğu görülmüştür. Bu bulgu, simülasyona aşinalık ile ilgili önceki çalışmalar ile tutarlıdır. Hem simülasyonda yapılmış (Yanko & Spalek, 2013) hem de gerçek hayat koşullarında yapılmış (Intini, Colonna, Berloco, & Ranieri, 2016) çalışmalarda, bir rotaya aşina olmanın o rotada hız yapma davranışını arttıracağı vurgulanmaktadır. Çalışmanın tekrarlı ölçümlü bir deneysel desen kullanılarak yapıldığı düşünüldüğünde, ikinci ölçümde hem sürece hem de simülasyonda kullandıkları rotaya daha aşina oldukları, bu sebeple hızlarını arttırmış oldukları düşünülebilir. Bunun

dışında, Charness ve arkadaşları (2012), bir çalışmaya birden fazla katılmanın belirlenmiş olan görevdeki beceriyi arttıracağını ileri sürmektedirler. Tüm bu bilgilerin ışığında, çalışmanın ikinci oturumunda katılımcıların hızlarını arttırmış olmaları şaşırtıcı değildir.

Katılımcıların hem dikey hem de yatay düzlemdeki hızları ve ivmelerine ilişkin çeşitli ölçümler aynı noktayı işaret etmektedir, kontrol grubu ikinci oturumda hızını ve ivmesini arttırmaktadır. Diğer bir deyişle kontrol grubundaki katılımcılar hem daha fazla hız yapmış hem de daha fazla ve daha hızlı bir şekilde hızlanmıştır. Aynı zamanda, söz konusu ölçümlere ilişkin standart sapmalar kontrol grubundaki katılımcıların simülasyondaki sürüşleri sırasında daha fazla hız değişiminde bulunduklarını göstermektedir. Son olarak, gaza ve frene bağlı ivme verileri incelendiğinde bazı ilginç noktalar göze çarpmaktadır. Fren kullanımı söz konusu olduğunda, kontrol grubundaki katılımcıların hızlanma değişimleri deney grubundaki katılımcılarınkinden daha fazladır. Diğer bir deyişle, kontrol grubunun fren kullanımı hem daha fazla hem de daha sıktır. Öte yandan, deney grubundaki katılımcıların fren kullanımı hem daha az hem de daha seyrektir. Gaz kullanımına ilişkin veriler de bu bulgular ile tutarlılık göstermektedir. Buna göre, kontrol grubu hem daha fazla miktarda hem de daha yüksek bir hızla ile hızlanmıştır.

Bulgular değerlendirilecek olursa, kontrol grubundaki katılımcıların hem gaz hem de freni daha düzensiz kullandıkları söylenebilmektedir. Diğer bir deyişle kontrol grubu deney grubundan daha hızlı araç kullanmakta, daha fazla miktarda ve yüksek hızda hızlanmaktadır. Öte yandan deney grubu hem hız hem de hızlanma açısından daha sabit bir eğilim göstermektedir. İlgili literatürün de belirttiği üzere, simülatörün birden çok kullanımı katılımcılarda bir aşinalık etkisi yaratabilmekte (Aginsky, Harris, Rensink, & Beusmans, 1997; Yanko & Spalek, 2013) ve bu aşinalık hem simülasyonda (Yanko & Spalek, 2013) hem de gerçek hayatta yapılan çalışmalarda (Intini ve ark., 2016) daha yüksek hızda araç kullanmak ile ilişkilendirilebilmektedir. Buna göre, rotaya aşina olan katılımcılar daha yüksek hızda araç kullanmaktadırlar. Bu yüzden deney grubunun hız

ve ivmeye ilişkin ölçümlerinin zaman içinde daha sabit bir tablo çizmesi, deneysel manipülasyonun işleyişi hakkında bir ipucu vermektedir. Çalışmanın ilk ve ikinci oturumunda alınan ölçümlerde beklendiği üzere bir düşüş olmasa da (frene bağlı ivme verileri hariç), deneysel manipülasyonun simülasyona alışma ve rota aşinalığı ile ilgili hız artışını önlemede faydalı olduğu söylenebilmektedir.

Değinilenler ile benzer olarak, yapılan analizler hedef türü yaklaşma ve uzaklaşma koşulları olmak olarak ikiye ayrılarak tekrarlanmıştır. Koşul (yaklaşma, uzaklaşma ve kontrol) ve zaman (ilk ve son ölçümler) ortak etkisi incelendiğinde hem ortalama hem de standart sapma ölçümleri açısından dikey hızlanma üzerinde etkili olduğu görülmüştür. Söz konusu analiz anlamlılık sınırının dışında kalmakla beraber, yaklaşma türü hedeflerin daha etkili olduğu, yaklaşma koşulundaki katılımcıların daha düşük hızları tercih ettiği yönünde bir eğilime işaret etmektedir. Öte yandan uzaklaşma koşulundaki katılımcıların ikinci oturumda daha çok hızlandığı görülmüştür. Standart sapmalar incelendiğinde, simülasyondan elde edilen bütün çıktı değişkenler için yapılan analizlerde, deney gruplarının hiç anlamlı sonuç vermediği, öte yandan kontrol gruplarında her zaman anlamlı bir artış olduğu bulgulanmıştır. Buna göre kontrol grubunda her zaman daha fazla hız ve ivme değişimi görülürken, deney gruplarında anlamlı bir farklılık bulunamamıştır. Bunun yanı sıra, yatay olarak yapılan hıza ilişkin analizlerde, yaklaşma türü hedefler koşulundaki katılımcıların, kontrol grubundaki katılımcılardan sınır düzeyinde de olsa anlamlı bir şekilde farklılaştığı görülmüştür. Buna göre kontrol grubundaki katılımcılar hızlarını ikinci oturumda arttırırken, yaklaşma türü hedefler koşulundaki katılımcılar hızlarını ikinci oturumda azaltmıştır. Anlamlı olmamakla beraber, uzaklaşma türü hedefler koşulundaki katılımcıların ikinci oturumdaki ölçümlerinde bir artış olduğu gözlemlenmiştir.

Frene bağlı veriler incelendiğinde, zaman ve koşul ortak etkisinin standart sapma üzerinde anlamlı olduğu görülmüştür. Buna göre, kontrol grubu freni daha fazla ve sık kullanmışken, deney grubunda bir farklılaşma görülmemiştir. Yukarıda değinilen aşinalık etkisi ile beraber, güvenli olmayan sürücülerin daha yüksek düzeyde fren

kullanımına sahip olduğu düşünülürse, bu bulgu beklentilerle tutarlıdır (Klauer, Dingus, Neale, Sudweeks, & Ramsey, 2009; Simons-Morton ve ark., 2009). Son olarak, zaman ve koşul ortak etkisinin simülatörde yapılan toplam kazalar üzerindeki etkisi incelenmiş ve anlamlı bulunmuştur. Buna göre, yaklaşma koşulundaki katılımcılar ikinci oturumda yaptıkları kaza sayısını anlamlı olarak düşürmüşlerdir.

Buraya kadar elde edilen bulgular toparlanacak olursa üç nokta öne çıkmaktadır. İlk olarak, kontrol koşulundaki katılımcılar simülatörden elde edilen hız ile ilgili çeşitli ölçümler açısından (yatay hız, dikey hız, yatay hızlanma, dikey hızlanma, frene bağlı hızlanma, gaza bağlı hızlanma) incelendiğinde, çalışmanın ikinci oturumunda artış göstermişlerdir. Bu bulgu önceden de değinildiği üzere laboratuvar koşullarına ve simülasyondaki senaryoda kullandıkları rotaya aşina olmaları ile açıklanabilmektedir (Yanko & Spalek, 2013). Kontrol grubundaki bu artış, deneysel manipülasyonun kullanıldığı diğer iki grupta görülmemektedir. Deney gruplarında (yaklaşma ve uzaklaşma) farklılaşmanın olmaması niyet aşılama manipülasyonunun etkili olmadığı şeklinde yorumlanmamalıdır. Hatta, bu bulgu niyet aşılamanın, kontrol grubunda tekrarlı bir şekilde kendini göstermiş olan aşinalık etkisini engellediği ve davranış üzerinde işe yarar bulgular elde ettiği şeklinde yorumlanabilir. İkinci olarak, yaklaşma türü hedeflere odaklanan niyet aşılama manipülasyonun hız yapma davranışı üzerinde uzaklaşma türü hedeflerden daha etkili olduğu bulunmuştur. Bu bulgu, yaklaşma türü hedeflerin sağlık ile ilgili konularda kullanılmasının daha uygun olduğunu söyleyen sağlık psikolojisi literatürü ile tutarlıdır (Elliot ve ark., 1997; Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). Son olarak, analizlerde elde edilen bulgularda anlamlılık düzeyleri sınırda olmalarına rağmen, uzaklaşma türü hedeflerin hız yapmayı arttırabileceği söylenebilmektedir. Çalışmada elde edilen uzaklaşma koşulundaki katılımcıların daha fazla hızlandığı bulgusu, sağlık psikoloji literatüründe uzaklaşma türü hedeflerin sağlık ile ilgili davranışlara uygun olmayabileceği bulgusunu doğrulamaktadır (Elliot ve ark., 1997).

Niyet Aşılamanın Simülatördeki Olaylar Üzerindeki Etkisi

Bu çalışmada, sürüş simülatörü verileri iki farklı yaklaşımla analiz edilmiştir. İlk olarak, bir üst başlıkta da değinildiği üzere, simülasyonun tüm senaryosunun ortalama ve standart sapma değerleri alınarak analiz edilmiştir. İkinci set analizler, senaryoya yerleştirilmiş olan tek tek olaylar seçilerek analiz edilmiştir. Bu bölümde tek tek olaylar özetlenip tartışılacaktır. Senaryoya yerleştirilmiş olan olaylar çok kısa bir metre aralığında gerçekleşen anlık hareketleri kapsamaktadır. Bu nedenle olay bazlı analizler yapılırken standart sapmalar analize dahil edilmemiş, analizler sadece ortalamalar üzerinden gerçekleştirilmiştir. Ayrıca senaryoya yerleştirilmiş olan on olay içinden sadece beş tanesi analiz edilmemiştir. Bu beş olaydan iki tanesi katılımcının sürüş deneyimine etki etmeyen ve sadece senaryoyu zenginleştirmesi için yerleştirilmiş olan olaylardır (örneğin, sağ kenarda park etmiş olan aracın yola girmesi). Geri kalan üç olay ise senaryonun en başı ve en sonuna yerleştirilmiş oldukları için, katılımcıların alışma ve sıkılma tepkilerinden etkilenilmemesi adına dışarıda bırakılmıştır. Bu olaylar yine de analiz edilmiş ve beklentilerle tutarlı şekilde anlamlı sonuçlar bulunmamıştır. İncelenen ilk olayda katılımcı bir kavşağa yaklaşırken trafik ışığı kırmızıya dönmekte ve kavşaktan arabalar ve yayalar her iki taraftan karşıya geçmektedir. Analiz sonuçları, çalışmanın ikinci oturumunda kontrol grubunun hızlanmasını arttırırken, deney grubunun düşürdüğünü göstermektedir. Diğer bir deyişle, deney grubundaki katılımcılar çalışmanın ilk aşamasında aynı olay sırasında daha fazla hızlanırken, ikinci aşamada yavaşlamışlardır. Deney grubu yaklaşma ve uzaklaşma olarak ikiye ayrıldığında, anlamlılık sınırının üzerinde olmakla beraber yaklaşma türü hedefler koşulundaki katılımcıların hıza bağlı ivmelerini düşürdüğü, ancak uzaklaşma koşulundakilerin aynı kaldığı görülmüştür.

Sonraki olay yine bir kavşakta ışık değişimini içermektedir. Burada her iki taraftan da yayalar karşıdan karşıya geçerken, olayda karşıdan karşıya geçen araç bulunmamaktadır. Analiz sonuçlarına göre, kontrol grubu hız ile ilgili ölçümler açısından daha yüksek düzeyde olarak bulgulanmışlardır. Buna göre, kırmızı ışığı

gördüklerinde daha sert ve ani fren yapmış ve daha yüksek bir ivme ile durmuşlardır. Diğer yandan deney grubunun kırmızı ışığa yaklaşırken olan hızı ve buna bağlı olarak yavaşlaması daha düşüktür. Olay yaklaşma ve uzaklaşma hedefleri açısından incelendiğinde hem yaklaşma hem de uzaklaşma türü hedeflerde anlamlı düşüş olduğu görülmüştür. Önceki bulgulardan farklı olarak, bu olayda uzaklaşma türü hedefler koşulundaki katılımcılar, yaklaşma türü hedefler koşulundakilerden daha fazla düşüş göstermişlerdir. İlgili literatür sağlık ile ilgili konularda yaklaşma türü hedefler daha etkiliyken, uzaklaşma türü hedeflerin nörotiklik gibi bazı kişilik özellikleri ile ilişkili olabileceğini vurgulamaktadır (Elliot & Trash, 2002). Bu olayda altı yaya, araçların olmadan bir kavşakta karşıdan karşıya geçmektedir. Bu sebeple, uzaklaşma türü hedeflerin yayalar gibi trafikte daha korumasız olan yol kullanıcılarını içeren koşullarda daha etkili olabileceği düşünülmektedir.

Bir diğer olay ise yayaların olmadığı, sadece araçların karşıdan karşıya geçtiği bir kavşaktaki ışık değişimini içermektedir. Yapılan analiz sonucunda, yaklaşma türü hedefler koşulundaki katılımcıların daha yüksek bir ivme ile hızlarını düşürdükleri bulgulanmıştır. Diğer bir deyişle ışığa yaklaşırken hızları daha yüksek olduğundan daha ani ve sert bir fren yapmışlardır. Bu bulgu beklentiler ile çelişmektedir. Bir açıklama olarak, bu olayın senaryonun 3500.metresinde gerçekleşmesi örnek gösterilebilir. Olayın senaryonun sonlarına doğru gerçekleşmiş olmasının, katılımcılara senaryonun bitişine yaklaştıklarını düşündürdüğü, bu yüzden de hızlarını arttırdıkları şeklinde açıklanabilir. Bu sebeple yaklaşma koşulundaki katılımcılar ışığı gördüklerinde ani bir frenle de olsa dururken, uzaklaşma ve kontrol koşulundaki katılımcılar hızlarını düşürmeden kırmızı ışıkta geçmişlerdir.

Ek olarak, iki olay yayaların bir trafik ışığı olmaksızın ani yola atlamalarını içermektedir. Her iki olay için yapılan analiz sonuçlarına göre, uzaklaşma koşulundaki katılımcılar hızlarını anlamlı olarak düşürmüşlerdir. Buna göre, uzaklaşma koşulundaki katılımcılar niyet aşılmanın etkisiyle hızlarını genel olarak düşürmüşlerdir, bu sebeple yayaları gördüklerinde ani ve sert fren yapmalarına gerek kalmadan daha düşük bir

ivme ile yavaşlamışlardır. Bu noktaya kadar yaklaşma türü hedefler hız yapma davranışı üzerinde daha etkili olarak bulunmuş ve bu bulgu ilgili sağlık psikolojisi literatürü ile tutarlılık göstermiştir (Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). Öte yandan, hem yayaları içeren söz konusu iki olay, hem de daha önce belirtilmiş olan yaya geçişli trafik ışığı olayında uzaklaşma türü hedeflerle yapılan niyet aşılama daha etkili olarak bulunmuştur. Hepsi bir arada değerlendirildiğinde, yayalar gibi trafikte daha korumasız olan yol kullanıcılarını içeren koşullarda uzaklaşma türü hedeflerin daha uygun olduğu bulgusu bir defa daha desteklenmiştir. Bu bulgu, bir diğer kişiye zarar verme düşüncesinin uzaklaşma türü hedeflerle daha kolay ilişkilendirilebileceği ile açıklanabilir. Bu sebeple niyet aşılama ile ilgili müdahalelerde literatürde değinildiği üzere uzaklaşma türü hedeflerin sadece kişilik ile değil (Elliot & Trash, 2002), bağlam çerçevesi ile de belirlenebileceği söylenebilir. Yaklaşma ve uzaklaşma türü hedeflerin sadece sürücü davranışları üzerindeki etkisi ilgili başka çalışmaya rastlanmadığından, bu bulgunun önem taşıdığı düşünülmektedir.

Hız Kurallarına Uymanın Niyet Aşılama Üzerindeki Etkisi

Çalışmada ayrıca hız kurallarına uyma, koşul ve zamanın hem kendi bildirim türü hem de simülasyondan elde edilmiş hız yapma davranışı üzerindeki ortak etkisi incelenmiştir. Tercih edilen hız kurallarına uymayı ölçek için, katılımcılara belirli bir hız limiti verilerek o hız limitinin geçerli olduğu bir yolda saatte kaç kilometrelik bir hızla yol almayı tercih edecekleri sorulmuştur. Verilen yanıtlar söz konusu hız limiti için yasal hız toleransı olan %10 eklenerek, "hız kurallarına uyan" ve "hız kurallarına uymayan" iki kategoriye ayrılmıştır. Bulgular şu şekilde özetlenebilir: Önceki bölümlerdeki analizlerle tutarlı olarak, anlamlı olan tüm analizlerde kontrol koşulundaki katılımcılar çalışmanın ikinci oturumunda hızlarını ve ivmelerini arttırmışlardır. Değinildiği üzere bu bulgu aşinalık prensibi ile açıklanabilmektedir (Intini ve ark., 2016; Yanko & Spalek, 2013).

Hız kurallarına uyan ve uymayan grupların ikisinin de hızlarını manipülasyon sonrasında arttırmış olmalarına rağmen, küçük bir fark göze çarpmaktadır. Hız

kurallarına uymayan ve kontrol grubunda olan katılımcıların tamamı daha yüksek hız ile araç kullanmışlardır. Bu bulgu, kişilerde önceden hız kurallarına uymama yönündeki eğilimin bozucu bir etki yaratabileceğini ortaya koymaktadır. Bamberg (2013)'in Öz-Düzenlemeli Davranışsal Değişimin Basamak Modeli ile paralel olarak, kişilerin belirli bir davranışı değiştirmek için olan niyetleri her zaman aynı noktada olmayabilir. Diğer bir deyişle, kişiler davranış değişimine giden yolda niyetlerine bağlı olarak farklı basamaklarda olabilirler. Teoriye göre kişi davranış değişimine giden yolda sırasıyla bazı basamaklardan geçer ve ancak bulunduğu aşamanın gereğini yerine getirebilirse bir sonraki aşamaya devam edebilir. Söz konusu analizler teorinin ana fikrini doğrular niteliktedir; bir davranışa ilişkin önceki tercihler onu değiştirmeye ilişkin bir zihinsel hazır oluş ile ilişkilendirilebilir. Bu yüzden vaktinden önce yapılan bir manipülasyon bir direnç ile karşılaşabilir. Öz olarak, kendilerini hız kurallarına uymayan grup olarak tanımlayan kişilerde niyet aşılamanın anlamlı sonuç vermemesi, o kişilerin henüz davranış değişiminde ilgili basamakta olmamaları ile açıklanabilir. Bu yüzden, davranışta daha köklü değişimler elde etmek için müdahalelerin daha uzun zamana yayılarak yapılması önerilebilir. Çalışmada ayrıca uzaklaşma koşulundaki katılımcıların hız kurallarına uyma eğilimleri olduğunu belirtseler bile, daha yüksek düzeyde hız yaptıkları bulgusuna ulaşılmıştır. Önceki açıklamalar ile tutarlı olarak bu bulgu, uzaklaşma türü hedeflerin sağlık ile ilgili hedeflere uygun olmadığının altını tekrar çizmektedir (Elliot ve ark., 1997; Elliot & Sheldon, 1998; Sullivan & Rothman, 2008). Bekleneceği üzere, hız kurallarına uyan ve yaklaşma türü hedefler ile manipüle edilmiş grup, daha düşük hızda araç kullanmıştır. Farklı olarak, hız kurallarına uymayan ve yaklaşma türü hedefler ile manipüle edilmiş grubun hız yapma davranışında bir düşüş görülmemiştir. Bu sebeple, her ne kadar söz konusu çalışma yaklaşma türü hedeflere ilişkin kanıt ortaya koysa da önceki tercihlerin niyet aşılamanın etkililiği üzerinde bozucu bir etki yapabileceği görülmektedir.

Özetlenecek olursa bu çalışmanın ilgili literatüre bazı önemli katkıları bulunmaktadır. İlk olarak, ilk bölümde de değinildiği üzere yapılan sistematik tarama sonucunda niyet davranışın en önemli belirleyicisi olarak bulunmuştur. Bu sebeple kişilerde istenen

yönde bir davranış değişikliği yaratmak için müdahale edilmesi gereken noktanın niyet olması gerektiği görülmektedir. İkincisi, niyet aşılama, hız yapma üzerinde etki ederek yol güvenliği adına önemli faydalar sağlayabilecek bir araç olarak kullanılabilir. Üçüncüsü, yaklaşma ve uzaklaşma türündeki hedefler arasındaki farklılık, yaklaşma türü hedeflerin genel olarak hız yapmayı engelleme üzerinde daha etkili olduğu şeklindedir. Dördüncüsü, uzaklaşma türü hedefler içinde bulundukları bağlama göre daha etkili olabilmektedir. Diğer bir deyişle, yayaları içeren durumlarda uzaklaşma türü hedeflerle niyet aşılanan katılımcılar hızlarını daha fazla düşürmüşlerdir. Son olarak, kişilerin hız kurallarına uyma veya uymamaya ilişkin tercihleri, bu tercihlerin yönüne bağlı olarak niyet aşılamanın etkisini olumlu veya olumsuz şekilde etkileyebilir.

Söz konusu çalışmanın bazı kısıtlılıkları da bulunmaktadır. İlk olarak, Gollwitzer ve Sheeran (2006) tarafından yapılan hesaplamaya göre her koşula 30 kişi düşmesi gerekirken, çalışmada koşul başına 26 kişi düşmüştür. İleride daha geniş örneklemlerle yapılacak olan çalışmaların daha büyük etki gücüne sahip olacağı düşünülmekle beraber, söz konusu çalışmanın örneklemi bulguların açıklanabilmesi ve genellenebilmesi için yeterlidir (Cohen, 1988; Wilson-Van Voorhis, & Morgan, 2007). Bunun yanı sıra, ilgili çalışmalar niyetin güçlü olduğu koşullarda niyet aşılamanın daha fazla etki ettiğini ileri sürmektedirler (Elliott Armitage, 2006; Webb & Sheeran, 2006). İleride yapılacak çalışmalarda niyet ile ilgili ön ölçümler de alınarak, niyetin niyet aşılama ve davranış arasındaki ilişkideki yönetici rolünün incelenmesi önerilebilir.

Çalışmanın bazı pratik çıktıları da bulunmaktadır. İlk olarak, niyete ilişkin yardım cetveli kolay ve etkili bir araç olarak bulunmuştur. Önceki çalışmalarda da değinildiği üzere (Brewster ve ark., 2015) niyete ilişkin yardım cetveli zaman almayan, masrafsız, oldukça pratik ve uygulaması kolay bir araçtır. Bu sebeple, yol güvenliğini geliştirmek için alanda çalışan profesyoneller tarafından psikoteknik değerlendirmelerde ve sürücülük eğitiminde kullanılabilir.

E: Curriculum Vitae

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Personal Information

Nationality: Turkish (TC)
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Education

Year	*Degree*	*University*	*Department*
2013- 2018	Ph.D.	Middle East Technical University	Traffic and Transportation Psychology CGPA: 3.95/4.00
2011-2012 (6 months)	Erasmus Exchange Student	Glamorgan University, Cardiff, UK	Psychology
2010-2012	Master's Degree	Ankara University	Social Psychology CGPA: 3.93/4.00
2009-2010	Scientific Prep.	Ankara University	Psychology
2003-2008	Bachelor	Hacettepe University	Philosophy CGPA: 2.65/4.00

Work Experience

Year	*Place*	*Enrollment*
2016 – …	Işık University, Department of Psychology	Lecturer
2012 - 2015	Işık University, Department of Psychology	Research Assistant

Representative Work

M.Sc. Dissertation: Tekeş, B. (2013) Variables Predict People with Disabilities: A Cross-Cultural Study. Ankara University, *Institution of Social Sciences*, ANKARA

Journal Publications:

a. ***National Publications***

Tekes, B. & Hasta, D. (2015) *Özgecilik Ölçeği: Geçerlik ve Güvenirlik Çalışması (Altruism Scale: An Adaptation Study)*. Nesne Psikoloji Dergisi (NPD), *3*(6), DOI: 10.7816. Retrieved from http://www.nesnedergisi.com/makale/pdf/1445872005.pdf

Kologlugil, S. , **Tekeş, B.** , Atakan, M. (2017). *Türkiye'de Özgür ve Açık Kaynak Kodlu Yazılım Üretimi: Bireysel ve Sosyal Motivasyonların Karşılaştırmalı Analizi*. Yildiz Social Science Review, 3 (1), 1-22. Retrieved from http://dergipark.gov.tr/yssr/issue/33541/298540

Akşar, C., Alavcı, T., Tekin, M. E. & **Tekeş, B.** (2018). Cinsiyetçiliğin Sürücü Öfkesi ve Sürücü Öfke İfadesi ile İlişkisi. *Trafik ve Ulaşım Araştırmaları Dergisi*, 1. Retrieved from http://dergipark.gov.tr/tuad/issue/36875/420886

b. International Publications (Web of Science & SSCI)

Deveci, E., & **Tekes, B**. (2014, August). Weight as A Predictor of Perceived Discrimination. Obesity Surgery *in* (Vol. 24, No. 8, pp. 1199-1199). 233 Spring St, New York, Ny 10013 Usa: Springer (abstract)

Tekeş, B., Üzümcüoğlu, Y., Hoe, C. & Özkan, T. (2018). The Effect of Cultural Values on Obesity: Investigating Hofstede's Cultural Dimensions and Schwartz's Basic Values. *Psychological Reports.* DOI: 10.1177/0033294118777965

Reports/Projects:

(2016-2017) "The Analysis of Traffic Assizes: The Evaluation of Turkey." The project is established with the collabration of General Directorate Of Security Affairs of Turkish Government and Middle East Technical University Safety Research Unit. I was one of the researchers on the project.

(2014-2016) "Dijital Kaynakların Müşterek Kullanımı Ve Özgür/Açık Kaynak Kodlu Yazılım (ÖAKKY): Kurumsalcı Bir Yaklaşım" [The collabrated use of the digital resources and open source softwares] (with the collabration of Associate Prof. Serhat Koloğlugil). Research Assistant/ Project commenced September 2014. This project is supported by TUBITAK 1001.

(2012-2013) "Parasocial Interactions: Marital Satisfaction, Psychological Symptoms, Self-Perception and Some Other Psychological and Social Demographic Variables" (Prof. Dr. Aysegul Durak Batıgun, Assist. Prof. Ayda Büyükşahin Sunal and Research Assist.Özge Akbalık Duran). Research Assistant/ Project commenced September 2011. This project is supported by Ankara University BAP scheme.

Other Scientific Activities

a. International Scientific Activities

Koca-Atabey, M., Öz, B. & **Tekeş, B.** (2018) The Traffic Experiences of Blind Road Users: An Interpretative Phenomenological Analysis (oral presentation), [Lanchester Disability Studies Conference] September 11 – 13, Lanchester, UNITED KINGDOM

Özdemir, F. & **Tekes, B.** (2016) Association of Active-Young Drivers' Time Perspective with Driver Behaviors and Skills (oral presentation), [The 31th International Congress of Psychology (ICP)] July 24 - 29 Oklohoma, JAPAN

Üzümcüoğlu, Y. & **Tekes, B.** (2015) The Effect of Personality Traits on Relational Self Regulation and their Relationship with Political Participation (oral presentation), [14. European Congress of Psychology (ECP)] July 7 - 10 Milano, ITALY

Tekes, B. & Üzümcüoğlu, Y. (2015) Hoftstede's Cultural Dimensions and Obesity (poster presentation), [14. European Congress of Psychology (ECP)] July 7 - 10 Milano, ITALY

Özdemir, F. & **Tekeş, B.** (2015) Predictive Power of Driver's Time Perspective and Driving Skills on Active-Young Driver Behaviors (oral presentation), [14. European Congress of Psychology (ECP)] July 7 - 10 Milano, ITALY

Deveci, E., **Tekeş, B.** (2014) Weight as a Predictor of Perceived Discrimination (Poster presentation) [19th World Congress of the International Federation for the Surgery of Obesity and Metabolic Disorders] August 26-30, 2014, Montréal, Québec, CANADA

Tekeş, B. Hasta, D., Hazer, P. (2014) Violence Against Women: How it is related to Authoritarianism and Belief in a Just World? (oral presentation), [28. International Congress of Applied Psychology (ICAP)] July 8 -13, Paris, FRANCE

Tekeş, B. Hasta, D. (2014) The Effect of Religiosity and Political Preferences on Belief in a Just World, Social Dominance Orientation and Individualism-Collectivism Between Two Cultures (oral presentation), [22. International Association of Cross-Cultural Psychology (IACCP)] July 15-19, Reims, FRANCE

Tekeş, B., Hasta, D. (2013) Attitudes Towards People with Disabilities in Turkey (oral presentation), [13. European Congress of Psychology] July 9-12, Stockholm, SWEDEN

Tekeş, B., Hasta, D. (2013). Attitudes Towards People with Disabilities in United Kingdom (poster presentation), [27. European Congress of Psychology Students] April 21-28, Izmir, TURKEY

b. National Scientific Activities

Duran, E., Ordu, O., & **Tekeş, B.** (2018) Emniyet Kemeri Takip Çalışması: Sürücü, Ön ve Arka Koltuk Yolcularının Emniyet Kemeri Kullanımı. (poster presentation), [Ankara Yıldırım Beyazıt Üniversitesi Psikoloji Kongresi: Deneyim Oluşturma Ve Aktarımı-IV "Köprüler Kurmak"] April 25-27, Ankara, TURKEY

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