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ILLUSION OF CONTROL, OPTIMISM BIAS AND THEIR RELATIONSHIP TO RISK-TAKING BEHAVIORS OF TURKISH DRIVERS

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ABSTRACT

ILLUSION OF CONTROL, OPTIMISM BIAS AND THEIR RELATION TO RISK-TAKING BEHAVIORS OF TURKISH DRIVERS

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The aim of the represent research was to investigate the relationship between illusion of control, optimism bias, locus of control, and drivers' risk-taking behavior among Turkish drivers. A total of 307 drivers completed the Driver Behavior Questionnaire, the Driver Skills Inventory, the Optimism Bias Scale, the Multidimensional Traffic Locus of Control Scale, and Rotter's Internality Externality Scale. In chapter one, comparison between perceived risk as driver and perceived risk as passenger demonstrated existence of illusion f control among drivers. Drivers' risk assignments were different when imagining themselves as drivers and passenger. Illusion of control was found to be related to the total number of accidents, especially involvement in active accidents. This indicates a positive relationship between illusion of control and risk-taking behavior. In the second chapter, optimism bias was found in drivers' risk likelihood estimations for accident involvement in the future. Drivers estimated their risk of being involved in four types of accidents as less than an average driver. Optimism bias was related to self-reported violations and strong evaluation of driving and safety skills as strong. Young and novice drivers were more realistic in their risk estimations. In the third chapter, relationship between locus of control and risk-taking was investigated. Only fate scale correlated with violations. Drivers who attribute accident causes to fate were more likely to commit violations. The limitations of the current research and implications for further research were discussed.

Keywords: Illusion of control, Optimism bias, Locus of control, Risk-taking behavior.

ÖZ

KONTROL İLLÜZYONU, İYİMSERLİK YANLILIĞI VE BUNLARIN SÜRÜCÜLERİN RİSK ALMA DAVRANIŞLARINA ETKİLERİ

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Bu çalışmanın amacı, Türk sürücülerinde kontrol illüzyonu, iyimserlik yanlılığı, kontrol odağı ve sürücülerin risk alma davranışları arasındaki ilişkiyi incelemektir. Toplam 307 sürücü Sürücü Davranışlası Ölçeği (SDÖ), SDÖ-algılanan control, SDÖ-algılanan risk, Sürücü Becerileri Envanteri, Çokboyutlu Trafik Kontrol Odağı Ölçeği ve Rotter İç Dış Kontrol Odağı Ölçeği'ni doldurdu. Birinci bölümde, SDÖ-algılanan risk ölçeğine uygulanan t-testi analizleri sürücülerde kontrol illüzyonunun varlığını gösterdi. Sürücülerin risk değerlendirmeleri kendilerini sürücü ve ön koltuk yolcusu olarak düşündüklerinde farklılaştı. Kontrol illüzyonu toplam kaza sayısıyla, özellikle aktif kaza sayısıyla, ilişkili bulundu. Bu, kontrol illüzyonu ve risk alma davranışı arasında olumlu ilişki olduğunu gösterir. İkinci bölümde, t-testi analizleri sürücülerin gelecekte kaza geçirme olasılıkları tahminlerinde iyimserlik yanlılığı gösterdiklerini ortaya koydu. Sürücüler, verilen dört kaza çeşidini geçirme olasılıklarını ortalam bir sürücününkinden daha düşük tahmin ettiler. İyimserlik yanlılığı, yüksek ihlal davranışıyla ve sürüş ve güvenlik becerilerinin güçlü olarak değerlendirmesiyle ilişkili bulundu. Genç ve deneyimsiz sürücülerin risk tahminlerinde daha gerçekçi değerlendirmeler yaptığı bulundu. Üçüncü bölümde, kontrol odağı ve risk alma davranışı arasındaki ilişki incelendi. Sadece kadercilik ölçeği ihlal davranışlarıyla ilişkili bulundu. Kaza sebeplerini kadere atfeden sürücüler güvenli sürüşü ihlal etmeye daha yatkın bulundular. Bu araştırmanın sınırlılıkları tartışılarak ileriki araştırmalar için doğurguları ele alınmıştır.

Anahtar Sözcükler: Kontrol illüzyonu, İyimserlik yanlılığı, Kontrol odağı, Riak alma davranışı

To Life

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GENERAL INTRODUCTION

1. Risk and Risk Theories

According to World Health Organization's (WHO) statistics, more than 1.2 million people die in road traffic accidents per year in the world, while around 50 million of them are injured or disabled. Almost half of the victims are pedestrians, cyclists, and motorcyclists.

In Turkey, 407,103 accidents occurred in 2002. Two thousand and nine hundred people died in consequence of these accidents and 94,225 people were injured (Trafik İstatistik Yıllığı, 2002)*. Turkey was the third country in the annual number of traffic accidents among other European countries (IRTAD, 2001; in Annual Traffic Statistics, 2002). Besides their immediate results for the victim, traffic crashes have distal consequences for society. Traffic crashes damage public property, result in loss of educated labor force, and most of the time families of the victims are influenced both psychologically and financially. According to WHO statistics, traffic crashes cost up to 4 % of their countries Gross National Product (GNP).

Traffic accidents might be due to several factors; such as vehicle characteristics, environment, and driver or the interaction of these. Yet, driver characteristics constitute the highest proportion. According to analyses of Lewin (1982), the human factor contributes to traffic accidents up to 90 %. Not all of these accidents are due to errors. Sometimes drivers deliberately deviate from safe driving (Reason, Manstead, Stradling, Baxter, & Campbell, 1990). Deviation might be due to several factors; such as daily necessities (e.g. trying to catch an appointment) to personality

* In Turkey fatality statistics are based on on-spot rule. Traffic accident victims dying in hospitals are not considered to die due to traffic accident.

characteristics (e.g. sensation seeking), motivation, and cognitive biases. In any case, deviation from safe driving increase risk beyond that can be expected due to natural components of an event.

Risk and subsequent behavioral change has been a central concept in safety research. Risk can be defined as any situation that might end up with negative consequence. Risk involves two components: likelihood and severity of negative outcome (van der Pligt, 1996). Risk is approached as a multidimensional subjective construct. Psychometric studies in the end of 1970s (Fischoff, Slovic, Lichtenstein, Read, & Combs, 1978; cited in Kobbeltvedt, Brun, & Laberg, 2004) proved nine dimensions as primary for risk perception: (1) involuntariness of exposure, (2) immediacy of effects, (3) lack of precise knowledge about risk levels, (4) lack of scientific knowledge, (5) uncontrollability, (6) newness, (7) catastrophic potential, (8) feelings of dread, and (9) fatal consequences. Nine dimensions revealed two higher order factors: dread risk and unknown risk. Dread risk is characterized by perceived lack of control, catastrophic potential, fatal consequences, and feelings of dread. Unknown risk is characterized by unobservable, unknown, and new hazards. The dread factor, compared to the unknown factor, was found to be highly correlated with perceived risk.

Early approaches to reduce accidents were mainly focused on engineering measures. Improving infrastructure, designing safer roads, and the introduction of seatbelts reduced fatality rates to some extent. Furthermore, legislative actions were also taken by making wearing seatbelt mandatory, limiting the amount of alcohol permissible while driving, and limiting speed limit. However, neither engineering interventions nor legal arrangements could interfere with the effect of driver's personal choices and unintentional choices on his/her behavior (Rothengatter, 2002). In other words, the human factor could not be get under control without an attempt to understand psychological factors influencing driver behavior and driver's perceptions. Drivers adapt their behaviors according to necessities of the situation with respect to perceived risk and perceived task demands (see Rothengatter & Huguenin, 2004). Three theories rose to account for drivers' compensatory behavior: Wilde's risk homeostasis theory (RHT) (1982), Summala's zero risk theory (1974), which later evolved into hierarchical model of behavioral adaptation (1997), and Fuller's task capability model (2000).

Risk compensation is adjusting behavior in response to perceived changes in risk. If we believe our risk is increased, we will take additional precautions to reduce negative effects of risk involving situation. On the contrary, if we perceive risk as low and feel safe, we will behave less cautiously and confront dangerous situation. Key issue in risk compensation is perceiving change in risk level, which will produce behavioral change (Hedlund, 2000). When do drivers feel in need of adjusting their behavior?

Wilde hypothesizes that we all have a "target risk level" and measure risk like a risk thermostat and overall accident rate remains stable at societal level (1982). Risk behavior involves costs and benefits. Target level of risk is the net benefit of intended risk. The theory assumes that people make continuous risk assessment. If perceived risk is not in congruence with target level risk, than they will adjust their behavior to eliminate the discrepancy between the two. Wilde's theory includes a feedback loop between behavior and outcome. A cautionary behavior reflects upon injury rate, while injury rate also reflects upon behavior. Target risk is seen as the key concept in this circular causality. There will be fluctuations in accident rate but overall increments and decrements will be averaged, and will remain stable unless target risk level is changed. RHT asserts that in order to reduce injury rate, the target level risk people are willing to take should be reduced (Wilde, 1998). However, in doing so RHT ignores environmental safety regulations, such as road and vehicle designs (Rothengatter, 2002; Hedlund, 2000). Furthermore, Evans challenged RHT by investigating traffic accident data (1986). Data was incompatible with RHT's basic proposition that number of accidents per unit of time of driving remains constant. The debate on RHT still continues.

Zero-risk theory focuses on motivational determinants, basically drivers' subjective risk assessments and compensatory behavior they are willing to take (Naatanen & Summala, 1974). Summala extended zero-risk theory approaching driver's task from multiple aspects.

Summala's hierarchical model of behavioral adaptation of driver's task takes into account changes in the traffic system in examining driver's reaction. It is a three-dimensional task cube (1997). It considers the driving task as an interaction of functional hierarchy, level of processing, and functional taxonomy. The functional hierarchy dimension ranges from vehicle control level up to trip decisions and vehicle choice. The functional taxonomy of behavior dimension includes driving skills such as lane keeping, crossing management, and maneuvering. The psychological processing level distinguishes between perceptual-motor control and decision-making and supervisory monitoring level. The model posits that "the higher the task in a functional taxonomy, the more often conscious decision-making and supervisory monitoring is applied". Attention control is in between two processes and it is applied both top-down and bottom-up. Speed and time control lies in the centre of the cube because these two factors determine mobility and they are major motivational aim of driving.

Fuller's task capability model differentiates between driver competence and driver capability (2000). Competence is driver's skill accomplishment including control skills, hazard perception skills, and anticipatory and defensive skills. Capability is the driver's ability to transfer his/her level of competence in a given situation. The model asserts that task difficulty emerges from the discrepancy between driver's attempts to respond to task demands and the available level of capability. If the demands of the task exceed driver capability, the task is perceived as difficult and risky. The result of this mismatch can be expected to be a crash. In order to manage task difficulty, the driver can either modify task demand or capability.

The three risk theories mentioned above try to explain driver behavior and how they handle risks in traffic. They do not consider whether drivers' risk estimations are accurate or not. The fact that drivers keep on having accidents, despite laws and regulations and engineering improvements indicates that they fail to accurately estimate risk. There is a discrepancy between perceived risk and objective risk. Estimation of risk is biased by cognitive processes, context, personal and cultural characteristics. Although drivers seem to be aware of relative risk related to specific behavior, they fail to accurately estimate the magnitude of risk for themselves. Attribution theory can help to understand why drivers have that tendency to have biased estimations. Attribution research suggests that the attribution process, which is an umbrella term for individual's effort to find causal relationships for the events occurring around them, is colored by a number of systematic errors and biases. These errors and biases might be due to limitations on cognitive system, motivational factors, or both. One of these biases is self-serving bias, which refers to the tendency of interpreting and explaining outcomes in ways that are favorable for the self. Self-serving bias has two facets: self-enhancement bias and self-protective bias. Self-enhancement bias is taking credit for successful outcomes. Self-protective bias, on the other hand, is denying responsibility for negative outcomes (Blaine & Crocker, 1993). Applying self-serving biases to risk appraisal states that people might have a tendency to make attribution to their dispositions, if they get a positive outcome as a result of risk-involving event. On the contrary, they will not like to make dispositional attributions for negative outcomes of risky events. Failure in associating behavior and risk will lead to persistence in that specific risky behavior without noticing causal relationship especially when the outcome is not negative. Taylor and Brown (1988) argued that self-serving nature of risk estimation for self might be due to exaggerated control and optimism beliefs. In other words, overestimated control and optimism leads to a reduction in perceived risk and an increased tendency of risk taking behavior.

The current study investigates how risk-taking behavior is influenced by illusion of control, optimism bias, and locus of control.

2. Illusion of Control

The importance of control in psychological functioning has been emphasized for a long time. Sense of control is related to positive outcomes in diverse aspects of life; such as health, coping, self-esteem, work success, school performance, information seeking and processing, and risk-taking (Seeman & Seeman, 1983; Ross & Broh, 2000).

The control phenomenon is approached from different perspectives. However, almost every researcher conceptualized and called the control construct she/he has been studying on differently. This is a disadvantage for accumulation of research findings (Skinner, 1996). While Bandura (1989) stressed on self-efficacy as an execution of control, Rotter (1966) emphasized beliefs about locus of control, that is, whether control is internal to the person or related to external factors. Weiner approached control from an attribution perspective by adding stability to previous internal/external distinction (Weiner, Nierenberg, & Goldstein, 1976). Langer drew attention to the illusory nature of control especially in skill situations (1975). Although defined differently by various researchers, control research revealed a discrepancy between objective and subjective control. Further research on perceived control demonstrated that inaccurate estimations of control are more adaptive for psychological well-being (Taylor & Brown, 1988 for review). Success in skill situations is related to behavioral capacity of the agent. Therefore, success in a skill situation is controllable. Chance situations, on the other hand, are fortuitous occasions, which make chance situations uncontrollable. However, human mind is liable to relate skill situations to chance situations (Langer, 1975). In other words, people fail to judge absence of contingency between chance and outcome, while, they appreciate contingency relationship between skill and outcome. Langer demonstrated that chance situations involving skill elements induce illusion of control to a great extent (1975). In a series of experiments about gambling, she introduced elements of skill situations- competition, choice, familiarity, and involvement to chance situations. Results indicated that belief in illusory control increased as subjects perceived their opponents as less competent, as subjects chose lottery tickets themselves, as both stimulus and response familiarity increased, and as subjects actively or passively involved in chance situations. Elements of skill situations embedded in chance situations induced exaggerated perceived control over chance situations and inappropriately higher feelings of confidence. Moreover, people misjudge their control in skill and chance situations. Illusion of control is exaggerated beliefs in one's success due to overestimated control over situations.

Illusion of control has two components: (1) expecting the chance of successful outcome higher than objective probability estimates would assert and (2) expecting success in chance situations, which are indeed beyond personal control. It can be inferred from the concept of illusion of control that individuals might be more likely to engage in risk-taking behavior when they are actually the control agent of situations, because of their exaggerated belief in their own control.

2.1. Illusion of control and risk-taking

Studies from different literature established that risk-taking behavior is influenced by illusion of control and perceived control. The studies cited below investigate different types of control construct; e.g. illusion of control, perceived control, illusory control, and desire of control. There is not an accumulated illusion of control literature. Therefore, research on subjective control constructs is presented.

Langer's study conceptualized illusion of control. Later studies demonstrated that the individual's need for a specific outcome in a chance situation has a determinant role on illusory control (Biner, Huffman, Curran, & Long, 1998, Studies 1 and 2). Biner et al. created feeling of need in subjects by manipulating food level, food-deprived and food-saturated groups. Subjects were provided the opportunity to win food by participating in a chance-based-card-drawing game. Subjects were assigned either to high-need group (high-deprivation group) or low-need group (low-deprivation group). A second assignment was made for skill-cues condition and no-skills cues condition. Participants in the first group picked their own cards to determine winning food. Experimenter picked cards for those in the latter group. After the procedure they were asked to rate their degree of skill in card-drawing game and to indicate how confident they were in drawing the winning card. Results demonstrated that those in high-need group had higher scores on skill and confidence-in-winning ratings. Furthermore, subjects in high-need group showed greater inclination to be involved in playing game. Biner et al. concluded that illusion of control was a function of motivation for a specific outcome. Consistent with Biner et al.'s study, Moore and Ohtsuka (1999) assessed relationship between illusion of control, internal locus of control, and problem gambling among young people. They found that young problem gamblers had less rational control beliefs, i.e. greater illusion of control, but believed that they had rational control over gambling. Furthermore, they believed that they were strongly in need of winning money from gambling. This group showed persistence despite of inevitable failure presumably due to belief in skill rather than chance.

Burger (1986) examined individual differences in illusion of control and general desire for control. In two experiments, high desire for control subjects bet more than low desire for control subjects when they were playing with familiar cards, but not when playing with unfamiliar cards. Burger also investigated the effect of a loss-win sequence on illusion of control. One group was given feedback as their guesses were true during first few trials, while another group was told that their guess during later trials were true. It was expected that those who win in the beginning will attribute this to their anticipatory abilities, while those who lose in the beginning will attribute this to their lack of control over the game. Results confirmed Burger's expectations. High desire for control subjects who won in the beginning showed the greatest illusion of control. Burger's results support the motivational roots in systematic distortions in perceived causality.

McKenna (1993) investigated the illusion of control phenomena in a traffic setting. He investigated drivers' expectations about perceived accident involvement. Participants in the experimental group were asked to judge their likelihood of accident involvement when they were driving (control condition). Control subjects were asked to make judgments about their probability of accident involvement when they were passenger (no-control condition). Results of the study showed that participants considered themselves less likely to be involved in an accident when they were in driver condition (control condition) compared to passenger condition (no control condition). These results indicate the importance of control while driving. Participants probably thought that they will be able to handle a probable risk situation if they are the driver, i.e. if they have control. However, they do not trust in other persons' ability to overcome risk situation, thus; rate accident likelihood similar to average person, i.e. when they are not in control. McKenna concluded that “it won’t happen to me” effect is not due to self-other comparison. On the contrary, he found that illusory self-assessments are consistent with positive-self bias (McKenna, 1991). Drivers do not see other drivers’ skills as negative but see their own skills as more positive.

In order to see how perceived control is related to risk-taking behavior, Horswill and McKenna conducted another study (1999b). The experiment investigated the effect of perceived control on a range of risk-involving driving activities (speed choice, following distance, gap acceptance, and overtaking). They used validated video simulation techniques to assess drivers’ behavior on four driving activities cited above. The same manipulation with McKenna (1993) was used to create control and no-control groups. Results indicated significant effects for speed choice, but not for other activities. Drivers tolerated higher speeds when they thought they are driving the car. Although there were not significant results for other tasks, it can be inferred that driving at high speed and motive to maintain it might lead to other risk-taking behaviors. Hammond and Horswill (2002) investigated whether individual differences in terms of desire for control influence illusion of control of drivers. Considering findings that people in control position tolerate higher risks (Horswill & McKenna, 1999b) and that those with high desire for control are more prone to illusion of control (Burger, 1986), it was expected that drivers with high desire for control might be more prone to illusion of control and might be willing to take more risks. A video simulation technique was used to measure risk-taking preferences of drivers. It was found that drivers with high desire for control were more likely to engage in risk-taking behavior, specifically, driving at higher speed and pulling into smaller gaps. It is clear that higher perceived control prompts driving at high speed. Taking into account the role of high speed in other risk-taking behaviors such as gap acceptance, close following (Horswill & McKenna, 1999b), and overtaking, it can be concluded that the situation is severe in terms of accidents related to speeding. This situation makes understanding drivers’ speed perception essential. Walton and Bathurst (1998) asked drivers' their perceptions of their own speed and other drivers' speed. Drivers overestimated speed of both themselves and others'; however, they estimated other drivers' speed even higher than their speed. Walton and Bathurst expected drivers who perceived themselves slower to consider themselves safer compared to other drivers. Although their expectations were reasonable, they failed to demonstrate the expected relationship, due to methodological problems. Their methodology was able to predict the relationship between perception of others' peed and overconfidence in safety and skill; but not able to highlight the differences in respondents' beliefs about their own safety and skill.

Illusion of superiority in skill-ratings was demonstrated in another study (Horswill, Waylen, & Tofield, 2004). Drivers were asked to rate different components of driving skills: hazard perception skills and vehicle-control skills. The aim of the study was to find out how drivers' assessments of driving skills reflected in their risk-taking intentions. They found that drivers rated themselves as superior on both types of skills; however, they showed greater illusion of superiority for hazard-perception skills compared to vehicle-control skills and overall driving skills. Additionally, hazard-perception skills were found to predict accident involvement rather than vehicle-control skills. Even though drivers seem to appreciate the role of hazard perception skills in safe driving, they are vulnerable to biased evaluations. Drivers who evaluated themselves as more skillful compared to their peers also evaluated themselves safer and those who considered their vehicle-control skills higher tended to consider their hazard-perception skills also high. Overall, hazard-perception skills explained variance in safety bias, drivers' ratings of safety compared with UK drivers, beyond general driving skills. Horswill et al. argue that drivers may not benefit from acknowledging importance of hazard-perception skills for safety because of their inflated beliefs in their own hazard-perception skills.

Combining findings of several studies it can be concluded that drivers regard themselves as more skillful (Horswill et al., 2004; Svenson, 1981), slower (Walton & Bathurst, 1998), and less likely to be involved in accidents (McKenna, 1993) compared to other drivers. Such beliefs might encourage feelings of invulnerability, while increasing drivers' tendency to take risks. Moreover, this belief pattern was found to be conflicting with aims of safety campaigns. Walton and McKeown (2001) found that drivers subject to such self-enhancement bias are less likely to perceive safety messages as targeted to them.

3. Optimism Bias

Optimism bias refers to the tendency of people to believe that they are less likely to experience negative events and more likely to experience positive events (Weinstein, 1980; 1987). Optimism bias is not limited to any particular age, sex, education, and occupation group (Weinstein, 1987). It assumes that the difference between self and other risk judgments arise from a distortion of personal risk judgments. Indeed, the distortion might be for both personal and other risk judgments. Perloff and Fetzer (1986) suggest that optimism bias might be due to a distortion of other's judgments of risk rather than personal judgment of risk to maintain cognitive consistency. Optimism bias seems to have cognitive and motivational roots. Motivational factors might help to supply desired end-states, while cognitive factors might supply means to achieve the end-states (Kunda, 1990; Shepherd, Carroll, Grace, & Terry, 2002).

Weinstein (1980) hypothesized that degree of desirability, perceived probability, perceived experience, perceived controllability, and stereotype salience of an event might influence the experienced amount of optimism bias experienced.

Shepperd et al. (2002) reviewed motivational and cognitive causes of optimism bias. They reviewed three motivational causes: self-enhancement, self-presentation, and personal control. Optimistic predictions about the self are gratifying. How people feel about themselves, how they perceive self-esteem is judged in terms of one's standing on personally relevant dimensions relative to other individuals. People generally hold positive self-perceptions. Research comparing individuals' own self-ratings with ratings of observers revealed that people make more positive judgments for themselves (Lewinshon, Mischel, Chaplin, & Barton, 1980). Moreover, people have a tendency to maintain positive self-conceptions (Tesser, 1988). Thus, people are more willing to make favorable comparisons. Estimating personal risk to be lower than other's risk might provide people with the satisfaction of favorable comparisons and it might make people feel better than average (Alicke, Klotz, Breitenbecher, Yurak, & Vredenburg, 1995). Self-enhancement concerns are thought to be reflections of self-presentational concerns (Shepperd, 2002). Self-presentational concerns imply an effort to establish and maintain desired and self-congruent impression on other people's mind (Goffmann, 1969). Inducing desirability concerns in individuals would result in unrealistic optimism due to operation of need to present oneself better off than others are. The third and last motivational account posits that optimism bias arise from perceived control. When people feel in control, they also perceive less risk (Klein & Kunda, 1994; McKenna, 1993; Weinstein, 1980). Belief in personal control prompts individuals' role as control agent in achieving desired outcomes and avoiding negative outcomes.

Shepperd et al. reviewed three cognitive mechanisms that guide optimism bias: representativeness heuristic, singular-target focus, and transforming interpersonal distance into a perception of risk differences. Representativeness heuristic is a cognitive shortcut in which decisions are based on relevancy judgment that produces a likelihood estimate. The more the A represents category B, the more people will assume that A is a member of category B. Optimism bias is measured by asking subjects to make comparative judgments with an average person, the definition of which is vague in people's mind. Weinstein (1980) suggests that this measurement might cause subjects to choose a prototypical comparison target representing risk-category. Perloff and Fetzer (1986) demonstrated that for different events subjects pick different comparison targets, which are indeed vulnerable to that specific event, and judge their own likelihood of experiencing negative events less than comparison target. Representativeness heuristic specifies a dissimilar, worse-off comparison target in peoples' mind. The second cognitive factor is singular-target focus, which states that people focus on a single target rather than generalized population when making comparative judgments. The third cognitive factor is transforming interpersonal distance into a perception of risk differences. It suggests that as people perceive interpersonal distance with comparison target, they will perceive risk difference. As interpersonal distance increases, optimism bias also increases.

3.1. Optimism Bias and Risk-taking

People are prone to optimism bias in a wide range of events including automobile accidents, alcoholism, divorce, being a crime victim, getting HIV, anorexia, and heart attack (Harris & Middleton, 1994; Perloff & Fetzer, 1986). Therefore, people are likely to make inaccurate risk judgments, to underestimate risk and to take risk.

Svenson (1981) found that drivers regarded themselves more skillful and at less risk than other drivers. A later study replicated these results (Svenson, Fischhoff, & MacGregor, 1985). Furthermore, they found that subjects attributed accidents to human factor and those drivers who believed in human factor considered themselves as safer than the average driver. DeJoy (1989) investigated the role of optimism bias in traffic accident risk perception. He asked subjects to compare their risk of being involved in a variety of given traffic accidents relative to their peers. Subjects also provided global estimates of their accident likelihood and driving safety and skill. Traffic accidents presented to participants varied in controllability and outcome severity. Results indicated that drivers were more optimistic when they perceived the event as more controllable. Consistent with other studies, subjects regarded themselves as safer, more skillful, and less likely to be involved in a traffic accident compared to their peers. Ratings of driving skills and driving safety were subject to more optimism bias than ratings of accident likelihood. Moen and Rundmo (2005) found similar results. In their study among risk-takers, safety attitudes were found to be most important predictor of unrealistic optimism.

The three studies cited above confirmed the effect of event controllability on risk perception. McKenna (1993) also found that when perceived control was taken into account, optimism bias disappears. He concluded that the basic mechanism is illusion of control, and not optimism bias. Harris and Middleton (1994) challenged McKenna's conclusion regarding optimistic bias as a display of illusion of control. They found that likelihood ratings changed for different comparison target groups. The likelihood of experiencing given events was least for self, higher for acquaintance, even higher for friend's friend, and highest for a typical university student. This pattern is consistent with transformation of interpersonal distance into a perception of risk differences; as interpersonal distance increases, the likelihood estimation for the other person also increases. Harris and Middleton could not get the same pattern for ratings of control. Target had an effect on likelihood ratings but not on control ratings. They concluded that risk and likelihood estimations are independent of control ratings.

Kos and Clarke (2001) dealt with the relation between optimism bias and control as well. They asked subjects their own risk and average person's risk of experiencing four events varying in controllability and perceived delay of event. They found that people showed optimism bias for controllable events. This implies that individuals do not consider, or fail to consider immediacy of results in their risk evaluations.

To sum up, the previous research demonstrated that biased risk estimations result in an optimistic view of world and future, which in turn promotes risk-taking behavior and prevents self-protective practices.

4. Adaptive Importance of Positive Illusions

It is essential to consider whether positive illusions are adaptive or maladaptive. Taylor and Brown (1988) suggest that positive illusions promote mental health. Their review states that positive illusions are related to reports of happiness. Furthermore, positive illusions facilitate cognitive functioning by enhancing the association of multiple cues with encoded information and by means of providing a more complex cognitive ground for decisions and judgments. Positive illusions also motivate people to persist in what they are doing, since they create high expectations about success. As a result, individuals produce more effective performance.

Is everyone prone to positive illusions? It seems this is not the case. Depressed, distressed, and low self-esteem individuals are accurate in their evaluations of control and estimations of risk likelihood (see Taylor & Brown, 1988).

Although positive effects of illusion of control and optimism bias are mentioned, risk-taking perspective muddles this positive picture. As noted earlier, if drivers believe they have control over the environment, if they overestimate their skills to handle problems, and if they overestimate experiencing positive outcomes; then they will underestimate risks and fail to engage in self-protective behavior. Paradoxically risky behavior may even reinforce itself. For instance, driving fast or overtaking, relatively risky behaviors reduce travel time and provide more continuous driving. It is not always the case that risky behaviors lead to accident. Thus, the absence of contingency between negative consequences and risky behaviors might present risky behaviors to be even beneficial.

Positive illusions bias drivers' perception of safety campaign messages. Drivers who believe that they are invulnerable to negative outcomes fail to appreciate safety messages directed at them; on the contrary, they believe that these messages are for other drivers, who are less skilled and more likely to confront negative events (Walton & McKeown, 2001).

In the previous two sections studies of illusion of control and optimism bias from traffic, gambling, and health literature were reviewed. However, it is worth noting that the result of a risky behavior in one area is not identical to another. Besides the fact that not every risky behavior leads to negative outcomes, immediacy of outcomes are different. Risk-taking behaviors in traffic have immediate results and effects, such as accident, injury or death. Yet risk-taking behaviors in health display their effects in the long-run. Although this difference is clear, other literature is used to explain the phenomenon.

5. Locus of control

Locus of control refers to an individuals' belief in his/her influence over situations in his/her life (Rotter, 1966). Rotter approached locus of control as a unidimensional construct with internal and external ends. Where the control resides is determined by perceived reinforcement. If the reinforcement is not perceived contingent upon one's own behavior, but rather on environmental influences, it is termed as external locus of control. In contrast, if the reinforcement is perceived contingent on one's own behavior, this is termed as internal locus of control. Levenson (1981) offered an alternative model to Rotter's unidimensional construct. She conceptualized locus of control as consisting of three orthogonal dimensions: internality, chance, and powerful others.

5.1. Locus of control and risk-taking

Locus of control was found to be related to risk-taking behavior in different areas, such as driving, occupational hazards, and sex-practices.

Research on safe-sex and accident involvement in workplace supports the relationship between locus of control and safety. Janicak (1996) found locus of control and job hazards as reliable predictors of being involved in job accidents. Externals were more likely to have job accidents. Internals were more likely to avoid risk. Jones and Wuebker (1993) investigated safety locus of control, the individual's belief about the contingency of his/her behavior on accident outcome, among health employees. Individuals with internal safety locus of control are expected to have high safety consciousness and behave less risky; while the opposite is expected for individuals with external safety locus of control. Jones and Wuebker found that hospital employees with external safety locus of control reported more occupational accidents, as well as more severe accidents compared to employees with internal safety locus of control. Terry, Galligan, Conway (1993) investigated predictors of safe-sex behavior. They found that externals were more likely to engage in unsafe sex practices.

Locus of control was assumed to be related to safe driving. Internals and externals were expected to differentiate with respect to their behaviors in risky situations. Internals believe their behaviors to be instrumental on outcomes, and might be more prone to accidents because they overestimate their abilities to handle dangerous traffic-related events. Externals, on the other hand, might be prone to accidents because they are dependent on situational factors or other people to handle traffic-related events (Garrity & Demick, 2001). Despite ambiguous results in the literature, empirical data seem to support the first thesis. The theoretical rationale behind this assumption came from a study by Hoyt (1973). Hoyt measured drivers' self-reported seatbelt wearing behavior, attributions of accident causes, anxiety felt while driving, and travel interest. He found that internals were more likely to attribute causes of accidents to controllable, internal factors. Furthermore, they reported wearing seatbelts more often compared to externals. Internals also reported less anxiety while driving and experienced driving as interesting and involving. Hoyt concluded that internals, who believe their actions influence outcomes, were more cautious and more likely to engage in safe practices while driving. Externals, on the other hand, were less cautious and less likely to take precautionary behavior.

Lefcourt (1982) suggests that to get accurate results with locus of control it's better to use behavior-specific measures rather than general locus of control measure like Rotter's IE. Montag and Comrey (1987) developed a driving-specific locus of control scale to measure Driving Internality (DI) and Driving Externality (DE). They approached DI and DE as separate scales rather than a bipolar scale. They found driving internality, rather than driving externality, to be negatively correlated with involvement in fatal accidents. In their meta-analysis, Arthur, Barrett, and Alexander (1991) obtained a correlation of .20, accounting for around 50% of variance, for the relationship between locus of control and accident involvement. Results of meta-analysis indicated that internal locus of control was associated with lower levels of accident involvement. However, I should note studies that did not find a relationship between locus of control and risky driving.

Iversen and Rundmo (2002) investigated determinants of risky driving and accident involvement. They used Montag Driving Internality and Driving Externality scales to measure locus of control. Externals reported more risk taking but the tendency did not reach significance. In their model locus of control influenced neither risky driving nor accident involvement. Arthur and Doverspike's (1992) study investigating the predictive power of locus of control and auditory selective attention on driving accident involvement did not reveal significant results for locus of control. Guastello and Guastello (1986) also did not find a relationship between locus of control and accident involvement. However, in their study, the lack of a relationship might be due to transformation of Rotter's concept into specific beliefs about accidents and driving behaviors.

The previous studies either found no relationship between locus of control and risk taking or found externality to be related to risky and less cautious behaviors. There is a distinction between internals and externals in terms of the nature of the risk they are likely to take. Cohen, Sheposh, and Hillix (1979) found that internals took more risks on skill tasks, while externals took more risks on chance tasks. Internals were likely to believe what happened to them were result of their own behavior. Externals, on the other hand, were likely to believe that it was due to chance rather than their behaviors.

To summarize, external locus of control and internal locus of control orientations result in differential risk taking behavior. Yet the previous research is not conclusive.

6. Aims and hypotheses

The aims of the current study were to investigate the relationship between illusion of control, optimism bias and locus of control among Turkish drivers and their relationship to risky driving, i.e. violations, accidents, and penalties.

It was hypothesized that; (1) Turkish drivers were prone to illusion of control; (2) illusion of control was expected to promote risk-taking behavior among Turkish drivers; (3) Turkish drivers would suffer from optimism bias in their risk estimations of being involved in an accident; (4) the optimism bias in drivers' accident involvement estimations were expected to increase their risk-taking behaviors; (5) external locus of control was expected to be related with risk-taking behavior.

1

ILLUSION OF CONTROL

1.1. Introduction

The aims of the current chapter were 1) to study if illusion of control can be found in self-reports (of driving) among Turkish drivers, 2) to investigate the relationship between illusion of control and age, sex, years since getting the license, annual mileage, lifetime mileage, total number of tickets, active accidents, passive accidents, and total number of accidents, and 3) to investigate the relationship between illusion of control and self-reported traffic accidents and penalties.

1.2. Method

1.2.1. Measures

1.2.1.1. Driver Behaviour Questionnaire (DBQ)

The Driver Behavior Questionnaire measures three kinds of aberrant behaviors: violations, errors, and lapses (Reason, Manstead, Stradling, Baxter, Campbell, 1990). Violations are defined as “deliberate deviations from those practices believed necessary to maintain the safe operation of a potentially hazardous system”. Errors are defined as “the failure of planned actions to achieve this intended consequences and can involve the unwitting deviation of action from intention (slips or lapses); and the departure of planned actions from some satisfactory path towards a desired goal (mistakes)”. The main distinction between violations and other categories is the intention to do behavior. The violation scale of DBQ includes such behaviors as ignoring the speed limit, driving although being aware of above legal blood-alcohol limit, close-following. Examples of errors include forgetting your way to travel, hitting something while reversing, and not recognizing pedestrians while turning from main road. Reason et al. propose that violations and errors are products of different psychological processes. Violations are result of social factors. Errors, on the other hand, are a result of the information–processing system.

The original version of DBQ consists of 50 items and it was meant to include five subscales: slips, lapses, mistakes, unintended violations, and deliberate violations (Reason, et al., 1990). Factor analysis; however, revealed three factors: violations, dangerous errors, and harmless lapses. The three-factor structure of DBQ is found to be robust in further studies.

The violation score of DBQ, rather error and lapses score, predicts accident liability (Parker, Manstead, Stradling, & Reason, 1992; Parker, West, Stradling, & Manstead, 1995). Drivers who violate safety codes are doing this intentionally and they are more likely to be involved in accidents. Therefore, in the current study the 28-item extended version of DBQ was used as an indicator of risk-taking behavior (Lawton, Parker, Manstead, & Stradling, 1997). DBQ’s Turkish translation and factor structure was validated by Lajunen & Özkan (2004). Participants were asked to report how often they committed each of 28 behaviors on a six-point scale (1= never, 6= very often).

1.2.1.2. Driver Skill Inventory (DSI)

Driver skill inventory measures driving skills and safety skills (Lajunen & Summala, 1995). Two subscales represent motive-skill dimensions. Naatanen &

Summmala (1974) stated that drivers' cognitive and motor skills do not necessarily predict their accident involvement. Motivational factors determine what they will do in a given situation. Evans (1991) made a similar distinction between driver performance and driver behavior. Driver performance is what the driver can do and it is related to driver's skills, perceptual-motor abilities, and knowledge. Driver behavior is what the driver actually does. It is the driver's choice to display performance.

The DSI consists of 20 items. The reliabilities of the two scales were .89 and .84 for driving skills and safety skills (Lajunen & Summala, 1995). It was translated and validated in Turkish by Sümer and Özkan (2002). The DSI asks drivers to rate how weak or strong they were on given skills on a five-point scale (1= very weak, 2= very strong). Recent research accounted for the asymmetric relationship between driving skills and safety skills (Sümer, Özkan, & Lajunen, 2006). The results revealed that high levels of safety skills buffer negative effects of high levels of driving skills, i.e. overconfidence in one's skills.

1.2.1.3. Illusion of control

Illusion of control is measured by asking drivers to judge their likelihood of involvement in an accident when they are driving versus when they are passengers (McKenna, 1993). The comparison between these two conditions is a measure of illusion of control. In other words, if an individual's accident likelihood judgments are lower when they are driving than when they are passenger, they are assumed to be prone to illusion of control. Although comparing these two conditions is common measurement of illusion of control, there is a point that I disagree with. Driving, in its nature, is under the control of the driver. The driver has control over the car, equipment, in his/her reactions, and decisions. The passenger, on the other hand, just sits on the front seat of the car and travels. Comparing almost full control with no control naturally gives significant results. However, this is not due to measurement method or manipulation.

Illusion of control was measured in its relation to perceived risk in the current study. Controllability was one of nine dimensions in Fischoff et al.'s conceptualization of risk as a multi dimensional construct. This implies that if something is not controllable, then it is risk-involving. Control is one of the basic needs of human beings for prediction and survival. Asking control directly would yield obviously high estimations. Therefore, I tried to infer drivers' control ratings from their risk ratings. Although driver's and front seat passenger's control over automobile and risk situation is not equal, the risks they are subjected to are same most of the time. Therefore, drivers should rate risky outcome of behavior as similar when imagining themselves as driving and when imagining themselves as passenger. The discrepancy between the two conditions would mean biased risk evaluations. Based on Fischoff et al.'s conceptualization, I would infer biased control beliefs, i.e. illusion of control, from biased risk estimations.

Participants were asked how risky they evaluated each behavior in DBQ. They were asked to rate DBQ items twice; first considering themselves as a driver and second considering themselves as a passenger. The question was "How risky do you think each behavior is when you are driving the car/ when you are front-seat passenger?". Questions were presented separately in two columns. Illusion of control score was derived from the difference between risk rating as a driver and risk rating as a passenger. Negative scores indicated illusion of control.

1.2.1.4. Perceived control

Besides investigating the effects of illusion of control on the risk-taking behavior, I wanted to see whether the effect of the perceived control differs from illusory control. DBQ items were used to measure perceived control. Drivers were asked to estimate their control on each item of DBQ on a six point scale (1 = not at all under my control, 6 = certainly under my control). Increasing scores indicated high perceived control.

1.2.1.5. Risk-taking

Risk-taking was measured by the violation score of DBQ original, the total number of accidents, and the total number of tickets.

1.2.2. Participants

Two-hundred and one drivers participated in the study. The sample consisted of 192 males (66 % of sample) and 97 females (33.6 % of sample). Two respondents did not report their sex. The mean age was 29.82 years (SD= 11.16). The average time drivers had their license was 8.62 years (SD = 8.24). Respondents' average mileage in last year was 8.973 km (SD= 18.427). Their lifetime mileage was 91.299 km (SD= 209.789).

1.3. Results

1.3.1. Factor analysis

1.3.1.1. Factor structure of DBQ

Twenty eight DBQ items were subjected to principal axis factoring with varimax rotation. The criteria for determining number of the factors were Kaiser's criterion of eigenvalues over 1.0, Cattell's scree plot, interpretability of the factors, and the consistency of factor structure with those in previous studies.
Initial factor analysis revealed three factors with eigenvalues over 1.0 and interpretation of scree plot supported the three-factor structure. However, factor analysis for other versions of DBQ did not reveal three clear factors. Therefore, two factors were forced to the original version of DBQ, which was found to be the most interpretable solution in a longitudinal study (Özkan, Lajunen, & Summala, 2006). Item number eight (Fail to check your mirror before pulling out or changing lanes) did not load on any of the factors in two-factor solution; therefore, it was excluded.

The first factor consisted of eleven items tapping violations in traffic and accounted for 12 % of the total variance. Item loadings on the first factor ranged from .74 to .33. The second factor consisted of sixteen items tapping errors made while driving and accounted for 11 % of the total variance. Item loadings on the second factor ranged from .59 to .31. Two factors together accounted for 23 % of the total variance. Reliability coefficients of the two factors were .80 and .79; respectively. Results of the factor analysis for DBQ original are presented in Table 1.3.1.1.

Table 1.3.1.1. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on DBQ items

DBQ-original scales	F1	F2	h^2
Factor 1: Violations (accounts for 12 % of the variance)			
11. Violate speed limit in city roads	.740	.013	.547
20. Overtake on right on motorway	.684	.068	.474
21. Race in traffic lights	.589	-.008	.347
28. Violate speed limit on motorway	.577	.057	.337
17. Angry, give chase	.543	.085	.302
25. Have an aversion to a particular type of road user	.467	.078	.225
23. Close follow	.454	.359	.335
24. Shoot lights	.443	.361	.329
3. Drink and drive	.418	.067	.179
18. Drive on an about-to-close lane on a motorway	.347	.172	.149
7. Angry, horn	.327	.067	.112
Factor 2: Errors (accounts for 11 % of the variance)			
14. Ignore give-way signs	.056	.587	.348
5. Queuing, nearly hit the car in front	.155	.503	.276
22. Wrong exit from roundabout	.001	.474	.225
10. Speed in roundabout	.332	.471	.331
9. Brake too quickly	.249	.461	.274
26. No recollection of recent road	.163	.443	.222
27. Misjudge speed of oncoming vehicle	.066	.430	.189
13. Turning left, nearly hit cyclist	.105	.413	.181
1. Hit something when reversing	-.051	.403	.165
4. Get into wrong lane at roundabout	.343	.394	.272
6. Fail to see pedestrians crossing	.194	.387	.187
16. Try to pass vehicle turning left	.234	.379	.197
19. Forget where car is	.166	.359	.156
12. Intend lights, but switch on wipers	-.108	.353	.137
15. Attempt driving off in third gear	.016	.313	.098
2. On usual route by mistake	.056	.315	.102

1.3.1.2. Factor structure of DBQ-perceived control

The twenty items of DBQ-perceived control version were subjected to principal factor analysis with varimax rotation. Initial factor analysis produced two factors, items of which were consistent with original DBQ. The first factor consisted of seventeen items measuring errors and accounted for 22 % of total variance. It was named as “perceived control on errors”. Item loadings on the first factor ranged from .71 to .39. The second factor consisted of eleven items measuring violations and accounted for 14 % of the total variance. The second factor was named as “perceived control on violations”. Item loadings on the second factor ranged from .60 to .35. Two factors accounted for 36 % of the variance. Reliability coefficients for the two factors were .91 and .82, respectively. Results of the factor analysis for DBQ-perceived control are presented in Table 1.3.1.2.

Table 1.3.1.2. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on DBQ-perceived control items

DBQ-perceived control scales	F1	F2	h^2
Factor 1: Perceived control on errors (accounts for 22% of the variance)			
14. Ignore give-way signs	.713	.253	.572
15. Attempt driving off in third gear	.685	.103	.480
16. Try to pass vehicle turning left	.666	.217	.491
6. Fail to see pedestrians crossing	.656	.226	.481
22. Wrong exit from roundabout	.618	.303	.474
27. Misjudge speed of oncoming vehicle	.618	.274	.457
12. Intend lights, but switch on wipers	.617	.140	.401
8. Maneuver without checking mirror	.617	.250	.444
13. Turning left, nearly hit cyclist	.600	.218	.408
5. Queuing, nearly hit the car in front	.570	.344	.444
10. Speed in roundabout	.568	.398	.481
23. Close follow	.500	.418	.425
19. Forget where car is	.473	.319	.325
26. No recollection of recent road	.421	.358	.305
9. Brake too quickly	.403	.187	.197
1. Hit something when reversing	.396	.179	.189
2. On usual route by mistake	.388	.331	.260
Factor 2: Perceived control on violations (accounts for 14% of the variance)			
20. Overtake on right on motorway	.141	.601	.381
11. Violate speed limit in city roads	.178	.592	.382
24. Shoot lights	.274	.566	.395
21. Race in traffic lights	.260	.544	.363
25. Have an aversion to a particular type of road user	.183	.519	.303
7. Angry, horn	.051	.480	.233
28. Violate speed limit on motorway	.329	.439	.300

Table 1.3.1.2. continued

18. Drive on an about-to-close lane on a motorway	.405	.405	.328
4. Get into wrong lane at roundabout	.270	.400	.233
17. Angry, give chase	.358	.381	.273
3. Drink and drive	.257	.348	.187

1.3.1.3. Factor structure of DBQ-perceived risk as driver

The twenty eight items of DBQ-perceived risk as driver version were subjected to principal factor analysis with varimax rotation. Initial factor analysis produced two factors, items of which were consistent with original DBQ. The first factor consisted of eighteen items. These were violation items and error items that would result in immediate accident. In other words, the first factor included high accident risk items whether the behavior is a violation or an error. Item loadings in the first factor ranged from .82 to .50 and accounted for 32 % of the total variance. The first factor was named as "high risk as driver". The second factor consisted of ten items. These items involved remaining six error items and four violation items of the original DBQ those would not result in accident. The second factor of DBQ-perceived risk as driver version consisted of relatively low accident risk items. Item loadings for the second factor ranged from .71 to .38 and accounted for the 15% of the total variance. The two factors together accounted for 47% of total variance. The second factor was named as "low risk as driver". Reliabilities for these scales were .94 and .85; respectively. Results can be seen in Table 1.3.1.3.

Table 1.3.1.3. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on DBQ-perceived risk as driver items

DBQ-perceived risk as driver scales	F1	F2	h^2
Factor 1: High risk as driver (accounts for 32 % of the variance)			
14. Ignore give-way signs	.820	.098	.682
23. Close follow	.795	.214	.678

Table 1.3.1.3. continued

24. Shoot lights	.773	.109	.610
16. Try to pass vehicle turning left	.755	.184	.604
11. Violate speed limit in city roads	.701	.269	.563
8. Maneuver without checking mirror	.695	.101	.493
22. Wrong exit from roundabout	.680	.265	.533
10. Speed in roundabout	.678	.242	.518
9. Brake too quickly	.676	.202	.498
13. Turning left, nearly hit cyclist	.660	.242	.494
27. Misjudge speed of oncoming vehicle	.656	.157	.455
28. Violate speed limit on motorway	.616	.327	.487
6. Fail to see pedestrians crossing	.612	.186	.409
17. Angry, give chase	.592	.354	.476
5. Queuing, nearly hit the car in front	.592	.273	.425
4. Get into wrong lane at roundabout	.541	.363	.424
3. Drink and drive	.526	.087	.284
21. Race in traffic lights	.503	.373	.393
Factor 2: Low risk as driver (accounts for 15 % of the variance)			
19. Forget where car is	.061	.711	.509
26. No recollection of recent road	.197	.669	.486
15. Attempt driving off in third gear	.218	.650	.471
12. Intend lights, but switch on wipers	.317	.634	.503
2. On usual route by mistake	-.032	.546	.299
20. Overtake on right on motorway	.486	.512	.498
7. Angry, horn	.145	.508	.279
25. Have an aversion to a particular type of road user	.440	.478	.422
18. Drive on an about-to-close lane on a motorway	.434	.470	.409
1. Hit something when reversing	.333	.381	.256

1.3.1.4. Factor structure of DBQ-perceived risk as passenger

The twenty eight items of DBQ-perceived risk as passenger version were subjected to principal factor analysis with varimax rotation. Initial factor analysis produced three-factor solution. However, this three-factor solution was not clear, items of errors and violations were confused. Therefore, two factors were forced into the analysis. The two-factor solution produced almost same pattern with DBQ-perceived risk as driver. The first factor included seventeen items. The items were the same as with those in the first factor of DBQ-perceived risk as driver scale except for one item. This factor was named as “high risk as passenger” and it accounted for 23 % of the total variance. Item loadings on first factor ranged from .76 to .39. The second factor consisted of the same items in the second factor of DBQ-perceived risk as driver scale and an additional item from the first factor of DBQ-perceived risk as driver. This factor was named as “low risk as passenger” and it accounted for 16 % of the total variance. Item loadings on the second factor ranged from .68 to .43. The two factors together accounted for 39% of the total variance. Reliabilities for these scales were .90 and .8; respectively. Results can be seen on Table 1.3.1.4.

Table 1.3.1.4. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on DBQ-perceived risk as passenger items

DBQ-perceived risk as passenger scales	F1	F2	h^2
Factor 1: High risk as passenger (accounts for 23 % of the variance)			
23. Close follow	.760	.168	.606
16. Try to pass vehicle turning left	.756	.134	.590
14. Ignore give-way signs	.722	.130	.538
24. Shoot lights	.710	.045	.506
10. Speed in roundabout	.665	.241	.500
27. Misjudge speed of oncoming vehicle	.615	.036	.380
8. Maneuver without checking mirror	.598	.100	.367
9. Brake too quickly	.591	.151	.372
11. Violate speed limit in city roads	.573	.280	.406
22. Wrong exit from roundabout	.547	.296	.386
28. Violate speed limit on motorway	.490	.211	.284
13. Turning left, nearly hit cyclist	.485	.375	.376
5. Queuing, nearly hit the car in front	.459	.323	.315
17. Angry, give chase	.425	.382	.327
3. Drink and drive	.421	.020	.178
21. Race in traffic lights	.414	.403	.334
4. Get into wrong lane at roundabout	.389	.346	.315
Factor 2: Low risk as passenger (accounts for 16 % of the variance)			
15. Attempt driving off in third gear	.215	.685	.516

Table 1.3.1.4. continued

19. Forget where car is	-.051	.682	.467
26. No recollection of recent road	.157	.665	.467
12. Intend lights, but switch on wipers	.179	.607	.401
7. Angry, horn	.071	.566	.326
25. Have an aversion to a particular type of road user	.374	.523	.414
20. Overtake on right on motorway	.311	.521	.369
2. On usual route by mistake	-.121	.499	.263
1. Hit something when reversing	.235	.493	.298
18. Drive on an about-to-close lane on a motorway	.353	.460	.335
6. Fail to see pedestrians crossing	.306	.436	.284

1.3.1.5. Factor structure of DSI

The twenty items of DSI were subjected to principal factor analysis with varimax rotation. Factor analysis produced two factors accounting for 42% of the total variance, which was consistent with previous studies using DSI. The first factor, which accounted for 28% of the total variance, consisted of thirteen items measuring driving skills. Item loadings on driving skills factor ranged from .80 to .40. The second factor involved seven items measuring safety skills and it accounted for 14% of the total variance. Item loadings on the second factor ranged from .72 to .43. The two factors accounted for 42% of the total variance. Reliabilities of the scales were .90 and .78; respectively. Results can be seen in Table 1.3.1.5.

Table 1.3.1.5. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on DSI items

DSI scales	F1	F2	h^2
Factor 1: Driving skills (accounts for 28 % of the variance)			
14. Overtaking	.758	000	.635
10. Controlling the vehicle	.734	.208	.539
20. Reverse parking	.695	.035	.518

Table 1.3.1.5. continued

2. Perceiving hazards in traffic	.686	.193	.471
6. Performance in specific situations	.674	.109	.465
1. Fluent driving	.657	-.128	.552
13. Managing the car through hill	.655	.054	.454
8. Making firm decisions	.645	.150	.419
4. Managing car through a slide	.645	.168	.417
5. Preview of traffic situations	.613	.156	.377
12. Adjusting the speed to the conditions	.595	.388	.400
7. Fluent lane-changing in heavy traffic	.549	-.214	.463
15. Relinquishing one's rights	.431	.169	.187
19. Following the traffic lights carefully	.364	.338	.247
Factor 2: Safety skills (accounts for 14 % of the variance)			
16. Conforming to the speed limits	-.082	.713	.529
17. Avoiding unnecessary risks	.051	.668	.519
3. Following a slow car in patient	-.009	.585	.375
18. Tolerating other drivers' blunders calmly	.051	.514	.313
9. Keeping calm in annoying situations	.068	.477	.279
11. Keeping sufficient following distance	.390	.411	.321

1.3.2. Comparisons between perceived risk as driver and as passenger

Negative mean value for illusion of control score (mean = -.16) indicates that drivers perceived risk ratings when imagining themselves as passenger were higher than when imagining themselves as drivers. Paired sample t-test analyses were administered to test whether risk ratings in two conditions differed significantly from each other. Results indicated that drivers' risk ratings on both high risk involving and low risk involving behaviors were significantly different when they were imagining themselves as driver than when they are imagining themselves as front seat passenger [($t(281) = -4.0$, $p < .01$) and ($t(280) = -3.9$, $p < .01$), respectively]. These results imply drivers' biased control beliefs, i.e. illusion of control.

1.3.3. Correlation analysis

Table 1.3.3.1. lists correlations between illusion of control, perceived control on violations, and background variables. Results indicate that illusion of control was not related to age, gender, experience, offences, and number of total tickets. It was only significantly negatively correlated with number of total accidents ($r = -.16$) and active accidents (-.14). It should be kept in mind that negative scores on illusion of control were indicative of the illusion. Therefore, the negative relationship between illusion of control and total number of accidents indeed imply a positive relationship. As drivers' illusion of control beliefs increase, their number of total accidents also increases. Considering the insignificant relationship of illusion of control with passive accidents, the effect must be due to involvement in active accidents.

Perceived control on violations was correlated with none of the background variables except for the number of total tickets. As perceived control on violations increased the number of total tickets decreased ($r = -.14$).

Table 1.3.3.1. Correlations among illusion of control, perceived control, and background variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Illusion of control	1											
2. Perceived control on violations	.149*	1										
3. Age	.090	-.035	1									
4. Sex	.095	.079	-.020	1								
5. Years since getting the license	.037	.021	.887**	-.081	1							
6. Annual mileage	-.038	.091	.169	-.136	.234**	1						
7. Lifetime mileage	-.029	.023	.424**	-.122*	.506**	.786**	1					
8. Offences	-.001	.020	.087	-.128*	.115	.258**	.243**	1				
9. Total tickets	-.086	-.141*	.008	-.133*	.046	.178**	.169**	.400**	1			
10. Active accidents	-.143*	.005	-.079	.003	-.048	.049	.078	.102	.272**	1		
11. Passive accidents	-.108	.000	.094	-.009	.105	.134*	.230**	.128*	.114	.302**	1	
12. Total accidents	-.157**	.004	-.001	-.004	.027	.151*	.227**	.144*	.253**	.848**	.761**	1

** p < .01
* p < .05

Note: Illusion of control score was measured on a negative scale. An increasing negative numeric value corresponds to higher scale value; i.e. higher illusion of control. Therefore, a negative correlation coefficient sign indicates a positive relationship.

Another correlation analysis was carried out for the relationship between illusion of control, perceived control on violations, and driving and safety skills. Illusion of control was not correlated with self-evaluated driving and safety skills. Perceived control on violations was significantly positively correlated with safety skills (r = .29). As drivers' perceived control on violations increased, they were more likely to evaluate their safety skills as strong (Table 1.3.3.2.).

Table 1.3.3.2. Correlations among illusion of control, perceived control on violations, driving skills, and safety skills

Variables	1	2	3	4
1. Illusion of control	1			
2. Perceived control on violations	.149*	1		
3. Driving skills	-.002	.093	1	
4. Safety skills	.103	.290**	.218**	1

** p < .01
* p < .05

1.3.4. Frequency analysis

Frequency analysis of the variables revealed an asymmetric pattern between violations and perceived control on violations. Ninety percent of participants scored below 3.0, which corresponds to "sometimes" on a 6-point scale, while, almost 99% of participants scored above 3.0, which corresponds to "under my control to a little extent", in DBQ-perceived control scale. Drivers report very few violations and great control.

1.4. Discussion

The aim of the current chapter was to present analysis of illusion of control. The results of the current study revealed that drivers are prone to an illusion of control. The control phenomenon was approached as an indicator of the risk concept in the current study. Drivers' risk assignments to the same behavior were different in driver and in passenger conditions. This implies existence of a bias in their beliefs about controllability of the risk. T-test analysis verified the existence of illusion of control.

In the current study illusion of control was not found to be related with any of the background variables. The previous research did not found illusion of control differences for males and females and different age groups. Furthermore, experience seems not to make a difference on drivers biased control ratings (McKenna, 1993; Horswill et al., 2004; Waylen, Horswill, Alexander, & McKenna, 2004).

Results demonstrated that as drivers' illusion of control increased, their number of total accidents and involvement in active accidents also increased. Lajunen (1999) defines safe driving as "lack of accidents in the past" and risky driving as "driver with many accidents". Accident frequency was treated as criteria for risky driving. Furthermore, it is necessary to make distinction between accident types. While passive accidents are mostly related to annual mileage of the driver; active accidents are related to accident liability (Lajunen, 1999). The current results support this distinction. Passive accidents were significantly positively correlated with annual mileage. On the contrary, active accidents were not correlated with either annual or lifetime mileage. Consequently, as drivers' illusion of control increase, their risky driving style increases as well.

Perceived control on violations was negatively related with number of total tickets. As drivers' perceived control on violations increase, they are more likely to avoid violating traffic rules and taking extra tickets. Moreover, those drivers are more likely to evaluate themselves as safe drivers. High perceived control was found to result in toleration of higher risks in traffic (Horswill & McKenna, 1999b). The current result should be approached cautiously because of the asymmetry between self-reported violations and perceived control. The original DBQ and DBQ-perceived control were presented on the same page. Participants answered two different versions on adjoining columns. First reporting violations, and then, rating their control on them might have resulted in underreporting of violations but overrating of control.

2

OPTIMISM BIAS

2.1. Introduction

Optimism bias was found to influence individuals' risk estimations through creating a false overconfidence that results in underestimation of vulnerability (Weinstein, 1980). Biased risk estimations seem to encourage individuals' risk-taking behavior (Svenson, 1981) and to cause individuals' failure to engage in self-protective practices (Perloff & Fetzer, 1986).

The aims of the current chapter were 1) to study if optimism bias can be found in self-reports (of driving) among Turkish drivers, 2) to investigate the relationship between optimism bias and age, sex, years since getting the license, annual mileage, lifetime mileage, total number of tickets, active accidents, passive accidents, and total number of accidents, and 3) to investigate the relationship between optimism bias and self-reported violations, traffic accidents, and penalties.

2.2. Method

2.2.1. Measures

2.2.1.1. Direct optimism bias (D measure)

Direct measurement of optimism bias is concerned with participant's comparative risk estimations for themselves. Drivers were asked "What is your likelihood of being involved in accident types presented below compared to an average driver?". They were asked to answer on a seven point scale (1 = much below average, 7 = much above average). The four accident types presented were: rear-end collision, head-on collision, accident due to loss of control, and accident in an intersection. Comparative risk estimations for four accident types were summed to obtain a direct optimism bias score. It is important to highlight that optimism bias can be determined only in group level. Individuals might have below-the-average risk for special reasons. However, majority of the group cannot have less risk than the other majority of the group. Group mean below the mid-point of the scale (4) means sample has biased risk estimations for themselves (Weinstein, 1980). High scores indicated less optimism bias.

2.2.1.2. Indirect optimism bias (ID measure)

Indirect measurement of optimism bias is concerned with participants' absolute risk estimations: one for themselves and one for comparison other. For self-risk rate drivers were asked "How likely do you think it is that you personally will be involved in accident types presented below within next ten years?". For other-risk rate drivers were asked "How likely do you think it is that an average driver will be involved in accident types presented below within next ten years?" on an eleven point scale (1 = no chance, 11 = certain). ID measure score was obtained from the difference between self-risk and other-risk. Negative scores indicated optimism bias.

Four accident types were rear-ending collision, head-on collision, having an accident due to loss of control, and having an accident in an intersection. These four accidents were chosen because they were most common types of accidents.

In addition to the optimism bias measures Driver Behavior Questionnaire (DBQ) - original, Driver Skill Inventory, and demography questions were used in the current analyses (see Method section, pg. 22).

2.2.2. Participants

Sample characteristics were presented in page 26.

2.3. Results

2.3.1. Descriptive statistics and comparison between self-risk ratings and other-risk ratings

Table 2.3.1.1. shows means and standard deviations (SD) of individual items used in D measure, item pairs used in ID measure, D measure, ID measure, self-risk, and other risk. It can be seen that the mean D responses are below 4 and that all the mean ID responses are negative. One-sample t-test analysis indicated that D measure responses for all accident types were significantly different from zero [(t (288) = 30.82, p< .01), (t (288) = 29.61, p< .01), (t (288) = 30.02, p< .01) and t (287) = 32.74, p< .01), respectively for rear-end, head- on, loss of control, and intersection accidents]. Paired-sample t-test analysis indicated that drivers' self-risk ratings and other-risk ratings were significantly different from each other [(t (288) = -14.18, p< .01), (t (288) = -15.45, p< .01), (t (288) = -14.50, p< .01) and t (287) = -14.28, p< .01), respectively for rear-end, head- on, loss of control, and intersection accidents self-other comparison pairs]. Drivers made lower risk estimations for themselves compared to the average driver. These results are consistent with previous research demonstrating that drivers rate their own risk of being involved in

accident less than an average driver (Kos & Clarke, 2001; DeJoy, 1989; Svenson, 1981).

Table 2.3.1.1. Means (SDs) of the direct (D) and indirect (ID) measures of optimism bias for accident types

	Direct measure	Indirect measure	Self risk	Other risk
Rear-end	2.39	-1.75	4.19	5.97
	(1.32)	(2.09)	(2.15)	(1.75)
Head-on	2.03	-1.92	3.57	5.51
	(1.17)	(2.1)	(1.89)	(1.94)
Loss of control	2.46	-1.92	4.23	6.18
	(1.40)	(2.24)	(2.13)	(1.84)
Intersection	2.57	-1.80	4.43	6.26
	(1.34)	(2.14)	(2.04)	(1.95)

2.3.2. Analysis of variance

The effect of gender on differential risk estimations was tested before continuing with further analyses. One-way ANOVA with gender as independent variable and four risk estimation item pairs (i.e. the difference score between self-risk and other-risk estimation for rear-end, head-on, loss of control, intersection accidents) as dependents was conducted. The only significant difference was for the first pair; F (1, 284) = 7.52, $p < .01$; F (1, 284) = .004, $p > .05$; F (1, 284) = .18, $p > .05$; F (1, 283) = 1.29, $p > .05$, respectively. Men judged their risk of involving in rear-end collision less compared to others than women did.

A second one-way ANOVA was run with gender as independent variable and self risk, other risk, direct OB, and indirect OB as dependent variables. The aim was to see whether significant gender difference in first item pair reflected on total scores, which would necessitate separate analysis for men and women. Results of ANOVA for all four items were insignificant; F (1, 287) = .52, p > .05; F (1, 284) = .10, p > .05; F (1, 287) = 1.86, p >.05; F (1, 284) = 1.01, p > .05, respectively. Thus, data were analyzed together for two sexes.

2.3.3. Correlation analysis

Table 2.3.3.1. lists correlations among optimism bias variables, background variables, and violations. D measure was significantly negatively correlated with age (r = -.25), years since getting the license (r = -.23), and positively with violations (r = .18). Young drivers were less likely to make biased risk estimations. In addition, drivers overestimating their risks were more likely to violate rules.

Self-risk rating was significantly positively correlated with offences (r = .14) and violations (r = .17). ID measure and other-risk rating were not correlated with any variable.

Table 2.3.3.1. Correlation analysis between optimism bias variables, background variables, and violations

	1	2	3	4
1.Direct measure	1			
2.Indirect measure	.354**	1		
3.Self risk	.525**	.546**	1	
4.Other risk	.140*	-.529**	.422**	1
5.Age	-.255**	-.072	-.099	-.009
6.Sex	.080	.060	.042	-.019
7.Years since getting license	-.227**	-.063	-.042	.042
8.Annual mileage	-.033	.003	.021	.034
9.Lifetime mileage	-.108	.010	-.003	-.015
10.Offences	.063	.081	.135*	.047
11.Total tickets	-.043	-.029	-.004	.024

Table 2.3.3.1. cotinued

12.Active accidents	.093	-.006	.071	.067
13.Passive accidents	.026	-.020	.063	.075
14.Total accidents	.077	-.014	.085	.088
15.Violations	.179**	.077	.167**	.079

** p < .01
* p < .05

A second correlation analysis was performed to investigate the relationship between optimism bias variables and self-evaluated driving and safety skills (Table 2.3.3.2.). Driving skills were negatively correlated with three D measures (r = -.28), ID measure (r = -.34), and self-risk rating (r = -.23). It was positively correlated with other-risk rating (r = .15). Safety skills were negatively correlated with D measure (r = -.29), ID measure (r = -.21), and self-risk (r = -.24). It was not significantly related with other-risk rating.

Table 2.3.3.2. Correlation analysis among optimism bias variables and driving and safety skills

	Driving skills	Safety skills
D measure	-.280**	-.294**
ID measure	-.339**	-.209**
Self-risk	-.227**	-.238**
Other-risk	.146*	.005

** p < .01
* p < .05

2.4. Discussion

Means and t-test analysis indicated that drivers were prone to optimism bias in their risk estimations for themselves and for other drivers.

Among all risk ratings only D measure and self-risk rating was related with background variables. Age and years since getting driving license were negatively correlated with D measure, implying that older and experienced drivers were more likely to make lower comparative risk estimations compared to young and novice ones. In their study on risk perception in motorcyclists, Rutter, Quine, and Albery (1998) found significant age and experience effects. Their results indicated that young and less experienced drivers were less likely to overestimate their risk. Among car drivers, DeJoy (1989) found a significant effect for experience and a marginal effect for age. Young and novice drivers are assumed to be more biased in their risk estimations. However, the present results demonstrate that young and novice drivers are more realistic in their risk estimations.

Self-risk rating was positively related to offences. Additionally, self-risk was positively related to violations. These results indicate that as drivers perceive their risk of accident involvement high, they are more likely to violate traffic rules.

In addition, both indirect and direct measurements of OB were negatively correlated with driving skills, which means that drivers who underestimate their own risk of being involved in an accident evaluate themselves as skillful drivers. These results together demonstrate a pattern consistent with findings from literature. Drivers who underestimate their risk of crash involvement were more likely to believe in their driving skills and to take risks (Svenson, 1981).

3

LOCUS OF CONTROL

3.1. Introduction

Previous research revealed external locus of control to be related to risk-taking behavior and failure to take precautionary action. Yet, some studies found no relationship between locus of control and risk-taking.

The aims of the current chapter were 1) to validate factor structure of multidimensional traffic locus of control scale, 2) to investigate the relationship locus of control and age, sex, years since getting the license, annual mileage, lifetime mileage, total number of tickets, active accidents, passive accidents, and total number of accidents, and 3) to investigate the relationship between locus of control and self-reported violations, traffic accidents, and penalties.

3.2. Method

3.2.1. Measures

3.2.1.1. Rotter's internality externaity scale (Rotter's IE)

Rotter's IE (1966) measures individual's generalized control beliefs on an internality-externality dimension. It consists of 29 forced-choice items, six of which are used as filling items. Each item has a or b choice representing internal or external control focus. "A" choice of twelve items and "B" choice of eleven items get 1 point. Subjects might have a total score between 0-23. Rotter's IE treats locus of control as a continuous variable. An increasing total score indicates an increase on the locus of control dimension going to externality.

Reliability and validity of the scale in a Turkish sample was tested by Dağ (1991). Internal reliability of the scale was .71 in the adaptation study and .70 in the current study.

3.2.1.2. Multidimensional traffic locus of control scale (T-LOC)

T-LOC (Özkan & Lajunen, 2005) approaches locus of control as a multidimensional construct. The scale asks participants to indicate on a five-point scale (1 = not at all possible, 5 = highly possible) how possible they thought the 16 causes presented had caused or would cause an accident when they think of their driving style and internal and external conditions. The original scale consists of sixteen items. In the current study a seventeen item version was used (Özkan, Lajunen, & Kaistinen, 2005). The original study revealed four scales: other drivers, self, vehicle and environment, and fate. Alpha reliabilities for scales were .79, .78, .69, and .44.; respectively.

In addition to locus of control measures Driver Behavior Questionnaire- original, Driver Skill Inventory, and demography questions were used in the current analyses (see Method section, pg. 22).

3.2.2. Participants

Sample characteristics were presented in page 26.

3.3. Results

3.3.1. Factor Analysis

3.3.1.1. T-LOC

Principal axis factoring with varimax rotation was performed on T-LOC. The criteria for determining the number of factors were Kaiser's criterion of eigenvalues over 1.0, Cattell's scree plot, interpretability of factors, and consistency of factor structure with those in previous studies.

The original factor structure of T-LOC is a four-factor structure. In the current study, factor analysis produced three factors for T-LOC. Te first factor consisted of nine items measuring other drivers-based causes and vehicle and environment based causes. This factor was named as "external factors" and accounted for 18% of the total variance. Item loadings on the first factor ranged from .68 to .38. Other driver-based causes and vehicle and environment based causes resulted in two separate factors in the original factor solution of T-LOC. However, in the current study these two factors were combined. Forcing four factors in the factor analysis resulted in scattered factor items. The second factor involved items measuring self-based causes and accounted for 15 % of the total variance. This factor was named as "self", consistent with Özkan & Lajunen (2005). Item loadings on self factor ranged from .74 to .58. The third factor consisted of three items measuring fate and chance based causes and accounted for 9 % of the total variance. The third factor was named as "fate". Item loadings on this fate factor ranged from .71 to .65. The three factors accounted for 42 % of the total variance. Reliabilities of the scales were .82, .82, and .74, respectively. Results are presented in Table 3.3.1.1.

Table 3.3.1.1. Factor loadings, communalities (h^2), percents of variance for principal axis factoring and varimax rotation on T-LOC items

T-LOC scales	F1	F2	F3	h^2
Factor 1: External factors (accounts for 18 % of the variance)				
14. Other drivers driving under influence of alcohol	.685	.000	-.093	.503
8. Other drivers drive often with too high speed	.676	.230	-.042	.492
15. Other drivers' dangerous overtaking	.665	.149	-.042	.446
4. Other drivers' risk-taking	.592	-.038	-.103	.888
10. Other drivers drive too closely to my car	.565	.217	.087	.370
12. Bad weather and lighting conditions	.557	.154	.197	.495
6. Dangerous roads	.548	.212	.126	.383
13. A mechanical failure in the car	.457	.075	.196	.338
3. Shortcomings in other drivers' driving skills	.383	-.079	-.040	.426
Factor 2: Self (accounts for 15 % of the variance)				
16. My own dangerous overtaking	.162	.738	.061	.564
2. My own risk-taking	.038	.736	-.046	.612
7. I drive often with too high speed	.100	.708	.012	.530
9. I drive too close to the other car in front	.224	.659	.139	.501
1. Shortcomings in my driving skills	.051	.582	-.019	.336
Factor 3: Fate (accounts for 9 % of the variance)				
11. Fate	.004	.061	.712	.488
17. Coincidences	.006	.020	.706	.512
5. Bad luck	.034	-.017	.651	.501

3.3.2. Correlation analysis

Correlational analysis was performed to investigate the relationship between T-LOC scales, Rotter's I E, background variables, driving and safety skills, and violations (Table 3.3.2.). The external scale was positively correlated with age ($r = .12$) and sex ($r = .13$). However, one-way ANOVA analysis did not reveal significant effect for sex, $F (1, 287) = .026$, $p > .05$. Self scale was correlated with none of the background variables. It was significantly negatively correlated with driving skills (r = -.15) and safety skills (r = -.12). The fate scale was positively correlated with offences (r = .18) and violations (r = .16) and it was negatively correlated with safety skills (r = -.18). Rotter's IE was negatively correlated with age (r = -.17) and years since getting the license (r = -.14).

Table 3.3.2. Correlations among locus of control variables, background variables, and violations

	External	Self	Fate	Rotter's IE
External	1			
Self	.302**	1		
Fate	.057	.066	1	
Rotter's IE	-.067	-.039	.265**	1
Age	.124*	.052	-.114	-.172**
Sex	.132*	-.071	-.024	.009
Years since getting license	.105	-.028	-.040	-.140*
Annual mileage	.005	-.020	.020	.050
Lifetime mileage	-.020	-.047	.041	-.013
Offences	-.056	-.057	.180**	.037
Total tickets	-.068	.006	.077	.072
Active accidents	.049	-.012	.097	.114
Passive accidents	.070	.065	.017	.024
Total accidents	.069	.027	.077	.092
Driving skills	.005	-.154**	-.073	-.069
Safety skills	.094	-.116*	-.181**	-.137*
Violations	-.009	.068	.159**	.101

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

3.4. Discussion

The current results revealed that drivers' tendency to attribute causes of accidents to external factors increased with their age. Although external scale and sex were significantly related, ANOVA analysis did not give significant results. Sex was not related to any locus of control variable. Sex was not found to be related with locus of control in a previous study, either (Özkan & Lajunen, 2005).

The self scale was negatively correlated both with driving and safety skills. As drivers think that accidents are caused by their own behaviors, they evaluate their driving skills and safety skills as weak. In other words, drivers were aware of their skill deficiencies and their role in accidents.

Additionally, as drivers attribute causes of accidents to fate, they were more likely to engage in violations and to have a high number of offences. Nevertheless, they report their safety skills as weak. Although drivers appreciate their weaknesses in safe practices while driving, they keep violating safe driving. One reason for this tendency might be drivers' negative behavioral adaptation to technological improvements in cars' driver assistance systems. In other words, drivers might trust in the technological equipment in the car and fail to take caution in case of danger.

General locus of control was negatively correlated with age, which means young drivers were more likely to have external locus of control. The contradiction between age and external scale of T-LOC and Rotter's IE might be due to the content of the constructs. External scale is a traffic-specific locus of control construct; while Rotter's IE is a general one. In addition, external drivers rated their safety skills as weaker than internal drivers.

In the current study, risky driving indicators such as violations and offences were related only to the fate scale of T-LOC. In Özkan & Lajunen (2005) fate was not correlated with aggressive and ordinary violations and offences. What might have caused these contradicting results? It should be kept in mind that the direction of significant correlations between driver skills scales and locus of control scales were all negative. Drivers in the current study do not believe either in their driving skills or safety skills. This might be a reason for them to not to rely on fate locus of control to the greatest extent: they do not trust in themselves but need an anchor for trust, which is the fate.

To summarize, drivers were likely to rely on fate when driving unsafely. Furthermore, driver assistance systems might have encouraged drivers to take risks no matter how skilled or unskilled they perceived themselves to be.

4

GENERAL RESULTS

4.1. Introduction

The aim of the current chapter is to investigate relationship between illusion of control, perceived control, optimism bias, and locus of control. Additionally, predictive power of these variables on two risky driving indicators, total number of accidents and total number of tickets, will be examined.

4.2. Method

4.2.1. Measures

Driver Behavior Questionnaire- original, Driver Skill Inventory, illusion of control measure, direct and indirect optimism bias measures, Rotter's Internality-Externality Scale, Multidimensional Traffic Locus of Control Scale, and demography questions were used in the current analyses.

4.2.2. Participants

Sample characteristics were presented in page 26.

4.3. Results

4.3.1. Correlation analysis

A correlational analysis was performed to investigate relationship between control variables, optimism bias variables, and locus of control variables (Table 4.3.1.). Illusion of control was negatively correlated with IE (r = -.12). Drivers who were prone to illusion of control were more likely to have an external locus of control. Perceived control was negatively correlated with self scale (r = -.13) and fate scale (r = -.13). Drivers perceiving high control on violations were less likely to attribute accident causes to self-based causes and fate.

D measure was positively correlated with self (r = .19) and fate scales (r = .16). As drivers made biased risk estimations of accident involvement, they were more likely to attribute accident causes to fate and self-based factors. Consistent with this, the ID measure was positively correlated with fate (r = .23). ID measure was negatively correlated with the external scale of T-LOC (r = -.13); while, it was positively correlated with Rotter's externality (r = .12).

Table 4.3.1. Correlations among illusion of control, perceived control, optimism bias variables, locus of control scales

	1	2	3	4	5	6	7	8
1. Illusion of control	1							
2. Perceived control on violations	.149*	1						
3. Direct measure	.009	-.086	1					
4. Indirect measure	-.002	-.076	.354**	1				
5. External	-.007	.025	-.015	-.127*	1			
6. Self	.004	-.127*	.190**	.060	.302**	1		

Table 4.3.1. continued

7. Fate	-.110	-.133*	.156**	.228**	.057	.066	1	
8.Internality-externality	-.119*	-.069	.099	.118*	-.067	-.039	.265**	1

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

4.3.2. Logistic regression analysis

Two direct logistic regression analyses were conducted to investigate predictors of total number of accidents and total number of tickets. Total number of accidents and total number of tickets were recoded into dichotomous variables. Having zero accidents was coded as "0" and having accidents was coded as "1". For total number of tickets, having zero ticket was coded as "0", having tickets "1".

The first direct logistic regression analysis was performed on the total number of accidents as outcome variable and eleven variables as predictors: illusion of control, perceived control, driving skills, safety skills, external scale, self scale, fate scale, general locus of control, indirect optimism bias, direct optimism bias, self-risk rating, and other-risk rating. Other-risk rating was excluded from analysis by the program (SPSS 11.0) as a redundant variable.

A test of the full model with eleven predictors against a constant-only model was significant; χ^2 (11, $\underline{N}$ = 291) = 26.82, $\underline{p}$ = .005, and χ^2 (8, $\underline{N}$ = 291) = 14.87, $\underline{p}$ = .06, indicating that the predictors distinguished between drivers with no accidents and drivers with accidents. Prediction success was 48 % for drivers with no accidents and it was 72 % for drivers having accidents. Overall correct classification rate was 61 %.

According to Wald criterion illusion of control, perceived control on violations, and safety skills (Wald = 6.25, $p < .05$, Wald = 7.74, $p < .01$, and Wald = 3.99, $p < .05$; respectively) were significant predictors able to distinguish drivers without accidents and with accidents. A unit increase in illusion of control decreased total number of accidents 42 %. A unit increase in perceived control on violations increased the total number accidents 84 %. Additionally, a unit increase in safety skills decreased total number of accidents 36 % (Table 4.3.2.1.).

Table 4.3.2.1. Direct logistic regression analysis on total number of total accidents

					95 % Confidence Interval for Exp (B)	
	B	Wald Test	Significance	Exp (B)	Lower	Upper
Illusion of control	-.539	6.250	.012	.583	.382	.890
Perceived control on violations	.612	7.737	.005	1.844	1.198	2.839
Driving skills	.438	3.479	.062	1.549	.978	2.454
Safety skills	-.446	3.988	.046	.640	.413	.992
External	.194	.244	.631	1.214	.753	1.957
Self	-.033	.045	.831	.968	.718	1.305
Fate	.111	.538	.463	1.118	.830	1.506
Internality-externality	.507	3.386	.066	1.660	.968	2.847
Indirect measure	-.007	.006	.938	.993	.822	1.198
Direct measure	.152	.825	.364	1.164	.839	1.616
Self-risk	-.154	1.867	.172	.858	.688	1.069
Constant	-4.428	5.754	.016	.012		

Note: Illusion of control score was measured on a negative scale. An increasing negative numeric value corresponds to higher scale value; i.e. higher illusion of control. Therefore, a negative correlation coefficient sign indicates a positive relationship.

The second direct logistic regression analysis was performed on the total number of tickets as outcome variable and ten variables as predictors: illusion of control, perceived control, driving skills, safety skills, external scale, self scale, fate scale, general locus of control, indirect optimism bias, direct optimism bias, and self-risk rating. As other-risk rating was excluded from the previous analysis by the program (SPSS 11.0) as a redundant variable, it was not included in the analysis from the beginning.

A test of the full model with eleven predictors against a constant-only model was not significant; χ^2 (11, N = 291) = 36.27, p = .00, and χ^2 (8, N = 291) = 4.77, p = .78, indicating that the predictors distinguished between drivers with no tickets and drivers with tickets. Prediction success was 82 % for drivers with no tickets and it was 40 % for drivers having tickets. Overall correct classification rate was 65 %.

According to Wald criterion driving skills and safety skills (Wald =11.71, $p < .01$ and Wald =11.59, $p < .01$) were the significant predictors able to distinguish drivers without tickets and with tickets. A unit increase in driving skills increased the total number of tickets 32 %. A unit increase in safety skills decreased the total number of tickets 55 % (Table 4.3.2.2.).

Table 4.3.2.2. Direct logistic regression analysis on total number of total tickets

					95 % Confidence Interval for Exp (B)	
	B	Wald Test	Significance	Exp (B)	Lower	Upper
Illusion of control	-.282	1.968	.161	.755	.509	1.118
Perceived control on violations	-.241	1.304	.253	.785	.519	1.189
Driving skills	.840	11.708	.001	2.317	1.432	3.75

Table 4.3.2.2. continued

Safety skills	-.796	11.593	.001	.451	.285	0.713
External	.003	.000	.989	1.003	.62	1.624
Self	-.022	.019	.89	.979	.719	1.331
Fate	.022	.021	.884	1.023	.756	1.384
Internality - externality	.447	2.499	.114	1.564	.898	2.724
Indirect measure	-.005	.003	.957	.995	.819	1.207
Direct measure	-.027	.025	.874	.974	.702	1.351
Self-risk	.052	.210	.647	1.054	.843	1.317
Constant	-.389	.043	.835	.678		

4.4. Discussion

The aim of the current chapter was to investigate the relationship among the main variables. Results indicated that drivers' who suffer from illusion of control were likely to have an external locus of control on the general locus of control scale.

I failed to find relationship between illusion of control and optimism bias, and driver skills (Chapter 1). Illusion of control was found to be more evident in case of skill-related outcomes. Therefore, I was expecting illusion of control to correlate with driving skills. However, it was correlated neither with driving nor with safety skills. Furthermore, controllability was found to be an important dimension for optimism bias (DeJoy, 1989; Weinstein, 1980). Why? This might be due to faulty arrangement of scales. Participants had to answer DSI just after DBQ-perceived risk version. Asking risk evaluations might have created awareness in participants that would reflect in their skill evaluations. Another reason might be the way illusion of control was measured. Illusion of control score was derived from risk evaluations. Controllability was found to be one of dimensions of risk in previous studies.

Although t-test analysis revealed significantly different risk evaluations for high risk as a driver and high risk as a passenger versions of DBQ, mean differences were small (Δ Mean = -.16). This might account for why the illusion of control score did not yield expected relationships with optimism bias and driver skills.

Drivers who perceive their control on violations as high were less likely to attribute causes of accidents to self-based and fate-related causes. The self scale of T-Loc resembles internal locus of control, i.e. drivers attribute accidents to their own behavior. Why do drivers perceive their control over driver behaviors high but fail to appreciate their behaviors' role on accident outcomes? It is possible that drivers separate behaviors and outcomes. On the one hand, they believe they do not violate frequently and have control on their violations (Chapter 1); on the other hand, they are reluctant to accept that accidents, i.e. outcomes of their behaviors, are due to their own behaviors. Drivers' tendency to disregard self-based causes might have defensive value (Kouabenan, 2002). Underestimating the responsibility of a negative event might serve to protect self-esteem and might provide relieve from feelings of blame.

Optimism bias in accident involvement estimations was positively related to fate as loci of control and externality on the general locus of control construct. As drivers perceived their personal risk to be involved in an accident as high, they were more likely to attribute causes of accidents to fate and to general external factors. Previous research revealed that externality was negatively correlated with precautionary actions (e.g. Janicak, 1996; Montag & Comrey, 1987; Hoyt, 1973). Why do drivers fail to make an attempt to take control of the situation, although they perceive risk as high? This might be related to culture. Rothbaum, Weisz, and Snyder (1982) approach control as a two process model and they make a distinction between primary and secondary control. They argue that self is a more active agent in primary control, while it is more passive and prefers going with the flow in secondary control. They further argue that adaptation of primary or secondary control is related to culture. Specifically, independent cultures are more likely to adopt active, primary control, whereas dependent cultures are more likely to adopt passive, secondary control. Accommodation to existing reality and circumstances is more important for dependent and interdependent cultures (Weisz, Rothbaum, & Blackburn, 1984). Therefore, it is reasonable for Turkish drivers to make external attributions for accident causes. Continuing this tendency in high risk situations might be related to defensive motives. Failure in a risky situation and confronting negative outcomes, i.e. accidents, would be damaging for drivers' self-esteem. It would not be unexpected for them to attribute causes of accidents to external factors rather than accepting their role in the situation, especially if the context is warning a negative outcome, i.e. containing high risk.

Two results were contradictory with the above explanation. ID measure was negatively correlated with the external scale of T-LOC. Furthermore, D measure was positively correlated with the self scale. These results indicate that drivers who estimate their personal risk to be involved in an accident as high were less likely to attribute causes of accidents to external factors, but were more likely to make self-based attributions. Furthermore, they were more likely to engage in violations (Chapter 2). What might have caused these contradictory results? Indeed, this might be reflection of admitting failure in safety practices. Although drivers continued risky behavior, they were aware that their behaviors but not external factors were the reason for accidents. On the one hand they accept being not perfect drivers; on the other hand, they do not take an action to change the situation.

Logistic regression analyses indicated that illusion of control, perceived control on violations, and safety skills were significant predictors of the total number of accidents. A decrease in illusion of control decreased the total number of accidents. Since the illusion of control was measured with negative values, a decreasing negative numeric value has an increasing scale value. Thus, as the illusion of control increased, the total number of accidents also increased. Perceived control on violations had an incremental effect on the total number of accidents, either. It is worth noting that the perceived control on violations was the most distinguishing predictor among the three. This demonstrates how critical subjective control is for the risk-taking behavior. Furthermore, as safety skills increased the total number of accidents decreased. The safety skills scale was a consistent predictor in the two direct logistic regression analyses. An increase in the safety skills led to a decrease in the total number of tickets, either. Safety skills have a critical importance for risky behavior. Driving skills promoted an increase in the total number of tickets. These results are consistent with Sümer, Özkan, & Lajunen's (2006) finding that the safety skills buffer the negative effects of overconfidence in the driving skills on risky behavior.

To summarize, the control variables were not related to the optimism bias variables. Both of them were correlated with locus of control scales. The illusion of control, perceived control on violations, and the safety skills were the significant predictors of the total number of accidents, while driving and safety skills scale were the predictors of the total number of tickets.

4.5. General Discussion

Drivers biased control estimations and risk assessments were found to influence their skill evaluations and risk-taking in traffic. The current study aimed to investigate the influence of cognitive biases among Turkish drivers.

The results established biased control and risk estimations of drivers. Nevertheless, these constructs revealed inconsistent results with risk indicators, such as violations, offences, and number of total accidents.

The limitations of the current study were related to measurement. Participants were asked to answer DBQ for four times in two presentations. In one presentation they were asked to report aberrant driver behavior and their control on the behavior. It is plausible that participants were defensive in reporting frequency of behavior as high but control on the behavior as low. Previous studies using DBQ yielded significant results. However, in the current study DBQ scales were correlated only with two variables of optimism bias.

A similar problem might have occurred in measurement of illusion of control. Participants were asked to make risk evaluations in adjoining columns first thinking themselves as drivers, second thinking themselves as passengers. Individuals strive for consistency. Probably they were reluctant to give different scores for driver and passenger conditions. Furthermore, feedback from four participants yielded that they failed to read instruction about filling the questionnaire. Thus, it seemed they were giving same answers twice. A small mean difference between two scales implies that the majority of the participants experienced a similar situation.

An implication of the current study would be demonstrating the centrality of fate among Turkish drivers. Previous research associated externality with risk-taking. In the current sample a more specific external factor, fate, was found to be a consistent determinant of risk estimations. Further research should investigate fate beliefs and the concept of hope among drivers. It may be the case that belief in fate and hope from the future promotes cognitive biases.

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APPENDICES

Appendix A- Demographic Information Sheet

SÜRÜŞ ANKETİ

Bu anket, Orta Doğu Teknik Üniversitesi Sosyal Psikoloji Yüksek Lisans programını tamamlamak için yürütülen bir tez çalışmasına bilgi toplamak amacıyla hazırlanmıştır. Ankette, trafikte karşılaşabileceğiniz bazı durumlardaki davranışlarınız ile ilgili sorular yer almaktadır. Lütfen, soruları dikkatlice okuyunuz. Size en uygun olduğunu düşündüğünüz tek bir seçeneği işaretleyiniz ve gerektiğinde ilgili bölümü doldurunuz. Lütfen, bütün sorulara tek başınıza ve içtenlikle cevap veriniz. Anket doldurma sırasında cevapları başkalarıyla tartışmayınız. Bizim için önemli olan sizin bireysel olarak ne düşündüğünüz ve ne yaşadığınızdır. Ankete isminizi veya herhangi bir kimlik bilginizi yazmayınız. Verdiğiniz yanıtlar tamamen gizli tutulacak ve bireysel değerlendirme yapılmayacaktır.

Değerli katkılarınız için teşekkür ederim.

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1. Yaşınız:__________________   2. Cinsiyetiniz: ☐ Erkek ☐ Kadın

3. En çok araç kullandığınız şehir: ____________________________

4. Ehliyetiniz var mı ? □ Evet □ Hayır 5. Kaç yıldır ehliyet sahibisiniz ? ___________________ yıldır

6. Sürekli kullandığınız bir arabanız var mı ? □ Evet □ Hayır

7. Geçtiğimiz seneden bu yana yaklaşık olarak kaç kilometre yaptınız ? ______________ km

8. Ehliyetinizi aldığınızdan bu yana yaklaşık kaç km araç kullandınız ? ___________________ km

9. Ne sıklıkla araç kullanırsınız ? □ Her gün □ Haftada bir kez □ Ayda iki kez □ Ayda bir kez □ Yılda birkaç kez □ Hemen hemen hiç

10. Son üç yılda kaç kez **aktif olarak** (sizin bir araca, bir yayaya veya herhangi bir nesneye çarptığınız durumlar) kaza yaptınız ? (hafif kazalar dahil) __________

11. Son üç yılda kaç kez **pasif olarak** (bir aracın veya bir yayanın size çarptığı durumlar) kaza geçirdiniz ? (hafif kazalar dahil) ______________

12. Son üç yılda, aşağıdaki trafik cezalarını kaç kere aldığınızı belirtiniz?
Yanlış park etme___________Hatalı sollama__________ Hız ihlali_____________Diğer_________

13. Şu ana kadar kaç ceza puanı aldınız? ___________________ Puan
14. Son bir yıl içerisindeki seyahatlerinizin tümünü düşündüğünüzde kendini kullandığınız bir araç ile yaptığınız seyahatlerin oranı nedir?
1 Tamamı 2 Neredeyse tamamı 3 Diğerlerinden fazla 4 Diğerlerinden az 5 Hemen hemen hiç

Appendix B- Driver Behavior Questionnaire original – perceived

Aşağıda verilen durumların her birini ne sıklıkta yaparsınız?

Aşağıda verilen durumlar sizce ne kadar sizin kontrolünüz altında?

Aşağıda verilen her bir madde için sizden istenen bu tür şeylerin sizin başınıza NE SIKLIKLA geldiğini ve bu durumların sizce NE KADAR SİZİN KONTROLÜNÜZ ALTINDA OLDUĞUNU belirtmenizdir. Değerlendirmelerinizi geçtiğimiz yıl boyunca kendinizin araç kullanma davranışlarından ne hatırlıyorsanız onları temel alarak yapınız. Lütfen değerlendirmelerinizi boş bırakılan bölüme size göre doğru olduğunu düşündüğünüz ifadenin karşılığı olan rakamı yazarak belirtiniz.

"NE SIKLIKLA" sorusu için cevap seçenekleri : **1= Hiç bir zaman 2= Nadiren 3= Bazen 4= Oldukça sık 5= Sık sık 6= Neredeyse her zaman**

"NE KADAR KONTROLÜNÜZ ALTINDA" sorusu için cevap seçenekleri:
1= Hiç kontrolüm altında değil 2= Yeterince kontrolüm altında değil 3= Biraz kontrolüm altında 4= Yeterince kontrolüm altında 5= Oldukça kontrolüm altinda 6= Tamamiyle kontrolüm altında

		NE SIKLIKLA	NE KADAR KONTROLÜNÜZ ALTINDA
1.	Geri geri giderken önceden fark etmediğiniz bir şeye çarpmak		
2.	A yönüne gitmek amacıyla yola çıkmışken kendinizi daha alışkın olduğunuz B yönüne doğru araç kullanırken bulmak		
3.	Yasal alkol sınırlarının üzerinde alkollü olduğunuzdan şüphelenseniz de araç kullanmak		
4.	Dönel kavşakta dönüş istikametinize uygun olmayan şeridi kullanmak		

5.	Anayoldan sola dönmek için kuyrukta beklerken, anayol trafiğine dikkat etmekten neredeyse öndeki araca çarpacak duruma gelmek		
6.	Anayoldan bir sokağa dönerken karşıdan karşıya geçen yayaları fark edememek		
7.	Başka bir sürücüye kızgınlığınızı belirtmek için korna çalmak		
8.	Bir aracı sollarken ya da şerit değiştirirken dikiz aynasından yolu kontrol etmemek		
9.	Kaygan bir yolda ani fren veya patinaj yapmak		
10.	Kavşağa çok hızlı girip geçiş hakkı olan aracı durmak zorunda bırakmak		
11.	Şehir içi yollarda hız sınırını aşmak		
12.	Sinyali kullanmayı niyet ederken silecekleri çalıştırmak		
13.	Sağa dönerken yanınızdan geçen bir bisiklet ya da araca neredeyse çarpmak		
14.	"Yol ver" işaretini kaçırıp, geçiş hakkı olan araçlarla çarpışacak duruma gelmek		
15.	Trafik ışıklarında üçüncü vitesle kalkış yapmaya çalışmak		
16.	Sola dönüş sinyali veren bir aracın sinyalini fark etmeyip onu sollamaya çalışmak		
17.	Trafikte sinirlendiğiniz bir sürücüyü takip edip ona haddini bildirmeye çalışmak		
18.	Otoyolda ileride kapanacak bir şeritte son ana kadar ilerlemek		
19.	Aracınızı park alanında nereye bıraktığınızı unutmak		
20.	Solda yavaş giden bir aracın sağından geçmek		
21.	Trafik ışığında en hızlı hareket eden araç olmak için yandaki araçlarla yarışmak		
22.	Trafik işaretlerini yanlış anlamak ve kavşakta yanlış yöne dönmek		
23.	Acil bir durumda duramayacak kadar, öndeki aracı yakın takip etmek		
24.	Trafik ışıkları sizin yönünüze kırmızıya döndüğü halde kavşaktan geçmek		
25.	Bazı tip sürücülere kızgın olmak (illet olmak) ve bu kızgınlığı bir şekilde onlara göstermek		
26.	Seyahat etmekte olduğunuz yolu tam		

	olarak hatırlamadığınızı fark etmek		
27.	Sollama yaparken karşıdan gelen aracın hızını olduğundan daha yavaş tahmin etmek		
28.	Otobanda hız limitlerini dikkate almamak		

Appendix C- Driver Behavior Questionnaire-perceived risk

Aşağıda verilen durumlar sizce ne derece riskli?

Aşağıda verilen her bir madde için sizden istenen bu tür şeylerin sizce NE DERECE RİSKLİ olduğunu kendinizi SÜRÜCÜ ve ÖN KOLTUK YOLCUSU olarak düşünüp AYRI AYRI belirtmenizdir. Değerlendirmelerinizi geçtiğimiz yıl boyunca kendinizin araç kullanma davranışlarından ne hatırlıyorsanız onları temel alarak yapınız. Lütfen değerlendirmelerinizi boş bırakılan bölüme size göre doğru olduğunu düşündüğünüz ifadenin karşılığı olan rakamı yazarak belirtiniz.

"NE DERECE RİSKLİ" sorusu için cevap seçenekleri : **1= Hiç riskli değil**
2= Çok az riskli **3= Biraz riskli** **4= Riskli** **5= Oldukça riskli**
6= Çok riskli

		NE DERECE RİSKLİ	
		SÜRÜCÜ OLARAK	**ÖN KOLTUK YOLCUSU OLARAK**
1.	Geri geri giderken önceden fark etmediğiniz bir şeye çarpmak		
2.	A yönüne gitmek amacıyla yola çıkmışken kendinizi daha alışkın olduğunuz B yönüne doğru araç kullanırken bulmak		
3.	Yasal alkol sınırlarının üzerinde alkollü olduğunuzdan şüphelenseniz de araç kullanmak		
4.	Dönel kavşakta dönüş istikametinize uygun olmayan şeridi kullanmak		
5.	Anayoldan sola dönmek için kuyrukta beklerken, anayol trafiğine dikkat etmekten neredeyse öndeki araca çarpacak duruma gelmek		
6.	Anayoldan bir sokağa dönerken karşıdan karşıya geçen yayaları fark edememek		

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

Appendix D- Driver Skill Inventory

Araç kullanırken güçlü ve zayıf yönleriniz nelerdir?

Özellikle araç kullanmanın farklı yönlerinde olmak üzere sürücüler arasında pek çok farklılıklar vardır. Hepimizin güçlü ve zayıf yönleri vardır. Lütfen, sizin güçlü ve zayıf yönlerinizi size göre doğru olan seçeneği işaretleyerek belirtiniz. Her bir soru için cevap seçenekleri:

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

		1	2	3	4	5
1.	Seri araç kullanma	O	O	O	O	O
2.	Trafikte tehlikeleri görme	O	O	O	O	O
3.	Sabırsızlanmadan yavaş bir aracın arkasından sürme	O	O	O	O	O
4.	Kaygan yolda araç hakimiyeti	O	O	O	O	O
5.	İlerideki trafik durumlarını önceden kestirme	O	O	O	O	O
6.	Belirli trafik ortamlarında nasıl hareket edileceğini bilme	O	O	O	O	O
7.	Yoğun trafikte kolaylıkla şerit değiştirme	O	O	O	O	O
8.	Kesin kararlar alma	O	O	O	O	O
9.	Sinir bozucu durumlarda sakin davranma	O	O	O	O	O
10.	Aracı kontrol etme	O	O	O	O	O
11.	Yeterli takip mesafesi bırakma	O	O	O	O	O
12.	Koşullara göre hızı ayarlama	O	O	O	O	O
13.	Geriye kaçırmadan aracı yokuşta kaldırma	O	O	O	O	O
14.	Sollama	O	O	O	O	O
15.	Gerektiğinde (örn., tehlikelerden kaçınmak için) yasal haklarınızdan "feragat etme"	O	O	O	O	O
16.	Hız sınırlarına uyma	O	O	O	O	O
17.	Gereksiz risklerden kaçınma	O	O	O	O	O
18.	Diğer sürücülerin hatalarını sükûnetle karşılamak	O	O	O	O	O
19.	Trafik ışıklarına dikkatle uyma	O	O	O	O	O
20.	Dar bir yere geri geri park edebilme	O	O	O	O	O

Appendix E- Direct Optimism Bias Measure

Ortalama bir sürücüye kıyasla, aşağıda belirtilen kaza türlerini geçirme olasılığınız sizce nedir?

1	**2**	**3**	**4**	**5**	**6**	**7**
Ortalamanın çok altında	Ortalamanın altında	Ortalamanın biraz altında	Ortalama	Ortalamanın biraz üstünde	Ortalamanın üstünde	Ortalamanın çok üstünde

	1	2	3	4	5	6	7
Önünüzdeki araca arkadan çarpma	**O**	**O**	**O**	**O**	**O**	**O**	**O**
Karşıdan gelen araçla kafa kafaya çarpışma	**O**	**O**	**O**	**O**	**O**	**O**	**O**
Aracınızın kontrolünü kaybettiğiniz için kaza yapma	**O**	**O**	**O**	**O**	**O**	**O**	**O**
Kavşakta kaza geçirme	**O**	**O**	**O**	**O**	**O**	**O**	**O**

Appendix F- Indirect Optimism Bias Measure

Sizce, önümüzdeki 10 yıl boyunca *sizin* aşağıdaki kaza türlerini geçirme olasılığınız nedir?

1	2	3	4	5	6	7	8	9	10	11
Hiç	Çok olasılık dışı		Olasılık dışı		Olası		Çok olası		Kesin	

		1	2	3	4	5	6	7	8	9	10	11
1.	Önünüzdeki araca arkadan çarpma	O	O	O	O	O	O	O	O	O	O	O
2.	Karşıdan gelen araçla kafa kafaya çarpışma	O	O	O	O	O	O	O	O	O	O	O
3.	Aracınızın kontrolünü kaybettiğiniz için kaza yapma	O	O	O	O	O	O	O	O	O	O	O
4.	Kavşakta kaza geçirme	O	O	O	O	O	O	O	O	O	O	O

Sizce, önümüzdeki 10 yıl boyunca *ortalama bir sürücünün* aşağıdaki kaza türlerini geçirme olasılığı nedir?

1	2	3	4	5	6	7	8	9	10	11
Hiç	Çok olasılık dışı		Olasılık dışı		Olası		Çok olası		Kesin	

		1	2	3	4	5	6	7	8	9	10	11
1.	Önünüzdeki araca arkadan çarpma	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**
2.	Karşıdan gelen araçla kafa kafaya çarpışma	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**
3.	Aracınızın kontrolünü kaybettiğiniz için kaza yapma	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**
4.	Kavşakta kaza geçirme	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**	**O**

Appendix G- Multidimensional Traffic Locus of Control Scale

Bu bölümde, kaza yapmış araç sürücülerinin, yapmış oldukları kazalara neden olarak gösterdikleri faktörler liste halinde verilmiştir. Kendi sürüş tarzınızı düşündüğünüzde bu faktörlerin yapmış olduğunuz veya olabileceğiniz kazalardaki **olası etkisini** ilgili yeri karalayarak belirtiniz. Her bir soru için cevap seçenekleri:

1= Hiç olası değil 2= Olası değil 3= Hem olası hem de olası değil 4= Olası 5= Büyük olasılıkla (ihtimalle)

		1	2	3	4	5
1.	Trafik kazası yapıp yapmayacağım çoğunlukla araç kullanma becerilerimin yetersizliğine bağlıdır	O	O	O	O	O
2.	Trafik kazası yapıp yapmayacağım çoğunlukla araç kullanırken yaptığım riskli davranışlara bağlıdır	O	O	O	O	O
3.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer sürücülerin araç kullanma becerilerinin yetersizliğine bağlıdır	O	O	O	O	O
4.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer sürücülerin araç kullanırken yaptığı riskli davranışlara bağlıdır	O	O	O	O	O
5.	Trafik kazası yapıp yapmayacağım çoğunlukla kötü şansa (veya şansızlığa) bağlıdır	O	O	O	O	O
6.	Trafik kazası yapıp yapmayacağım çoğunlukla bozuk ve tehlikeli yollara bağlıdır	O	O	O	O	O
7.	Trafik kazası yapıp yapmayacağım çoğunlukla aşırı sürat yapmama bağlıdır.	O	O	O	O	O
8.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer sürücülerin aşırı sürat yapmasına bağlıdır	O	O	O	O	O
9.	Trafik kazası yapıp yapmayacağım çoğunlukla öndeki araçları çok yakından takip edip etmeme bağlıdır	O	O	O	O	O
10.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer araç sürücülerinin kullandığım aracı yakın takip etmelerine bağlıdır	O	O	O	O	O
11.	Trafik kazası yapıp yapmayacağım çoğunlukla	O	O	O	O	O

	kadere bağlıdır					
12.	Trafik kazası yapıp yapmayacağım çoğunlukla kötü hava ve aydınlatma koşullarına bağlıdır	**O**	**O**	**O**	**O**	**O**
13.	Trafik kazası yapıp yapmayacağım çoğunlukla araçtaki mekanik bir arızaya bağlıdır	**O**	**O**	**O**	**O**	**O**
14.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer sürücülerin alkollü araç kullanmasına bağlıdır	**O**	**O**	**O**	**O**	**O**
15.	Trafik kazası yapıp yapmayacağım çoğunlukla diğer sürücülerin tehlikeli bir şekilde hatalı sollama yapmasına bağlıdır	**O**	**O**	**O**	**O**	**O**
16.	Trafik kazası yapıp yapmayacağım çoğunlukla tehlikeli bir şekilde hatalı sollama yapmama bağlıdır	**O**	**O**	**O**	**O**	**O**
17.	Trafik kazası yapıp yapmayacağım çoğunlukla tesadüflere bağlıdır	**O**	**O**	**O**	**O**	**O**

Appendix H- Rotter's Internality Externality Scale

Bu anket bazı önemli oalyların insanları etkileme biçimini bulmayı amaçlamaktadır. Her maddede 'a' ya da 'b' harfleriyle gösterilen iki seçenek bulunmaktadır. Lütfen, her seçenek çiftinde sizin kendi görüşünüze göre gerçeği yansıttığına en çok inandığınız cümleyi (yalnız bir cümleyi) seçiniz ve bir yuvarlak içine alınız.
Seçiminizi yaparken, seçmeniz gerektiğini düşündüğünüz veya doğru olmasını arzu ettiğiniz cümleyi değil, gerçekten daha doğru olduğuna inandığınız cümleyi seçiniz. Bu anket kişisel inançlarla ilgilidir; bunun için 'doğru' ya da 'yanlış' cevap diye bir durum söz konusu değildir.
Bazı maddelerde her iki cümleye de inandığınızı ya da hiç birine inanmadığınızı düşünebilirsiniz. Böyle durumlarda, size en uygun olduğuna inandığınız cümleyi seçiniz. Seçim yaparken her bir cümle için bağımsız karar veriniz; önceki tercihlerinizden etkilenmeyiniz.

1.	a. Ana-babaları çok fazla cezalandırdıkları için çocukları problem oluyor.
	b. Günümüz çocuklarının çoğunun problemi, ana-babaları tarafından aşırı serbest bırakılmalarıdır.
2.	a. İnsanların yaşamındaki mutsuzlukların çoğu, biraz da şanssızlıklarına bağlıdır.
	b. İnsanların talihsizlikleri kendi hatalarının sonucudur.
3.	a. Savaşların başlıca nedenlerinden biri, halkın siyasetle yeterince ilgilenmemesidir.
	b. İnsanlar savaşı önlemek için ne kadar çaba harcarsa harcasın, her zaman savaş olacaktır.
4.	a. İnsanlar bu dünyadaki hak ettikleri saygıyı er geç görürler.
	b. İnsan ne kadar çabalarsa çabalasın ne yazık ki değeri genellikle anlaşılmaz.
5.	a. Öğretmenlerin öğrencilere haksızlık yaptığı fikri saçmadır.
	b. Öğrencilerin çoğu, notların tesadüfi olaylardan etkilendiğini fark etmez.
6.	a. Koşullar uygun değilse insan başarılı bir lider olamaz.
	b. Lider olamayan yetenekli insanlar fırsatları değerlendirememiş kişilerdir.
7.	a. Ne kadar uğraşsanız da bazı insanlar sizden hoşlanmaz.
	b. Kendilerini başkalarına sevdiremeyen kişiler başkalarıyla nasıl geçinileceğini bilmeyenlerdir.
8.	a. İnsanın kişiliğinin belirlenmesinde en önemli rolü kalıtım oynar.
	b. İnsanların nasıl biri olacaklarını kendi hayat tecrübeleri belirler.
9.	a. Bir şey olacaksa eninde sonunda olduğuna sık sık tanık olmuşumdur.
	b. Ne yapacağıma kesin karar vermek kadere güvenmekten daima daha iyidir.

10.	a. İyi hazırlanmış bir öğrenci için, adil olmayan bir sınav hemen hemen söz konusu olamaz.
	b. Sınav sonuçları derste işlenenle çoğu kez o kadar ilişkisiz oluyor ki, çalışmanın anlamı kalmıyor.
11.	a. Başarılı olmak çok çalışmaya bağlıdır; şansın bunda payı ya hiç yoktur ya da çok azdır.
	b. İyi bir iş bulmak, temelde, doğru zamanda doğru yerde bulunmaya bağlıdır.
12.	a. Hükümetin kararlarında sade vatandaş da etkili olabilir.
	b. Bu dünya güç sahibi birkaç kişi tarafından yönetilmektedir ve sade vatandaşın bu konuda yapabileceği fazla bir şey yoktur.
13.	a. Yaptığım planları yürütebileceğimden hemen hemen eminimdir.
	b. Çok uzun vadeli planlar yapmak her zaman akıllıca olmayabilir, çünkü birçok şey zaten iyi ya da kötü şansa bağlıdır.
14.	a. Hiç bir yönü iyi olmayan insanlar vardır.
	b. Herkesin iyi bir tarafı vardır.
15.	a. Benim açımdan istediğimi elde etmenin talihle bir ilgisi yoktur.
	b. Çoğu durumda, yazı-tura atarak da isabetli kararlar verebiliriz.
16.	a. Kimin patron olacağı, genellikle, doğru yerde ilk önce bulunma şansına kimin sahip olduğuna bağlıdır.
	b. İnsanlara doğru şeyi yaptırmak bir yetenek işidir; şansın bunda payı ya hiç yoktur ya da çok azdır.
17.	a. Dünya meseleleri söz konusu olduğunda, çoğumuz anlayamadığımız ve kontrol edemediğimiz güçlerin kurbanıyızdır.
	b. İnsanlar siyasal ve sosyal konularda aktif rol alarak dünya olaylarını kontrol edebilirler.
18.	a. Bir çok insan rastlantıların yaşamlarını ne derece etkilediğinin farkında değildir.
	b. Aslında 'şans' diye bir şey yoktur.
19.	a. İnsan, hatalarını kabul edebilmelidir.
	b. Genelde en iyisi insanın hatalarını örtbas etmesidir.
20.	a. Bir insanın sizden gerçekten hoşlanıp hoşlanmadığını bilmek zordur.
	b. Kaç arkadaşınızın olduğu, ne kadar iyi olduğunuza bağlıdır.
21.	a. Uzun vadede, yaşamınızdaki kötü şeyler iyi şeylerle dengelenir.
	b. Çoğu talihsizlikler yetenek eksikliğinin, ihmalin, tembelliğin ya da her üçünün birden sonucudur.
22.	a. Yeterli çabayla siyasal yolsuzlukları ortadan kaldırabiliriz.
	b. Siyasetçilerin kapalı kapılar ardında yaptıkları üzerinde halkın fazla bir kontrolü yoktur.
23.	a. Öğretmenlerin verdikleri notları nasıl belirlediklerini bazen anlayamıyorum
	b. Aldığım notlarla çalışma derecem arasında doğrudan bir bağlantı vardır.
24.	a. İyi bir lider, ne yapacaklarına halkın bizzat karar vermesini bekler.
	b. İyi bir lider herkesin görevinin ne olduğunu bizzat belirler.
25.	a. Çoğu kez başıma gelenler üzerinde çok az etkiye sahip olduğumu hissederim.
	b. Şans ya da talihin yaşamımda önemli bir rol oynadığına inanmam.
26.	a. İnsanlar arkadaşça olmaya çalışmadıkları için yalnızdırlar.

	b. İnsanları memnun etmek için çok fazla çabalamanın yararı yoktur, sizden hoşlanırlarsa hoşlanırlar.
27.	a. Liselerde atletizme gereğinden fazla önem veriliyor.
	b. Takım sporları kişiliğin oluşumu için mükemmel bir yoldur.
28.	a. Başıma ne gelmişse, kendi yaptıklarımdandır.
	b. Yaşamımın alacağı yön üzerinde bazen yeterince kontrolümün olmadığını hissediyorum.
29.	a. Siyasetçilerin neden öyle davrandıklarını çoğu kez anlayamıyorum.
	b. Yerel ve ulusal düzeydeki kötü idareden uzun vadede halk sorumludur.