Factors related to seat belt use: A Turkish case

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To a safer world
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of original publications</td>
<td>6</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>7</td>
</tr>
<tr>
<td>Abstract</td>
<td>8</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>9</td>
</tr>
<tr>
<td>1.1 The seat belt use as a protective safety device</td>
<td>9</td>
</tr>
<tr>
<td>1.1.1 Biomechanics of seat belts</td>
<td>9</td>
</tr>
<tr>
<td>1.1.2 Effectiveness of seat belt use in reducing injury and fatalities</td>
<td>10</td>
</tr>
<tr>
<td>1.1.3 Benefit-cost ratio for seat belts</td>
<td>10</td>
</tr>
<tr>
<td>1.2 Regional differences in seat belt use</td>
<td>11</td>
</tr>
<tr>
<td>1.2.1 Seat belt use rates from different countries</td>
<td>11</td>
</tr>
<tr>
<td>1.3 Factors related to seat belt use</td>
<td>12</td>
</tr>
<tr>
<td>1.3.1 Demographic factors</td>
<td>13</td>
</tr>
<tr>
<td>1.3.2 Environmental and psycho-social factors</td>
<td>13</td>
</tr>
<tr>
<td>1.3.3 Beliefs and attitudes related to seat belt use</td>
<td>13</td>
</tr>
<tr>
<td>1.4 Interventions for increasing seat belt use</td>
<td>16</td>
</tr>
<tr>
<td>1.4.1 Seat belt laws</td>
<td>17</td>
</tr>
<tr>
<td>1.4.2 Enforcement programs for seat belt use</td>
<td>17</td>
</tr>
<tr>
<td>1.4.3 Seat belt technologies</td>
<td>18</td>
</tr>
<tr>
<td>1.5 Methodological considerations</td>
<td>19</td>
</tr>
<tr>
<td>1.6 Aims of the study</td>
<td>20</td>
</tr>
<tr>
<td>2 Method</td>
<td>22</td>
</tr>
<tr>
<td>2.1 Subjects</td>
<td>22</td>
</tr>
<tr>
<td>2.2 Instruments and procedures</td>
<td>22</td>
</tr>
<tr>
<td>2.3 Statistical methods</td>
<td>24</td>
</tr>
<tr>
<td>3 Results and discussions</td>
<td>25</td>
</tr>
<tr>
<td>3.1 Environmental and psycho-social factors related to seat belt use</td>
<td>25</td>
</tr>
<tr>
<td>3.2 Motivations for seat belt use and non-use</td>
<td>26</td>
</tr>
</tbody>
</table>
3.3 Explaining seat belt use with the Theory of Planned Behavior and Health Belief Model (sub-study III)…………………………………………………………….. 26
3.4 Comparing seat belt use between work-time and free-time driving among taxi drivers (sub-study IV)……………………………………………………………… 29
3.5 Relationship of seat belt use to health and driver behaviors (sub-study V)……. 30

4 General Discussion………………………………………………………………… 32
4.1 Factors related to seat belt use among Turkish car occupants…………………. 32
4.2 A tentative model showing factors related to seat belt use……………………… 32
4.3 Implications for seat belt use interventions……………………………………….. 36
  4.3.1 Stronger seat belt laws with higher enforcement…………………………… 37
  4.3.2 Educational seat belt use campaigns………………………………………… 38
  4.3.3 Forming habitual seat belt use………………………………………………… 39
  4.3.4 Technical solutions for increasing seat belt use…………………………….. 40

Critical Remarks……………………………………………………………………… 41
Concluding Remarks……………………………………………………………….. 41
References……………………………………………………………………………… 43
Original Publications………………………………………………………………… 52
List of original publications

This thesis is based on the following publications that are referred to in the text by their roman numerals (I-V).


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Abstract

Seat belts are effective safety devices used to protect car occupants from severe injuries and fatalities during road vehicle accidents. Despite the proven effectiveness of seat belts, seat belt use rates are quite low, especially in developing countries, such as Turkey. The general aim of the present study was to investigate a large variety of factors related to seat belt use among Turkish car occupants using different perspectives and methods and therefore, to contribute to the design of effective seat belt use interventions for increasing seat belt use rates in Turkey. Five sub-studies were conducted within the present study. In the first sub-study, environmental (e.g., road type) and psycho-social factors (e.g., belt use by other car occupants) related to the seat belt use of front-seat occupants were investigated using observation techniques. Being male, of a young age, and traveling on city roads were the main factors negatively related to seat belt use. Furthermore, seat belt use by the drivers and front-seat passengers was highly correlated and a significant predictors of each other. In the second sub-study, the motivations of the car occupants for seat belt use and non-use were investigated using interview techniques. Situational conditions, such as traveling on city roads and for short distances, and not believing in the effectiveness and relevance of seat belt use for safety, were the most frequently reported reasons for not using a seat belt. Safety, habit and avoiding punishment were among the most frequently reported reasons for using a seat belt. In the third sub-study, the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM) were applied to seat belt use using Structural Equation Modeling techniques. The TPB model showed a good fit to the data, whereas the HBM showed a poor fit to the data. Within the TPB model, attitude and subjective norm were significant predictors of intentions to use a seat belt on both urban and rural roads. In the fourth sub-study, seat belt use frequency and motivations for seat belt use among taxi drivers were investigated and compared between free-time and work-time driving using a survey. The results showed that taxi drivers used seat belts more when driving a private car in their free-times compared to when driving a taxi during their work-times. The lack of a legal obligation to use a seat belt in city traffic and fear of being attacked or robbed by the passengers were found as two specific reasons for not using a seat belt. Lastly, in the fifth sub-study, the relationship of seat belt use to driver and health behaviors was investigated using a survey. Although seat belt use was related both to health and driver behaviors, factor analysis results showed that it grouped with driver behaviors. Based on the results of the sub-studies, a tentative empirical model showing different predictors of seat belt use was proposed. According to the model, safety and normative motivations and perceived physical barriers related to seat belt use are the three important predictors of seat belt use.

Keywords: Seat belt use; environmental factors; psycho-social factors; safety and normative motivations; the Theory of Planned Behavior; the Health Belief Model; health behaviors; driver behaviors; front-seat occupants; taxi drivers; Turkey.
1 Introduction

Worldwide, road traffic fatalities and injuries have been among the major public health problems. Every year 1.2 million people are killed and about 50 million people are injured in road traffic accidents; in other words, every day more than 3,000 people die from road traffic injuries around the world, according to the World Health Organization (WHO) (2004) estimates. Furthermore, road traffic accidents are predicted to be the fifth leading cause of death in 2030, while they were the ninth leading cause of death in 2004, according to the world health statistics (WHO, 2008).

Although it is a widespread problem, high road traffic fatality and injury rates have been a major health problem, especially in low- and middle-income countries where road traffic fatalities are projected to increase substantially by 2020 (Nantulya and Reich, 2003; WHO, 2004). Compared to the developed or high income countries, developing or low-income countries have made little progress in the use and development of effective traffic injury interventions and strategies (Forjuoh, 2003; Forjuoh and Li, 1996). For instance, despite their proven effectiveness, use of occupant protection devices, such as seat belts and bicycle and motorcycle helmets, is considerably low especially in some low- and middle-income countries with low traffic safety records (i.e., with high injury and fatality rates in road vehicle accidents) (Forjuoh, 2003; Forjuoh and Li, 1996; Nantulya and Reich, 2003; WHO, 2004). Gaining a better understanding of the factors related to the use of occupant protection devices, especially in low- and middle-income country settings, and therefore, contributing to the decrease in the number of road traffic fatalities and injuries can be considered among the important tasks of traffic safety research.

1.1 The seat belt as a protective safety device

Seat belts are simple yet effective occupant protection devices designed to protect car occupants from colliding with the interior of the vehicles and being ejected from the vehicles by keeping them in their seat in the event of an accident (e.g., Elvik and Vaa, 2004; Evans, 2004). Although there are different types of occupant restraint systems (e.g., lap belts, shoulder belts, lap/shoulder belts), since the mid-1970s a seat belt especially refers to integrated lap/shoulder belts, also called the three-point belt system (Evans, 2004). Integrated lap/shoulder belts have been the most common and beneficial type of seat belts especially in front seats (Evans, 2004), although lap-only belts are still available especially in the rear seats of some vehicles. Seat belts were first introduced into automobiles in the 1950s and by the 1960s they were installed in most of the new vehicles in the world (Evans, 2004). Since seat belts were introduced then as optional features in new cars and there were no mandatory seat belt laws, use rates were very low in many countries (Evans, 2004; WHO, 2004). After seat belts were proved to be effective in reducing severe injuries in the event of accidents, their use was increased through legislation and improved enforcement in many countries, such as Australia (Andreassend, 1976) and the U.K. (Evans, 2004).

1.1.1 Biomechanics of seat belts

According to Newton’s laws of motion, an object moving at a certain speed will continue to move at that speed unless it is obstructed by some force or object. Therefore, in a car crash,
although the car may stop suddenly, the occupant would continue to move at a pre-impact speed resulting in hitting the interior of the car or being ejected from the vehicle (Elvik and Vaa, 2004; King and Yang, 1995). In order to protect the car occupants in case of a road vehicle accident, three-point seat belts were produced which have two principle modes of protection: minimization of bodily contact of the occupants with the interior surfaces of the car and prevention of ejection of the car occupants from the vehicle (King and Yang, 1995). In a road vehicle accident, compared to the unbelted car occupants, belted occupants are kept in their seat and thus reduce the speed at the same rate as the car does. This minimizes the occupant’s speed relative to the vehicle and reduces mechanical energy, to which the body is exposed (Elvik and Vaa, 2004; King and Yang, 1995). Thus, in an accident, the probability of having a severe injury decreases drastically for the belted car occupants, compared to the unbelted car occupants (Elvik and Vaa, 2004; Evans, 2004; King and Yang, 1995).

For car occupant protection, seat belt use in the back seats is as important as seat belt use in the front seats because of the same biomechanical principles of seat belts. Unbelted car occupants increase the risk of injury for other car occupants as well as for themselves by direct impact with the other occupants or by increasing the loading force on the backs of the front seats (e.g., Cummings and Rivara, 2004; Evans, 2004; MacLennan et al., 2004). For instance, exposure to unbelted car occupants was associated with a 40% increase in any injury, and especially belted occupants were at an increased injury and death risk from unbelted occupants (MacLennan et al., 2004). Thus, seat belt use by all car occupants sitting in both the front and back seats is very crucial both for their own and other car occupants’ safety.

1.1.2 Effectiveness of seat belt use in reducing injury and fatalities

Seat belts have been one of the great success stories of road injury prevention because of their effectiveness in saving many lives (WHO, 2004). International studies have demonstrated the effectiveness of seat belts in reducing injury severity (e.g., Elvik and Vaa, 2004; Evans, 1996, 2004) Based on a review of studies, Elvik and Vaa (2004) reported that the use of seat belts reduces the probability of being killed by 40-50% for drivers and front-seat passengers and about 25% for the back-seat. Similarly, Evans (1996, 2004) reported that in car crashes seat belts reduce the fatality risk by about 42% for drivers. Seat belts are especially effective in reducing fatal and serious injuries compared to slight injuries, and much of their effectiveness is due to eliminating ejection (Evans, 1990, 2004; WHO, 2004). However, in extremely severe crashes seat belts may not be enough to prevent death (Evans, 2004; King and Yang, 1995).

1.1.3 Benefit-cost ratio for seat belts

Every road safety measure is perceived as having certain benefits and sacrifices, and for a road safety measure to be highly accepted by the public, its benefits should be greater than its costs (Rumar, 1999). Compared to some other protective safety devices, such as bicycle helmets, retro reflexes and airbags, seat belts had a higher perceived utility and lower perceived sacrifice level (Rumar, 1999). A cost-benefit analysis showed that the benefits of seat belts (e.g., health and economic savings) clearly outweighed their costs (e.g., installation costs and time spent putting on and taking off the seat belts) with an estimated benefit-cost ratio between 3 and 8 (Elvik and Vaa, 2004).
Besides seat belts, airbags are another commonly used car occupant protection device designed to protect car occupants from injuries that seat belts may not prevent, such as injuries resulting from hitting the head on the steering wheel (e.g., Elvik and Vaa, 2004; King and Yang, 1995). Although airbags are also effective in preventing injuries, their effectiveness is not as high as seat belts when used alone. For instance, the estimated effectiveness of airbags in preventing fatalities was about 18% for drivers and 13% for right-front passengers, and for drivers who switched from seat belts to airbag-only protection, a 41% increase in fatality risk was reported (Evans, 1990). Also, the benefits of airbags were reported to be smaller than its costs (Elvik and Vaa, 2004). Therefore, compared to airbag or seat belt-only protection, airbags when used together with seat belts were reported to provide better protection for car occupants (Elvik and Vaa, 2004; Evans, 1990; King and Yang, 1995).

1.2 Regional differences in seat belt use

Seat belt use rates have varied significantly from country to country depending mostly on the existence and enforcements of seat belt laws. Making a worldwide comparison of seat belt use rates is difficult because of the lack or limited availability of seat belt use data in many countries, especially from Asian and African regions. Based on the present data it can be concluded that worldwide Northern and Western European countries (European Transport Safety Council [ETSC], 2006), the U.S. (National Highway Traffic Safety Administration [NHTSA], 2008), Canada, Japan and New Zealand (International Road Traffic and Accident Database [IRTAD], 2006) are among the countries with the highest seat belt use rates. On the other hand, countries especially from the Middle East such as Saudi Arabia (Bendak, 2005) and Kuwait (Koushki and Bustan, 2006), from Africa such as Kenya and South Africa (Olukoga and Noah, 2005; WHO, 2004), from South America such as Argentina (Silveria, 2003) and from Southern/Mediterranean Europe such as Greece (Chliaoutakis et al., 2000; Petridou et al., 1998) and Turkey (T. C. Emniyet Genel Müdürlüğü, 1999) have considerably lower seat belt use rates.

Economical and political variables, differences in cultural beliefs and education levels, competing health problems and traffic contexts might account for the differences in traffic injury prevention interventions including seat belt use among countries with different income levels (Forjuoh, 2003). From a broader perspective, differences between the “traffic cultures” of the countries might explain this variation in seat belt use rates in different countries. “Traffic culture” has been defined as the sum of all external (e.g., economy, infrastructure, and vehicles) and internal factors (e.g., driver behaviors and skills) that directly or indirectly influence a country’s traffic safety level (Leviäkangas, 1998; Özkan, 2006). Therefore, given the scope of traffic culture, differences in a wide range of factors, ranging from the availability and usability of seat belts in the vehicles to attitudes towards seat belt use, might explain the variations in seat belt use rates among different countries.

1.2.1 Seat belt use rates from different countries

According to the estimates of the ETSC (2006), seat belt use rates in EU countries varied from 59% to 96% for front-seat occupants and from 21% to 90% for rear-seat occupants, with lower seat belt use rates in Southern (e.g., Greece) and Eastern European countries (e.g., Poland), compared to Northern (e.g., Sweden) and Western European (e.g., France) countries. In the U.S. from 1994 to the present seat belt use rates have increased steadily, with 90% seat belt use on
expressways in 2008 (NHTSA, 2008). Besides most European countries and the U.S., seat belt use rates of car drivers are also high in Canada, Japan and New Zealand (IRTAD, 2006). In 2004 about 90% of the car drivers used a seat belt on urban roads and, about 87% used a seat belt on rural roads in Canada; in 2005 about 98% of the car drivers used a seat belt on both urban roads and motorways in Japan; and in 2005 about 92% of car drivers used a seat belt on urban roads and about 95% used a seat belt on rural roads in New Zealand (IRTAD, 2006).

Compared to the developed countries; however, developing countries where seat belt laws mostly came into effect more recently have considerably lower seat belt use rates. For instance, in Argentina after the seat belt law in 1992, seat belt use was reported to be 32% for drivers and 30% for front-seat passengers in the city of Buenos Aires (Silveira, 2003). Similarly, in Saudi Arabia where a seat belt law came into effect more recently in 2000, an average seat belt use rate of 60% for drivers and 22.7% for front seat passengers was reported in two suburbs of Riyadh (Bendak, 2005).

**Seat belt use rates in Turkey**

Turkey is a developing country with low traffic safety records, such as high injury and fatality rates in traffic accidents. In 2007, a total of 749,456 traffic accidents were recorded by the police in which 3,459 people were killed and 149,140 people were injured in Turkey (T. C. Emniyet Genel Müdürlüğü, 2007). Also, international road fatality comparisons show that in 2006 the fatality rate per million vehicles was the second highest in Turkey, exceeding 700, after the Russian Federation, whereas it was less than 100 in Switzerland, Norway and Sweden (Organization for Economic Co-operation and Development [OECD], 2008). Increased seat belt use can reduce the high rates of injury and fatality in traffic accidents in Turkey. However, seat belt use rates are considerably lower in Turkey, compared to many developed countries with a high income level. For instance, in Ankara, the capital city of Turkey, only 16% of the car drivers and 18% of the front-seat passengers used a seat belt on city roads; however, on intercity roads, the usage rate was much higher at about 71% among car drivers (T. C. Emniyet Genel Müdürlüğü, 1999). Also, in Turkey 16% of drivers involved in traffic crashes on city roads used a seat belt, whereas the same figure for intercity roads was 35%, and 81% of the drivers who died in traffic crashes were not using a seat belt (Swedish National Road Consulting [SWE ROAD], 2001). Seat belt use rates are especially low among professional drivers in Turkey. For example, almost none of the taxi drivers, who are exempt from the seat belt laws, or front-seat passengers of taxis used a seat belt (T. C. Emniyet Genel Müdürlüğü, 1999). It is clear that in order to improve car occupant safety in Turkey, seat belt use rates among all car occupants including the professional drivers should be increased urgently.

### 1.3 Factors related to seat belt use

Previous studies have found numerous factors related to seat belt use. Some of these factors are extrinsic that are related to the physical (e.g., type of road traveled) and social context (e.g., presence of passengers in the car) of the car occupants, while some of them are intrinsic (e.g., age, gender, and attitudes) that are related to car occupant characteristics.
1.3.1 Demographic factors

Previous research has found several demographic factors, such as age, gender and education level of the car occupants, to be related to seat belt use. For instance, being female, older and having a higher education level were positively related to seat belt use, whereas being male, younger and having a lower education level were negatively related to seat belt use (e.g., Begg and Langley, 2000; Calisir and Lehto, 2002; Lerner et al., 2001; Li, Kim and Nitz, 1999; Matsuura, Ishida and Ishimatsu, 2002; Reinfurt et al., 1996; Shinar, Schechtman and Compton, 2001; Steptoe and Wardle, 2001). Also, having a lower socio-economic level was negatively related to seat belt use (e.g., Lerner et al., 2001; Shin, Hong and Waldron, 1999; Shinar, 1993; Vivoda, Eby and Kostyniuk, 2004). Similar to other driving violations, non-use of seat belts is more common especially among young and male car occupants. This can be explained by low normative motivations to comply with traffic regulations (Yagil, 1998), risk-taking behavior (e.g., Turner and McClure, 2003) and high levels of certain personality traits, such as sensation-seeking and irresponsibility (e.g., Ulleberg, 2002), among young and male car occupants.

1.3.2 Environmental and psycho-social factors

There are some environmental (e.g., road and weather condition) and psycho-social factors (e.g., presence and number of passengers in the car) that have been found to be related to seat belt use in previous research (e.g., Chliaoutakis et al., 2000; Lehto and James, 1997; Williams and Shabanova, 2002). In terms of environmental factors, driving at night, in urban areas, on the weekends and for short distances were negatively related to seat belt use; however, driving in bad weather and road conditions, heavy traffic, at high speeds and in an unknown area were positively related to seat belt use (Chaudhary and Preusser, 2006; Chliaoutakis et al., 2000; Cunill et al., 2004; Fockler and Cooper, 1990; Li, Kim and Nitz, 1999; Petridou, 1998; Williams and Shabanova, 2002). Also, sitting in the back seats and traveling in older vehicles and in vehicles other than passenger cars, especially pick-up trucks, were associated with a lower seat belt use rate (e.g., Begg and Langley, 2000; Reinfurt et al., 1996). In terms of psycho-social factors, the presence and belt use of other passengers (e.g., Lehto and James, 1997; Nambisan and Vasudevan, 2007; Williams and Shabanova, 2002) were among the factors influencing seat belt use of drivers. For instance, seat belt use among teenage drivers increased when parents or older adults accompanied them, but decreased when younger occupants accompanied them, and a larger number of passengers increased seat belt use among older drivers, but decreased it among teenage drivers (Williams and Shabanova, 2002). Also, driver and front-seat passenger seat belt use were found to be correlated; front-seat passenger belt use increased when the driver was using a belt, and decreased when the driver was not using a seat belt (Lehto and James, 1997; Nambisan and Vasudevan, 2007).

1.3.3 Beliefs and attitudes related to seat belt use

In addition to the factors already mentioned, the beliefs and attitudes of car occupants regarding seat belt use have been related to their use of seat belts (e.g., Begg and Langley, 2000; Fockler and Cooper, 1990; Steptoe et al., 2002). For instance, negative attitudes and beliefs about the effectiveness of seat belt use were negatively related to seat belt use (Begg and Langley, 2000;
Fockler and Cooper, 1990), whereas stronger beliefs in the health benefits of seat belts were associated with higher use rates (Steptoe et al., 2002).

Social psychological theories provide potentially useful tools for explaining how attitudes and beliefs influence a variety of road user behaviors. The Theory of Planned Behavior (TPB) and the Health Belief Model (HBM) are two powerful social psychological theories that have been commonly used to understand the attitudes, intentions, and beliefs underlying a wide range of health behaviors, such as having a healthy diet and making physical exercises (Åberg, 2001; Conner and Sparks, 1996; Sheeran and Abraham, 1996; Stroebe, 2000). Although the TPB and the HBM have been applied widely to various protective health behaviors, they rarely have been applied to seat belt use. However, both the TPB and the HBM provide a useful theoretical framework for understanding how social psychological factors influence seat belt use.

The Theory of Planned Behavior

The TPB (Ajzen, 1985, 1991) was extended from the “Theory of Reasoned Action” (TRA), which was the earlier work of Fisbein and Ajzen (1975). According to the TPB (see Figure 1; Conner and Sparks, 1996), the immediate predictors of volitional behavior are intentions, which are determined by attitude, subjective norm and perceived behavioral control (Ajzen, 1985, 1991; Conner and Sparks, 1996). Attitudes refers to a person’s overall evaluations of a behavior, while subjective norm consists of the person’s beliefs about whether significant others think he/she should engage in that behavior (Ajzen, 1985, 1991; Conner and Sparks, 1996). Perceived behavioral control has both direct and mediated effects (by behavioral intention) on behavior and refers to the person’s perception of control on engaging in that behavior (Ajzen, 1985, 1991; Conner and Sparks, 1996). The TPB has been extended with the inclusion of moral norm, anticipated regret and habit constructs to the model (Åberg, 2001; Manstead and Parker, 1995; Verplanken et al., 1998). In the extended TPB, moral norm refers to the individual’s personal beliefs about what is right and wrong to do, while anticipated regret refers to anticipated affective consequences of breaking internalized moral rules (Manstead and Parker, 1995). In a study of travel mode choices (Verplanken et al., 1998) habit was suggested as a new variable to the TPB especially intended to cover the habitual and autonomous behaviors that might not be volitional. The addition of these new constructs to the TPB has improved its predictive power significantly (Åberg, 2001; Manstead and Parker, 1995).
Figure 1. Theory of Planned Behavior

Previous studies support the efficacy of the TPB in predicting a wide range of behaviors, such as health-related behaviors (for a review see Armitage and Conner, 2001). In seat belt use, attitudes and subjective norms had significant effects on intentions (Stasson and Fishbein, 1990), and general attitudes about seat belt use were highly correlated with the subjects’ reported intentions to use a seat belt (Budd, North, and Spencer, 1984).

The Health Belief Model

The HBM (Janz and Becker, 1984) can also be counted among the commonly used attitude-behavior models, although it has not been applied as widely and successfully as the TPB (Parker, 2004). Threat perception and behavioral evaluation are the two main components of the HBM (see Figure 2; Sheeran and Abraham, 1996). The threat perception component includes two sub-components, which are perceived susceptibility and anticipated severity (Sheeran and Abraham, 1996; Stroebe, 2000). Perceived susceptibility refers to the extent that the person feels susceptible to a health breakdown, and anticipated severity refers to the severity felt about the consequences of that health breakdown. The behavioral evaluation component also consists of two sub-components, which are perceived benefits and perceived barriers. Perceived benefits refer to the benefits that are gained by engaging in the health behavior, and perceived barriers refer to the barriers enacting the health behavior (Sheeran and Abraham, 1996; Stroebe, 2000). In addition to threat perception and behavioral evaluation, cues to action and health motivation components were included in the model (Sheeran and Abraham, 1996; Stroebe, 2000). Cues to action refers to some triggers such as social influence and health education campaigns for promoting healthy behaviors; and health motivation refers to one’s readiness to be concerned about health matters in general.
The HBM has been applied to many preventive health behaviors, such as condom use (e.g., Adih and Alexander, 1999; Laroque et al., 1997) and having cervical cancer screening (e.g., Byrd et al., 2004). Reviews of the previous studies that applied the HBM to various health behaviors show that perceived barriers were the most reliable component predicting behavior, followed by perceived susceptibility, benefits and severity components (Sheeran and Abraham, 1996; Stroebe, 2000). Although there are many studies that applied the HBM to explain different protective health behaviors such as condom use, there is a lack of studies that applied the HBM to some protective traffic behaviors such as seat belt use. This might be explained by the conceptualization of the HBM which was developed to cover protective behaviors especially in health context. Despite the lack of studies that applied the HBM to explain seat belt use, there are a few studies that applied the HBM to explain some other similar protective traffic behaviors such as bicycle helmet use (e.g., Lajunen and Räsänen, 2004; Quine, Rutter and Arnold, 1998). Perceived barriers and cues to action components were the strongest predictors of helmet use among teenagers (Lajunen and Räsänen, 2004).

1.4 Interventions for increasing seat belt use

In order to increase seat belt use rates, several interventions including mandatory seat belt laws with primary enforcement and special enforcement programs have been applied. Mandatory seat belt laws, which make seat belt use a legal obligation for the car occupants, have been the most common type of intervention and the main pre-condition for increasing the seat belt use rates in many countries. However, it is a matter of fact that laws alone are not enough to increase the seat belt use rates as much as needed. In order to increase the compliance with the seat belt laws, implementation of effective enforcement programs and highly-publicized educational seat belt campaigns and programs promoting seat belt use are also needed.
1.4.1 Seat belt laws

International evidence for the effectiveness of seat belt laws in increasing seat belt use rates and thus reducing injury and fatality rates in the accidents is abundant (e.g., Andreassend, 1976; Campbell, Stewart and Reinfurt, 1991; Dihn-Zarr et al., 2001; Elvik and Vaa, 2004; Evans, 2004; Jonah and Lawson, 1984; Lange and Voas, 1998; Loeb, 1995; Rivara, Thompson and Cummings, 1999). For instance, in Victoria, a state of Australia, after the first mandatory seat belt law in a jurisdiction came into effect in 1970, the following year an increase in seat belt use rates from about 15% to about 50% and about a 12% decrease in deaths of the affected car occupants were reported (Andreassend, 1976). Also, Evans (2004) cited the success in the U.K., where seat belt use increased from 40% to 90% after seat belt legislation was enacted in 1983, as one of the most striking examples demonstrating the effectiveness of legislation to improve seat belt use. Based on a review of studies, Elvik and Vaa (2004) reported that on average mandatory use of seat belts led to a decrease of 10-15% in the number of fatalities and serious injuries among car occupants. Similarly, a review of several seat belt law studies conducted in the U.S. between 1980 and 2000 indicated that after the introduction of seat belt laws there was a 20%-36% increase in the observed seat belt use and a 3%-20% decrease in the combined fatal and non-fatal injuries (Dihn-Zarr et al., 2001). Primary seat belt legislation that allows police officers to stop a driver for not using a seat belt was more effective in increasing seat belt use than secondary seat belt legislation that only allows a police officer to issue a seat belt citation after the driver has been stopped for some other legitimate reason (Campbell, 1988; Dinh-Zarr et al., 2001; Evans, 2004; Lange and Voas, 1998; Rivara et al., 1999).

1.4.2 Enforcement programs for seat belt use

Besides the introduction of seat belt legislation, the development of enhanced enforcement programs promoting seat belt use has been essential and effective in increasing seat belt use rates (e.g., Dihn-Zarr et al., 2001; Hagenzieker, Bijleveld and Davidse, 1997; Jonah and Grant, 1985; Reinfurt, 2004; Williams et al., 1987; Williams and Wells, 2004). Enhanced enforcement programs are designed to increase public awareness about enforcement of seat belt laws through direct encounters on the road, such as more frequent police control, higher citations for seat belt violations and use of seat belt checkpoints, and media campaigns promoting seat belt use (Dihn-Zarr et al., 2001). The ‘Click It or Ticket’ program which was implemented statewide in North Carolina, in the U.S., is a good example to one of the most successful and active enhancement programs for increasing seat belt use rates (Reinfurt, 2004). Between 1993 and 2003, implementation of this successful enhancement program promoting seat belt use accounted for about 20 percentage point increase in seat belt use rates from 65% to 86% (Reinfurt, 2004). Similarly, after the introduction of enhanced enforcement programs for seat belt use, an 8%-24% increase in the observed seat belt use and a 7%-15% decrease in the combined fatal and non-fatal injuries were reported in a review of different studies (Dihn-Zarr et al., 2001).

Several factors such as the features of the target population, presence of rewards, initial baseline rate for the seat belt usage before the enforcement programs and time passed after the enforcement programs were found to be influential in their effectiveness (e.g., Hagenzieker et al., 1997; Jonah and Grant, 1985; Pastò and Baker, 2001). For instance, the long-term effects of the incentive programs were smaller than the short-term effects, and the short-term effects of the
programs were higher when incentives were delivered immediately and the initial baseline rate for seat belt use was low (Hagenzieker et al., 1997). Similarly, in Canada the long-term effectiveness of selective traffic enforcement programs for increasing seat belt use was less than their short-term effectiveness. However, two years after the enforcement programs usage rate (66.0%) was still greater than the baseline rate (58.3%) (Jonah and Grant, 1985). Thus, although the effects of seat belt enforcement programs may decline over time, they are still effective in keeping the usage rates above the pre-enforcement baseline rates.

**Seat belt laws and enforcement in Turkey**

In Turkey, for the automobile and minibus drivers and front seat passengers, the use of seat belts was made mandatory for inter-city roads in 1986, and for city roads in 1992 (T. C. Emniyet Genel Müdürlüğü, 1999). In 1998, seat belt use was made mandatory for the passengers sitting in the rear seats of the automobiles and also for some passengers traveling in vehicles other than automobiles, such as trucks, pick-ups and intercity buses (T. C. Emniyet Genel Müdürlüğü, 1999). However, in Turkey only the vehicles which were manufactured or imported since 1995 were required by the law to have seat belts installed in the rear seats. For the vehicles without seat belts installed in rear seats, which were manufactured or imported before 1995, installation of seat belts to rear seats was optional (T. C. Emniyet Genel Müdürlüğü, 1999). Therefore, the seat belt law requiring seat belt use in the rear seats only applies to vehicles with installed seat belts in the rear seats, but not to older vehicles without seat belts in the rear seats, which were manufactured or imported before 1995 (T. C. Emniyet Genel Müdürlüğü, 1999). Despite the enacted seat belt legislation, many car occupants do not use a seat belt in Turkey. Low enforcement of the seat belt laws is one of the main factors contributing to the low rate of seat belt use in Turkey. Thus, stronger seat belt laws with higher enforcement are needed to increase seat belt use rates in Turkey.

### 1.4.3 Seat belt technologies

Developing effective seat belt technologies is among the interventions to increase seat belt use rates. There are different types of seat belt technologies, ranging from simple audible and visual seat belt reminder systems to interlock systems that have been used to increase seat belt use (Committee for the Safety Belt Technology Study, 2004; Krafft et al., 2006; Robertson, 1975; Williams, Wells and Farmer, 2002). For a seat belt technology to be successful it should be both effective in increasing seat belt use and accepted by the car occupants (Committee for the Safety Belt Technology Study, 2004; Harrison and Senserrick, 2000). Seat belt reminders systems were reported to be cost-effective (ETSC, 2003) and successful in increasing seat belt use rates (e.g., Krafft et al., 2006; Williams, Wells and Farmer, 2002). For instance, Ford’s belt reminder system, which involved activation of both audible and visual warning for drivers, was reported to be modestly successful in increasing seat belt use (Williams, Wells and Farmer, 2002). Also, in Sweden the number of drivers using a seat belt was significantly higher in cars with smart seat belt reminders than cars without the reminders (Kraft et al., 2006). However, the use of more aggressive systems such as interlocks, which did not allow a car to be started if the front-seat occupants did not use their seat belts, was not accepted by the public (Williams, Wells and Farmer, 2002).
1.5 Methodological considerations

Although there have been many studies investigating seat belt use, there is not a common methodology in assessing seat belt use rates (Chliaoutakis et al., 2000). Self-reports (surveys and interviews), observations and examination of the official records are among the common methods used for measuring seat belt use. Since seat belt use is a simple act to measure, simply use of a seat belt (yes vs. no) or the frequency of seat belt use have been the main criteria for measuring the seat belt use in different studies.

In surveys, the respondents are usually asked to rate their frequency of seat belt use on a traditional always-never Likert-type scale. Although seat belt use can be measured in a detailed way with self-reports, their lack of accuracy for measuring actual seat belt use was pointed out by previous studies (e.g., Parada et al., 2001; Robertson, 1992; Streff and Wagenaar, 1989). Different studies showed that self-report measures of seat belt use especially telephone surveys overestimated observed seat belt use, for example, by 8.9 to 19.4 percentage points (Streff and Wagenaar, 1989) and by more than 20 percentage points on average (Robertson, 1992). This discrepancy between the actual and reported seat belt use frequency can be explained mostly by social desirability concerns of the respondents (Fockler and Cooper, 1990; Stulginskas, Verreault and Pless, 1985). It was reported that compared to measuring seat belt use by asking the number of times belted out of the last ten trips, measuring seat belt use on a general always-never scale gives more accurate results (Streff and Wagenaar, 1989). On the other hand, in another study it was reported that compared to measuring seat belt use on a always-never scale, measuring seat belt use with a new question which asks what percent of times seat belts were used by the respondents gave rates closer to actual seat belt use rates (McNight and Dawson, 1996). Thus, in order to decrease the discrepancy between actual and reported seat belt use, it was recommended to measure seat belt use by asking for a percentage rather than on an always-never scale (McNight and Dawson, 1996).

In direct roadside observations, observers observe the car occupants of the chosen cars passing through a specific observation location, which is a certain roadside in most of the cases. The observers mainly record seat belt use (yes vs. no) of the car occupants along with other information such as gender of the car occupant and road type. Compared to the self-reports, direct roadside observations are more reliable and unbiased methods for measuring seat belt use since the seat belt use is directly observed and it is not subject to under or over reporting by the car occupants. However, direct roadside observations are also subject to several limitations, such as difficulty of coding seat belt use in the dark, among rear-seat passengers and subjective assessment of a driver’s age and ethnicity (e.g., Parada et al., 2001).

Besides self-reports and observation methods, examination of the official records such as police statistics are another way to measure seat belt use. Statistics related to seat belt use among car occupants who are involved in traffic accidents provides an estimate of the effectiveness of seat belt use by comparing the percent of belted occupants who survive to the percent of unbelted occupants who survive (Evans, 2004). However, effectiveness estimates based on the official records are also subject to some biases such as miscoding seat belt use and ignoring selective recruitment effects. Miscoding seat belt use in a systematic way is considered as a major bias in seat belt use effectiveness estimates (e.g., Cummings and Rivara, 2003; Evans, 2004). Recording crash survivors as belted when they were not or recording car occupants who died in crashes as
unbelted when they were belted are examples of misclassification of seat belt use (Cummings and Rivara, 2003). For instance, after the seat belt laws in the U.S. went into effect, survivors of crashes tended to say that they were using a seat belt even though they were not; therefore, seat belt use was biased for survivors, but not for fatally injured occupants resulting in inflating effectiveness estimates by substantial amounts (Evans, 2004). Another large source of bias in seat belt use effectiveness estimates is ignoring selective recruitment effects which result in upwardly biased estimates by large amounts (e.g., Eluru and Bhat, 2007; Evans, 1985, 1996). Compared to seat belt users, non-users have a higher crash risk, more severe crashes resulting in more serious injuries and fatalities and more traffic violations (e.g., Evans, 1996; Reinfurt et al., 1996). On the other hand, seat belt users are likely to be safety-conscious drivers who have less severe injuries in car crashes (e.g., Eluru and Bhat, 2007). Therefore, according to the selective recruitment, those drivers who would receive the greatest benefits from using seat belts tend to be the ones least likely to use them (Evans, 1985). In order to avoid biased seat belt effectiveness estimates, possible misclassifications of seat belt use and selective recruitment effects should be taken into account in effectiveness calculations.

1.6 Aims of the study

Although seat belt use has been studied widely in highly developed and motorized countries, such as the U.S. and Western European countries, there are few studies investigating seat belt use in developing countries with low traffic safety records, such as Turkey. Although there is a great potential of transferring the traffic injury interventions from the high-income countries to low- and middle-income countries, to be effective the intervention should be applicable and relevant enough in low- and middle-income country settings (Forjuoh, 2003; Forjuoh and Li, 1996). Therefore, it might be better to examine seat belt use in the special context of a low- or middle-income country first and then evaluate the applicability and relevance of the seat belt interventions developed in high-income country settings in that special low- or middle-income country setting. The present study aimed to investigate a large variety of factors related to seat belt use in Turkey, where implementation of effective seat belt use interventions are needed for increasing low seat belt use rates.

The present study had the following general and specific aims:

I. To investigate factors related to seat belt use (sub-study I)
   - To obtain the recent seat belt use rates in Ankara.
   - To identify the front-seat occupant characteristics and environmental factors related to seat belt use.

II. To investigate the motivations for seat belt use and non-use (sub-study II)
   - To investigate how different traveling conditions influence seat belt use rates among Turkish car occupants.
   - To identify the reasons for using and not using a seat belt under different travel conditions.

III. To study the social psychological predictors of seat belt use with the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM) (sub-study III)
• To explain self-reported seat belt use on urban and rural roads with the basic and extended TPB model and the HBM.
• To compare the TPB and HBM in terms of their predictive power and fit to the data.
• To identify the significant predictors of self-reported seat belt use within the TPB and the HBM.

IV. To compare seat belt use between work-time and free-time driving among taxi drivers (sub-study IV)
• To investigate whether reported seat belt use frequencies and reasons for not using a seat belt change according to the driver status (taxi driver vs. private car driver).
• To investigate factors related to reported seat belt use frequency when driving a taxi and a private car.
• To investigate specific reasons for not using a seat belt when driving a taxi.

V. To investigate the relationship of seat belt use to health and driver behaviors (sub-study V)
• To investigate whether seat belt use is related to different health and driver behaviors, and if so, to examine how and to what degree it is related.
• To investigate whether seat belt use belongs to the particular category of driving-related behaviors or, more generally, of health behaviors.
2 Method

Characteristics of the subjects, instruments, and procedures and statistical methods used in the present study are summarized in this section.

2.1 Subjects

Table 1 shows the number, type, and sex-distribution and age mean/category of the subjects participating to the sub-studies of the present study. All the subjects were Turkish and a large number of them were young or middle-aged with a university education.

Table 1. Sample characteristics of the sub-studies

<table>
<thead>
<tr>
<th>Sub-study</th>
<th>N</th>
<th>Subject type</th>
<th>Sex Distribution (% of males)</th>
<th>Age (% of subjects in each age category/mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. study</td>
<td>3963</td>
<td>Front-seat occupants</td>
<td>59.5</td>
<td>32.8, &lt;30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>55.6, 30-50</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16.6, &gt;50</td>
</tr>
<tr>
<td>2. study</td>
<td>1398</td>
<td></td>
<td>60.3</td>
<td>30.7, &lt;30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60.9, 30-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.4, &gt;50</td>
</tr>
<tr>
<td>II</td>
<td>221</td>
<td>Front-seat occupants</td>
<td>54.8</td>
<td>31 (M)</td>
</tr>
<tr>
<td>III</td>
<td>277</td>
<td>Front-seat occupants</td>
<td>55.2</td>
<td>21.8 (M)</td>
</tr>
<tr>
<td>IV</td>
<td>122</td>
<td>Taxi drivers</td>
<td>100.0</td>
<td>39.8 (M)</td>
</tr>
<tr>
<td>V</td>
<td>252</td>
<td>Drivers</td>
<td>71.4</td>
<td>31.8 (M)</td>
</tr>
</tbody>
</table>

2.2 Instruments and procedures

The instruments and procedures used in the sub-studies are summarized in Table 2 and in the following paragraphs. More detailed information about the instruments and procedures used can
be found in the original publications of the sub-studies. All the scales except from the Driving Skills Inventory (DSI) (Lajunen and Summala, 1995) and the Driver Behavior Questionnaire (DBQ) (Reason et al., 1990) were newly developed for the aims of the present study.

Table 2. Instruments and procedures used in the sub-studies

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Procedure</th>
<th>Sub-study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation sheet</td>
<td>Roadside observation</td>
<td>I</td>
</tr>
<tr>
<td>Interview form</td>
<td>Semi-structured interview</td>
<td>II</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>Survey</td>
<td>III, IV, V</td>
</tr>
<tr>
<td>Driving Skills Inventory (Lajunen and Summala, 1995)</td>
<td></td>
<td>IV</td>
</tr>
<tr>
<td>Driver Behavior Questionnaire (Reason et al., 1990)</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

In the first sub-study, a group of trained observers made independent observations of the car occupants traveling in the cars chosen randomly from a flow of traffic by four roadsides (two city, two intercity roads), and in the car parks of five large shopping centers in Ankara. Information recorded by the observers included seat belt use (yes, no), age group (<30 years, 30-50 years, >50 years), sex (male, female), and type (driver, front-seat passenger) of the car occupants.

In the second sub-study, the interview form included questions related to: demographic (e.g., sex and age) and driving-related information (e.g., total kilometers driven last year); seat belt use frequency in different traveling conditions (e.g., when traveling on city and intercity roads) and in different vehicle types (e.g., minibuses, taxis); reasons for using and not using a seat belt in these conditions; benefits of using a seat belt; factors that can increase seat belt use; and the use of a seat belt in the presence of children in the car. A group of trained interviewers conducted the interviews with people from different age and occupation groups.

In the third sub-study, the questionnaire used included questions related to demographic information, traffic safety and seat belts in general, and the TPB and the HBM items applied to seat belt use. Most of the data were collected from the university students either during class hours or at different places on campus. Some data were collected from young passengers who were not university students but acquaintances of the students.

In sub-study four, besides the DSI (Lajunen and Summala, 1995), the questionnaire included questions related to the following topics: demographic and driving-related information (e.g., age, education and total km driven last year); seat belt use frequency in different traveling conditions (e.g., city trips, outside city trips); reasons for not using a seat belt, and attitudes towards seat belt use. The data was collected from taxi drivers in their free-times at the taxi stations by a group of trained interviewers. Taxi drivers were asked to rate the items thinking...
about the times both when they were driving a taxi (at work) and driving a private car (during free-time).

Lastly, in sub-study five, the questionnaire mainly included questions related to demographic and driving-related information; a health behaviors scale; and the DBQ (Reason et al., 1990) adapted from English to Turkish by Lajunen and Özkan (2004). A group of trained psychology students collected the data from their acquaintances either on the university campus or at different places outside the campus.

2.3 Statistical methods

Table 3 summarizes the statistical methods used in sub-studies I-V.

<table>
<thead>
<tr>
<th>Method</th>
<th>Sub-study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive statistics</td>
<td>I-V</td>
</tr>
<tr>
<td>Parametric methods for testing group differences</td>
<td>II, IV, V</td>
</tr>
<tr>
<td>t-test</td>
<td>III, IV, V</td>
</tr>
<tr>
<td>Non-parametric methods for testing group differences</td>
<td>I, II</td>
</tr>
<tr>
<td>Chi-square statistics</td>
<td>I, II</td>
</tr>
<tr>
<td>Multivariate statistical methods</td>
<td></td>
</tr>
<tr>
<td>Pearson correlation coefficient</td>
<td>I, III, V</td>
</tr>
<tr>
<td>Factor analysis</td>
<td>II, IV, V</td>
</tr>
<tr>
<td>Multiple regression analysis</td>
<td>II, IV, V</td>
</tr>
<tr>
<td>Binary logistic regression analysis</td>
<td>I</td>
</tr>
<tr>
<td>Path analysis (structural equation modeling techniques)</td>
<td>III</td>
</tr>
<tr>
<td>Methods for testing internal consistency (reliability)</td>
<td>I, IV, V</td>
</tr>
<tr>
<td>Cronbach’s coefficient alpha</td>
<td>II, IV, V</td>
</tr>
</tbody>
</table>
3 Results and Discussions

The results and discussions of the sub-studies are summarized in this section. More detailed information related to the results and discussion parts of the sub-studies can be found in the original publications of the sub-studies.

3.1 Environmental and psycho-social factors related to seat belt use (sub-study I)

Results

The results of the sub-study I showed that the seat belt use rate among all observed front-seat occupants was 25%. Seat belt was used significantly higher on intercity roads than city roads. Moreover, on all roads seat belt was used significantly more among drivers (27.4%) than front-seat passengers (23.6%), among females (35.2%) than males (18.5%), and among older car occupants over 50 (29.8%) than younger car occupants under 30 (23.8%) and between the ages of 30 and 50 years (25.2%). Binary logistic regression analyses results showed that among both drivers and front-seat passengers, female gender and traveling on intercity roads were two important factors positively related to using a seat belt. Also, the results of the second study under sub-study I showed that driver and front-seat passenger belt use were highly correlated (r=0.71, p<0.01) and significant predictors of each other.

Discussion

The overall low seat belt use rate (25%) among the front-seat occupants found in the present study highlights the need for urgent remedial actions to increase seat belt usage in Turkey. Similar to some previous findings showing that being male and of a younger age were negatively related to seat belt use (e.g., Begg and Langley, 2000; Calisir and Lehto, 2002; Reinfurt et al., 1996), the present results showed that especially young male front-seat occupants used seat belts less. An underestimation of dangers involved in the commissions of traffic violations and low levels of normative motivation for compliance with traffic laws among young and male drivers (Yagil, 1998) can explain why young and male car occupants used seat belts less. Also, similar to previous findings (e.g., Chliaoutakis et al., 2000; Cunill et al., 2004; Petridou, 1998), seat belt use rates were much lower on city roads than intercity roads. The main reason for this finding might be that people perceive city roads as safer and having lower severe crash probability than intercity roads and, therefore, do not see the necessity of using a seat belt. Lastly, the strong relationship found between seat belt use of the drivers and the front-seat passengers may be because the front-seat passengers take the driver as a model and imitate him/her, who is probably perceived as being in a position of authority (Lehto and James, 1997).
3.2 Motivations for seat belt use and non-use (sub-study II)

Results

The results of sub-study II showed that “safety” followed by “situational conditions” (e.g., traveling on intercity roads), “habit” and “avoiding punishment” were the most frequently reported reasons for using a seat belt. On the other hand, “situational conditions” (e.g., traveling short distances on city roads) followed by “no relevance to safety”, “discomfort” and “no habit” were the most frequently reported reasons for not using a seat belt in most of the traveling conditions.

According to the principal component analysis results, two factors emerged from the reported seat belt use frequencies: low-risk traveling conditions (e.g., traveling on city roads and day-time) and high-risk traveling conditions (e.g., traveling on intercity roads and night-time). Then multiple regression analyses results showed that in low-risk traveling conditions being female, reporting “safety”, “avoiding punishment”, “having a habit of seat belt use” and “obeying with others’ opinions about seat belt use” as reasons to use a seat belt were positively related to seat belt use frequency. Whereas, reporting “not believing in the effectiveness of seat belt use”, “situational conditions”, “discomfort” and “other reasons” as reasons not to use a seat belt were negatively related to seat belt use frequency. On the other hand, in high-risk traveling conditions being female, of an older age, reporting “safety” and “following others’ opinions about seat belt use” as reasons to use a seat belt were positively related to seat belt use frequency. Whereas reporting “discomfort”, “not believing in the effectiveness of seat belt use”, “other reasons” and “not having a habit of seat belt use” as reasons not to use a seat belt were negatively related to seat belt use frequency.

Discussion

“Safety” was the most frequently reported reason for using a seat belt in both low and high-risk traveling conditions and the strongest predictor of seat belt use frequency in every condition. This shows the strength of beliefs in the safety benefits of seat belt use in determining the seat belt use frequency. Similar to the previous findings (e.g., Chliaoutakis et al., 2000; Cunill et al., 2004; Fockler and Cooper, 1990; Li, Kim and Nitz, 1999; Petridou, 1998; Williams and Shabanova, 2002), the present findings showed that situational reasons had an important role in determining seat belt use. This indicates the situation-dependent nature of seat belt use for some car occupants. That is, seat belts are used when there is a high perceived risk in a traveling condition, such as when traveling on an inter-city road with a high speed, and not used when there is a low perceived risk, such as when traveling on a city road with a lower speed.

3.3 Explaining seat belt use with the Theory of Planned Behavior and the Health Belief Model (sub-study III)

Results

The SEM (Structural Equation Modeling) results showed that the basic Theory of Planned Behavior (TPB) model showed a good fit to the seat belt data since the CFI (Comparative Fit Index) and the GFI (Goodness of the Fit Index) were more than 0.90 and RMSEA (Root Mean
Square Error of Approximation) value was equal to 0.06. However, the extended TPB model (i.e., with habit, anticipated regret and moral norm as additional components) and the Health Belief Model (HBM) showed an unacceptably poor fit to the data. The basic TPB and HBM models with the standardized structural equation coefficients for urban and rural roads are displayed in Figure 3 and 4, respectively. As can be seen from Figure 3, attitudes and subjective norm had a positive relationship to intentions to use seat belt both for urban and rural roads. However, paths from perceived behavioral control to intention to use a seat belt and to self-reported seat belt use and the path from intention to use a seat belt to self-reported seat belt use were not significant either for urban or rural roads.

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*Figure 3. Seat belt use on urban and rural roads explained with the TPB model
*p<0.05, (standardized structural coefficients for rural roads are given in parentheses)
Within the HBM, for urban roads perceived benefits had a positive relationship to self-reported seat belt use, while perceived barriers and cues to action had a negative relationship to self-reported seat belt use. For rural roads, only perceived benefits and health value had a significant positive relation to self-reported seat belt use.

**Discussion**

The decrease in the TPB model fit to the data after the addition of anticipated regret, moral norm and habit might indicate that these constructs are not strong predictors of seat belt use among Turkish passengers. Similar to previous findings (e.g., Stasson and Fishbein, 1990), within the basic TPB model, attitude and subjective norm were significant predictors of intentions to use a seat belt on both urban and rural roads. However, intention to use a seat belt was not a significant predictor of self-reported seat belt use. This non-significant relationship between intention and...
behavior could be explained by the reported divergence between intentions to use a seat belt and actual seat belt use (Chliaoutakis et al., 2000; Knapper, Cropley and Moore, 1976; Loo, 1984, Social Attitudes to Road Traffic Risk in Europe [SARTRE], 2004). This divergence might be explained by the perceptions about the irrelevance of seat belt use to safety in some traveling conditions. Although people might have positive attitudes and intentions related to seat belt use, especially in perceived low-risk traveling conditions (e.g., when traveling on city roads) they do not use their seat belts because they think that if they drive carefully they will not need seat belts (e.g., SARTRE, 2004). Also, a habit of not using a seat belt might explain the divergence between the intentions and behaviors related to seat belt use, because attitudes and intentions were reported to lose their predictive power on behavior when the behavior becomes habitual (e.g., Ronis, Yates and Kirsch, 1989; Verplanken and Aarts, 1999).

Within the HBM, the perceived benefits of using a seat belt were a significant predictor of self-reported seat belt use on both urban and rural roads, whereas, the perceived barriers of using a seat belt were the strongest predictor of self-reported seat belt use only on urban roads. That might be related to perceived lower accident probability and severities on urban roads that may make the barriers of using a seat belt dominate over the benefits. Similarly, perceived high accident probability and severity on rural roads may lead car occupants to emphasize the benefits of using a seat belt more than the barriers.

3.4 Comparing seat belt use between work-time and free-time driving among taxi drivers (sub-study IV)

Results

The results of sub-study IV showed that discomfort, followed by not having the habit and driving short distances were among the frequently reported reasons for not using a seat belt when driving both a taxi and private car. For the times when driving a taxi, no obligation by law to use a seat belt in city traffic and fear of not being able to defend themselves in case of an attack and robbery by the passengers appeared as two important reasons for not using a seat belt.

According to the results of the principal axis factoring analysis, three factors emerged from the items related to reasons for not using a seat belt both for the times when driving a taxi (situational factors; over trust to driving skills and experience and under estimation of accident probability; following the example of an other taxi driver) and a private car (situational factors; over trust to driving skills and experience and following the example of close others; not needing a seat belt, discomfort and no habit).

Two multiple regression analyses were conducted to investigate the factors related to seat belt use of the participants when driving a taxi and a private car. The results showed that the number of accidents in the last three years, driving skills and situational reasons (e.g., short trips) were negatively related to the reported seat belt use frequency. Whereas penalty score, safety skills and following the example of other taxi drivers were positively related to the reported frequency of seat belt use when driving a taxi. On the other hand, not needing to use a seat belt, discomfort and not having the habit of seat belt use factor and total attitude towards seat belt use were negatively related to self-reported seat belt use frequency. Safety skills were positively related to the reported seat belt use frequency of the participants when driving a private car.

Also, paired sample t-tests were conducted to compare the reported seat belt use frequencies and reasons for not using a seat belt between work-time driving and free-time
driving. The results showed that participants reported significantly higher seat belt use frequency when driving a private car than a taxi in all traveling conditions. Also, they agreed significantly more with discomfort, waste of time due to seat belt use, no need to use a seat belt, not having the habit and underestimation of accident probability on urban roads, and short distances, which were reasons for not using a seat belt, when driving a taxi than driving a private car.

**Discussion**

The present findings showing higher seat belt use frequency in all traveling conditions for the times when driving a private car than a taxi clearly indicates that taxi drivers change their seat belt use behavior according to their driver status (taxi driver vs. private car driver). Therefore, there should be reasons specific to taxi driving to explain why the same drivers use a seat belt less while driving a taxi than a private car. No obligation to use a seat belt in city traffic by the law was a strong motivation for not using a seat belt when driving a taxi. Similar to some previous findings (Ferguson et al., 1999; Fernandez, Park and Olshaker, 2005), this finding indicates the need for seat belt laws that also apply to taxi drivers to increase seat belt use among them. Also, fear of being attacked or robbed by the passengers was another common reason for not using a seat belt when driving a taxi. This finding is in line with previous findings showing the important role of workplace hazards in predicting safety behavior among taxi drivers (Machin and Souza, 2004). However, considering the higher risk of accident involvement due to higher driving exposure among taxi drivers, it is likely that risk of being involved in an accident is greater than the risk of being attacked by the passengers among taxi drivers. Therefore, a taxi driver would benefit more from using seat belts than not using them.

For the times when driving a taxi, the drivers’ driving skills were negatively related to reported seat belt use frequency, while safety skills were positively related to reported seat belt frequency. Taxi drivers’ overconfidence in their driving skills related to their high annual mileage and exposure may partly explain their infrequent seat belt use since driving experience was positively associated with driver’s confidence in his/her driving skills (Lajunen and Summala, 1995). On the other hand, for the times when driving a private car, not needing to use a seat belt, discomfort and no habit was the strongest factor negatively related to seat belt use frequency, similar to the findings of sub-study II. This finding supports the previous findings of the study emphasizing the important role of beliefs related to the effectiveness of seat belts, discomfort felt by seat belt use and habit factors in determining seat belt use frequency among car occupants.

**3.5 Relationship of seat belt use to health and driver behaviors (sub-study V)**

**Results**

According to the factor analyses results, four factors emerged from the health behaviors scale: healthy diet; sports participation; regular walking and adequate sleep; and dental and general health. Similarly, four factors emerged from the DBQ including the seat belt use items: driving errors, driving violations, and seat belt use in front and back seat. A second order factor analysis was conducted using health behaviors and the DBQ factors to see which kind of factors (health
or driving-related factors) seat belt use could be grouped with. The results showed that seat belt use grouped with driver behaviors (e.g., driving errors and violations) but not with health-related behaviors.

Correlation coefficients (r) between the seat belt use and other variables of the study showed that front-seat belt use was positively correlated with back-seat belt use, healthy diet, dental and general health, and regular walking and adequate sleep. However, it correlated negatively with driving errors, driving violations, and smoking frequency. Besides, multiple regression analysis results showed that back-seat belt use, regular walking and adequate sleep were factors positively related to front-seat belt use. Whereas being male, driving errors, and smoking frequency were factors negatively related to front-seat belt use.

Discussion

The results of sub-study V showed that seat belt use can be considered in the context of driver behaviors, such as driving errors and violations. Positive correlations between seat belt use and some health-enhancing behaviors indicate that people who engage in health-enhancing behaviors also use seat belts more often. This finding can be explained by a general concern for being in good health. On the other hand, negative correlations between seat belt use and driving errors and violations show that risky drivers committing driving errors and violations use seat belts less. Thus, it seems that driver seat belt use is related to some other driver behaviors and reflects a general safety orientation.

Since seat belt use is grouped with driving behaviors, seat belt use campaigns can give driving-related rather than health-related messages to increase seat belt use. In a driving-related message, non-use of a seat belt can be emphasized as a driving violation that might result in penalty. Perceiving non-use of a seat belt as a driving violation rather than an unhealthy behavior is more likely to increase seat belt use.
4 General Discussion

Internationally seat belts have been shown to be effective occupant protection devices used for protecting car occupants from severe injuries and fatalities during road vehicle accidents. Despite the proven effectiveness of seat belts and mandatory seat belt laws, however, seat belt use rates are still quite low in many developing countries, such as Turkey. Increasing seat belt use rates can greatly improve car occupant safety by reducing the number of road fatalities and severe injuries. Therefore, effective seat belt use interventions are urgently needed for increasing seat belt use rates in Turkey. Since knowledge of different factors related to seat belt use is needed for making effective seat belt use interventions or adoption of interventions from other countries, the present study investigated a wide range of factors related to seat belt use in Turkey.

4.1 Factors related to seat belt use among Turkish car occupants

In the first step, sub-study I aimed to introduce the low seat belt use rate problem and identify the environmental and psycho-social factors related to seat belt use in Turkey. The results highlighted the problem of low seat belt use and identified the factors associated with low seat belt use among Turkish car occupants. Being male, young and traveling on city roads were the main factors negatively related to seat belt use. In the next step, the motivations of the car occupants to use or not to use seat belts were investigated using interview techniques in sub-study II. The interviews conducted with the car occupants provided detailed information related to the motivations of the car occupants to use seat belts. The results emphasized the important role of situational and environmental reasons (e.g., duration of the trip, weather condition) in determining seat belt use. Sub-study IV can be considered as a continuation of sub-study II since it also investigated and compared motivations of seat belt use between free-time and work-time driving among taxi drivers, a professional driver group. The results showed that taxi drivers used seat belts less when driving a taxi during work-time compared to the times when driving a private car in their free-time. No obligation to use a seat belt in city traffic and fear of being attacked or robbed by the passengers appeared as two specific reasons for not using a seat belt when driving a taxi. Sub-study III investigated seat belt use in a social psychological context by explaining it with the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM). The results showed that within the TPB attitudes and subjective norm were significant predictors of an intention to use a seat belt. Lastly, sub-study V investigated the relationship of seat belt use to driver and health behaviors, in order to understand with which behavior category seat belt use is grouped. The results showed that although seat belt use is related to both health and driver behaviors, it is significantly grouped with driver behaviors.

4.2 A tentative model showing factors related to seat belt use

The previous findings clearly show that there is a wide range of individual factors affecting seat belt use, ranging from presence and enforcement of seat belt laws to attitudes towards seat belt use. However, knowledge of various individual factors affecting seat belt use is not enough for a complete understanding of seat belt use; rather, knowledge of how different individual factors related to seat belt use interact and affect seat belt use in different ways is needed. Therefore, based on the results of the present study, a tentative model is presented in Figure 5 for showing
how different factors related to seat belt use group and explain seat belt use from different perspectives.

Figure 5. Factors related to seat belt use

The results revealed that there are three main predictors of seat belt use: safety, normative motivations, and perceived physical barriers related to seat belt use. Safety motivations (i.e., motivations to be safe) related to seat belt use was determined mainly by attitudes and perceptions of the car occupants concerning the relevance of seat belts to safety under different
traveling conditions. Positive attitudes and beliefs related to the safety benefits of seat belts are expected to lead the car occupants to report safety frequently as a reason for using a seat belt. However, it should be noted that, despite the positive beliefs and attitudes related to the safety benefits of seat belt use, most of the car occupants used seat belts only when they needed them in some high-risk traveling conditions. In other words, for most of the car occupants the safety benefits of seat belt use were relevant only in perceived high-risk traveling conditions (e.g., when traveling on intercity roads), while they were irrelevant in perceived low-risk traveling conditions (e.g., when traveling on city roads). Therefore, interaction of attitudes and beliefs related to safety benefits of seat belts with perceived accident risk in a traveling condition determine the safety motivations for seat belt use.

Next, normative motivations (i.e., motivations to follow the norms) related to seat belt use included compliance with the seat belt use norms which were legal and moral norms, and significant others’ opinions and belt use of other car occupants. Legal norms mainly include seat belt laws, while moral norms include being a responsible person and a good role model to others by using a seat belt. Compliances with all these norms were among the motivations for seat belt use in the present study. The levels of compliance with these different types of seat belt norms are expected to be correlated with each other. For instance, a car occupant who complies regularly with seat belt laws is also likely to comply with the moral norms related to seat belt use and with significant others’ positive opinions about seat belt use. Furthermore, the safety and normative motivations of car occupants are expected to correlate with each other, as well. For instance, a car occupant with a safety motivation for using a seat belt is also likely to have a normative motivation to comply with the seat belt norms; or, a car occupant who has a normative motivation to comply with the seat belt norms is also likely to have or develop safety motivations for seat belt use.

Lastly, perceived physical barriers related to seat belt use were mainly determined by physical costs of seat belt use, such as the physical discomfort and insecurity felt while using a seat belt. The present findings showed that many car occupants did not use seat belts because they felt physically uncomfortable when belted either because of some perceived restrictions on movements, pressure on the body or feeling too warm especially in the summer. Also, feeling insecure when belted because of fear of being ineffective in protecting themselves in case of an attack or robbery by the taxi passengers was a strong reason for non-use of seat belts among taxi drivers. These findings show how perceived physical barriers related to seat belt use also determine seat belt use.

The present results showed that, besides safety and normative motivations and perceived physical barriers related to seat belt use, habit was a strong determinant of seat belt use. Habits were defined as “learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end-states” (Verplanken and Aarts, 1999). Similarly, the habit construct in Figure 5 covered automatic seat belt use before starting each car trip, which resulted from some motivations, such as safety and legality. Past behavior which is performed frequently and regularly in stable contexts turns into habits and predicts future behavior through automatic processes (e.g., Ouellette and Wood, 1998; Stroebe, 2000; Verplanken and Aarts, 1999). Since people have an ample opportunity to use their seat belts regularly in stable contexts (e.g., using seat belt in the same car everyday when going to work), after enough repetition past seat belt use behavior is likely to turn into a habit which then predicts future seat belt use. It should be noted that behavior determines habit as well as habit determines behavior, that is, repetition of behavior determines habit strength and habit strength
determines behavior frequency (e.g., Ronis, Yates and Kirsch, 1989). Thus, high repetition of seat belt use in a stable context is likely to result in a strong habit of seat belt use which, in turn, will lead to automatic seat belt use.

Since seat belt use frequency correlated with frequency of engaging in some driver and health behaviors of car occupants, driver and health behaviors were added as correlates of seat belt use in the present model. It is possible that more general constructs such as health motivation and driving style, can explain the significant correlations found between frequency of engaging in seat belt use and certain health and driver behaviors. Thus, although the present model includes only driver and health behaviors as correlates of seat belt use, there is scope for further development of the model by including components such as health motivation and driving style in explaining seat belt use.

Lastly, demographic features of the car occupants, such as their age, gender and education level, are expected to affect both their motivations and perceived physical barriers related to seat belt use and frequency in engaging driver and health behaviors. Similar to previous findings (e.g., Blockey and Hartley, 1995; Yagil, 1998), the present findings showed that there are gender and age differences in seat belt use, and driver and health behaviors of the car occupants.

According to the model presented in Figure 5, seat belt use is determined by the combinational effects of the levels of safety and normative motivations and perceived physical barriers related to seat belt use. Seat belt use is expected to increase as the levels of safety and normative motivations increase, whereas it is expected to decrease as the levels of physical barriers increase. Since safety and normative motivations related to seat belt use are expected to be correlated, a car occupant is likely to have similar levels of safety and normative motivations. Therefore, it is likely that the probability of using a seat belt for a car occupant will increase with parallel increases in safety and normative motivations and it will decrease with parallel decreases in the safety and normative motivations. For a car occupant to use a seat belt, overall motivations to use a seat belt should be high enough to eliminate the effects of perceived physical barriers if there are any. It should be noted that individual effects of safety and normative motivations and perceived physical barriers of seat belt use are likely to differ from each other in their weight of importance. Since safety was the most frequently reported reason for using a seat belt and the strongest predictor of seat belt use in the present study, it is likely that safety motivations have a stronger weight in determining seat belt use than normative motivations and perceived physical barriers. Therefore, while estimating the probability of seat belt use, differences among the perceived importance of the determinants of seat belt use should be taken into account.

The model presented in Figure 5 is a tentative model; therefore, it should be tested in further studies for its power in explaining seat belt use. Although the model covers various groups of factors explaining seat belt use, there is still an ample room for making the model more comprehensive by including additional constructs such as health motivation, driving style and various cultural dimensions that explain seat belt use. For instance, “traffic culture” in a country which refers to the “sum of all factors affecting the skills, attitudes and behaviors of drivers as well as equipment” (Leviäkangas, 1997) is very likely to have an important role in explaining seat belt use in a particular country. Traffic culture is not presented in the model as a separate construct because as a “sum of different factors” it is such a broadly inclusive construct that it can not be embedded in the model as a single construct. However, since traffic culture results from the larger cultural heritage of a country (Leviäkangas, 1997), it could be studied through measuring some general cultural dimensions, such as power distance, uncertainty avoidance and...
individualism versus collectivism (Hofstede, 2001). These cultural dimensions are likely to influence most of the relationships between the constructs presented in Figure 5. However, culture was not measured in the present study because this is not a cross-cultural study; thus, measuring the role of culture on seat belt use was beyond the aims of the study.

4.3 Implications for seat belt use interventions

The findings of the present study have important implications for different types of seat belt use interventions. Based on the present findings, Table 4 summarizes some possible seat belt use interventions and their critical agencies and special target groups. Previous examples showed that in increasing seat belt use substantially, special enforcement programs including a basic coalition of public-private agencies, high publicity through pervasive and innovative mass media events and law enforcement were all needed (e.g., Reinfurt, 2004; Williams and Wells, 2004). Therefore, in order to increase seat belt use substantially in Turkey, different levels of agencies, ranging from the government to the local police need to collaborate and introduce highly publicized and large-scale interventions on a statewide level rather than make small-scale interventions with little collaboration.
Table 4. Different types of interventions for increasing seat belt use

<table>
<thead>
<tr>
<th>Critical agencies</th>
<th>Type of intervention</th>
<th>Special target groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy makers</td>
<td>▶ Introducing strong seat belt laws and high law enforcements</td>
<td>Taxi drivers</td>
</tr>
<tr>
<td>Lawmakers</td>
<td>▶ Introducing primary seat belt legislation</td>
<td>Back-seat passengers</td>
</tr>
<tr>
<td>The police</td>
<td>▶ Increasing fines for seat belt use violations</td>
<td>Hard-core non-users</td>
</tr>
<tr>
<td>Mass media (TV, radio, newspapers, etc)</td>
<td>▶ Setting up frequent seat belt check-points and increased police control</td>
<td>e.g., young and male car occupants</td>
</tr>
<tr>
<td>Education institutions (e.g., public schools, driver education schools, university research centers)</td>
<td>▶ Making seat belt campaigns aiming at:</td>
<td>Hard-core non-users</td>
</tr>
<tr>
<td>Public and private road safety institutions</td>
<td>▶ Educating car occupants about the need of seat belt use in all traveling conditions</td>
<td>Part-time seat belt users</td>
</tr>
<tr>
<td>Health institutions</td>
<td>▶ Forming positive attitudes and intentions towards seat belt use</td>
<td>Professional drivers</td>
</tr>
<tr>
<td>Vehicle industry</td>
<td>▶ Promoting habitual seat belt use with the help of forming implementation intentions</td>
<td>Back-seat passengers</td>
</tr>
<tr>
<td>Vehicle inspection agencies</td>
<td>▶ Designing more comfortable seat belts and controlling the availability and usability of seat belts in the vehicles</td>
<td>Non-users and part-time seat belt users</td>
</tr>
<tr>
<td></td>
<td>▶ Increasing the use of seat belt reminder systems in the vehicles</td>
<td></td>
</tr>
</tbody>
</table>

4.3.1 Stronger seat belt laws with higher enforcement

First of all, the results of sub-studies II and IV again showed the very important role of seat belt laws and high enforcement of laws in increasing seat belt use rates. In sub-study II “avoiding punishment” was a frequently reported reason for using a seat belt, indicating the necessity of more frequent police control and persuasive traffic fines for increasing seat belt use rates. Also, the results of sub-study IV showed that for taxi drivers not being required to use a seat belt by law was a very strong reason for not using a seat belt. Seat belt use by taxi drivers is very crucial.
especially because they are at higher risk of being involved in a car accident due to their high driving exposure. Therefore, seat belt use among taxi drivers should be promoted by enacting and enforcing seat belt laws that also apply to them.

Lawmakers have a critical role in implementing strong seat belt laws that apply to all car occupants. Enacting primary seat belt legislation that allows police officers to stop a driver for not using a seat belt (Campbell, 1988; Dinh-Zarr et al., 2001; Evans, 2004; Lange and Voas, 1998; Rivara, Thompson and Cummings, 1999) and making traffic fines paid for violating seat belt use high enough to persuade car occupants to use seat belts are two examples of important ways to increase seat belt use through legal means. The police have a very important role in enforcing seat belt laws especially by checking belt use of the car occupants frequently, for example, at seat belt checkpoints or on their routine patrols, and writing citations for car occupants not using a seat belt.

Although seat belt laws and enforcement of laws are needed for all car occupant groups, some car occupant groups with lower seat belt use rates, such as taxi drivers and back-seat passengers, would especially benefit more from strong seat belt laws with high enforcement. Therefore, these groups may be the special target groups of some law interventions. For instance, enacting primary seat belt legislation that applies to taxi drivers is very likely to increase seat belt use among taxi drivers. Similarly, a high enforcement of the seat belt laws for back-seat passengers can be very effective for increasing seat belt use among them. Although it was not included in the present study, seat belt use rates are very low among back-seat passengers in Turkey, despite the mandatory laws that also apply to them. Compared to the front-seat passengers, back-seat passengers are checked for seat belt use almost never by the police and this is one of the main reasons why back-seat passengers do not use seat belts. Therefore, higher law enforcement for the back-seat passengers is likely to increase seat belt use among them.

4.3.2 Educational seat belt use campaigns

Besides law interventions, the study results imply that educational campaigns that especially target part-time seat belt users (i.e., car occupants using a seat belt only in perceived high-risk traveling conditions) and hard core non-user groups, such as young and male car occupants, are needed to increase seat belt use rates. Since previous research showed that educating car occupants alone did not increase seat belt use substantially (e.g., Williams and Wells, 2003), educational campaigns should be supported by other types of interventions, such as well-publicized law enforcement. The study results showed that most of the car occupants did not use seat belts in perceived low-risk traveling conditions, such as while traveling on city roads. However, contrary to these mistaken beliefs of the car occupants, the injury-reducing effects of seat belts are especially effective in low speed accidents which happen on urban roads (e.g., IRTAD, 1995). In order to correct such mistaken beliefs related to need for seat belts in different traveling conditions, highly publicized educative seat belt campaigns should emphasize the vital role of seat belts in protecting car occupants from injuries and fatalities in all traveling conditions. For instance, some media channels, such as TV, can show some visual material demonstrating how seat belts can protect car occupants from severe injuries even in very low speed accidents. Also, some injury statistics for seat belt users and non-users can be given to correct the mistaken beliefs of the car occupants concerning the relevance of seat belt use to safety.
Based on the study results, some suggestions can be made about the intended messages of future seat belt use campaigns. For instance, since driver belt use was a significant predictor of front seat passenger belt use in sub-study I, seat belt use campaigns can emphasize the important role of driver belt use in enforcing belt use among front-seat passengers. In this way drivers would feel responsible for the safety of front-seat passengers and use seat belts more. Similarly, seat belt campaigns tailored to taxi drivers can emphasize the important role of taxi drivers in the safety of their passengers by enforcing seat belt use among them. Since traveling by a taxi is one of the most common public means of transportation, taxi drivers should feel responsible for the safety of their passengers by using a seat belt, being a good role-model and requiring their passengers to use a seat belt. Furthermore, the results of sub-study II showed that parents tended to use seat belts when their children were in the car because they wanted to be a good role-model for their children. Thus, to increase seat belt use among people with children, seat belt campaigns can emphasize the message of parents being a good role-model by using a seat belt. Similarly, because the subjective norm was a significant predictor of intentions to use a seat belt in sub-study III, seat belt use campaigns might emphasize in their messages the significant others’ positive opinions concerning seat belt use. Lastly, since in sub-study III the perceived benefits of seat belt use were a significant predictor of seat belt use both for urban and rural roads and perceived barriers of seat belt use were a significant predictor of seat belt use only for urban roads, seat belt use campaigns should aim at decreasing the perceived barriers of using seat belt on urban roads and emphasize the evident benefits of seat belt use on both urban and rural roads.

In order to be effective, seat belt use messages should use fear appeals with caution. Using fear appeals in health promotion messages can be ineffective if fear is used as part of a punishment procedure; therefore, a positive reinforcement approach rather than the use of fear can be more effective in behavior change (e.g., Soames, 1988). Hence, seat belt campaigns that reinforce seat belt use by emphasizing its benefits (e.g., safety and avoiding punishment) rather than emphasizing the negative consequences of not using a seat belt (e.g., high risk of severe injury and death) are likely to be more effective in increasing seat belt use.

4.3.3 Forming habitual seat belt use

The results of sub-study III showing the significant relationship between attitudes and intentions to use a seat belt indicate that seat belt campaigns should aim at forming and strengthening positive attitudes towards seat belt use for increasing the intentions to use seat belts. This can be done by focusing on the benefits of using seat belt instead of emphasizing the negative outcomes of not using a seat belt. However, it should be noted that intentions to use a seat belt were not significant predictors of self-reported seat belt use in the present study; this result supported previous studies showing that positive attitudes and intentions towards seat belt use do not always predict seat belt use (e.g., Chliaoutakis et al. 2000; Knapper, Cropley and Moore, 1976; Loo, 1984; SARTRE, 2004). One important reason for this finding might be that attitudes and intentions lose their predictive power on behavior when the behavior becomes habitual (e.g., Ronis, Yates and Kirscht, 1989; Verplanken and Aarts, 1999). Therefore, a habit of not using a seat belt might be one of the reasons explaining why positive attitudes and intentions sometimes do not predict seat belt use. For people who do not habitually use their seat belts, first the habit of not using a seat belt should be broken and then a new habit of seat belt use should be created. Once seat belt use becomes a habit, the belt will be used automatically for each trip. Finding a way to break the old habits and create new ones is a challenging task which needs consideration
of different factors such as habit strength (e.g., Verplanken and Aarts, 1999; Verplanken, Aarts and van Knippenberg, 1997). For instance, in a study of travel mode choices, participants with strong habits paid little attention to new information and alternative actions in comparison to the participants with weak habits (Verplanken, Aarts and van Knippenberg, 1997). Therefore, breaking the habit of not using a seat belt might be difficult and require time especially among the car occupants with a strong habit of not using a seat belt.

Forming implementation intentions, which are plans of action specifying when, where and how the responses lead to goal attainment (e.g., Gollwitzer 1999; Gollwitzer and Brandstätter, 1997; Gollwitzer and Schaal, 1998), can be a good start to creating habit of seat belt use. Both implementation intentions and habits comprise responses to specific cues, which are automatically elicited (e.g., Sheeran and Orbell, 1999; Verplanken and Aarts, 1999). Forming implementation intentions were applied for increasing various targeted behaviors including health behaviors (e.g., Sheeran and Orbell, 1999; Verplanken and Faes, 1999) and driver behaviors (e.g., Elliot and Armitage, 2006). For instance, forming implementation intentions for compliance with the speed limits by asking the drivers to specify when, where and how they will keep the speed limits in a certain area were reported to be successful in increasing self-reported compliance with speed limits among those drivers (Elliot and Armitage, 2006). Also, it was reported that goal achievement of the drivers was dependent on the number of behavioral strategies they had specified in their if-then plans (i.e., situations in which people will perform an intended behavior and the strategies they will use for ensuring that their goal intentions are realized) (Elliot and Armitage, 2006). Similarly, implementation intentions related to seat belt use can be formed, for example, by making the car occupants think and specify the next time and trip that they will use their seat belts and what their if-then plans will be related to it (e.g., if I am driving on a city road, then I will use my seat belt regardless of my speed to ensure that I will achieve my goal of using a seat belt while traveling on city roads). Implementation intentions work better when the target population already has motivation and goal intentions to perform a required behavior (e.g., Elliot and Armitage, 2006; Gollwitzer, 1999). Therefore, implementation intentions related to seat belt use can work better when they are reinforced by car occupants’ high motivation and goal intentions for seat belt use. Thus, after highly publicized educational campaigns aimed at increasing the motivations and intentions for seat belt use, implementation intentions might be a useful intervention for promoting habitual seat belt use among car occupants.

4.3.4 Technical solutions for increasing seat belt use

Besides legal interventions and educational seat belt campaigns, some technical solutions, such as designing more comfortable and convenient seat belts and installing more cars with seat belt reminder systems, are also needed to increase seat belt use. The vehicle industry and car manufacturers have important roles in providing technical solutions needed for increasing seat belt use rates. The present finding showing physical discomfort as one of the strong reasons for not using a seat belt indicates the need for designing more comfortable and convenient seat belts that considers the comfort and convenience of car occupants, who have different body features and sizes. Also, unavailable or broken seat belts especially in taxis and back seats of some vehicles are problems related to poor seat belt conditions in Turkey. Therefore, the availability and usability of seat belts in the vehicles should be checked by vehicle inspection agencies and the police and the vehicles lacking seat belts should be installed with seat belts.
Critical Remarks

Although the specific limitations of the each sub-study are presented under the discussion parts of the original publications, a few remarks can be made related to the general limitations of the whole study. Firstly, using self-reports in data collection in all sub-studies but sub-study I can be considered as one of the major limitations of the present study because car occupants tend to overestimate their seat belt use frequency in self-reports (Robertson, 1992; Streff and Wagenaar, 1989). In order to eliminate the discrepancy between the reported and actual seat belt use frequency, car occupants could be interviewed after observing their actual seat belt use. However, because of the low response rate and limited data provided in this method, most of the sub-studies were based on only self-reports for providing large and detailed data related to seat belt use.

Another major limitation of the study can be not using a representative sample including different groups of car occupants from different regions of Turkey. It was almost impossible to make a country-wide measurement of seat belt use with a representative sample for this study; therefore, some biases in estimates were unavoidable. Thus, the present results should be generalized to car occupants with similar characteristics and conditions. Especially in sub-studies II, III and V the sample mainly included young car occupants with a high education level because of the high accessibility and high response rate.

The present study used only a Turkish sample; it is possible, however, that factors explaining seat belt use vary even between countries with low seat belt usage rates. Therefore, in order to draw some general conclusions about the factors explaining seat belt use in low- or middle-income countries with low seat belt use rates, further cross-cultural studies comparing seat belt use in different low- and middle-income country settings are needed.

Concluding Remarks

Worldwide high rates of road traffic injuries and fatalities, which are considered among the major public health problems, indicate the need for effective road traffic injury prevention interventions for decreasing injury and fatality rates. Traffic injury interventions with proven effectiveness such as seat belts have been applied successfully especially in developed countries with high-income levels, whereas there are failures in the use of these interventions especially in less-developed countries with low- or middle-income (Forjuoh, 2003). In order to evaluate the applicability and relevance of the effective traffic injury interventions in the low- and middle-income countries, where road traffic fatalities are projected to increase substantially by 2020 (Nantulya and Reich, 2003; WHO, 2004), factors related to the use of different injury prevention interventions should be studied deeply specifically in those country settings. Traffic safety research has an important role in highlighting the ways for increasing use of these interventions or designing new interventions in low- and middle-income country settings.

The present study investigated different factors related to seat belt use in Turkey, where seat belt use rates are considerably low compared to developed countries, using different methods and perspectives. Using a variety of methods in measuring seat belt use, which is needed for getting a full picture of seat belt use, can be considered among the strong parts of the present study. The overall results showed that safety and normative motivations and perceived physical barriers related to seat belt use are the main predictors of seat belt use. Although safety
was a strong motivation for seat belt use, beliefs concerning the relevance of seat belt use to safety changed depending on the perceived risk level in different traveling conditions. In most cases seat belts were reported to be used more in perceived high-risk traveling conditions, such as when traveling on intercity roads, while they were reported to be used less in perceived low-risk traveling conditions, such as when traveling on city roads with lower speeds. Therefore, although the car occupants mostly believed in the safety benefits of seat belts, they thought that they did not need to use seat belts because they would not have a severe accident when driving in a perceived low-risk condition. However, seat belts have been proven to be effective safety protection devices needed to protect the car occupants from severe injuries even in very low-speed accidents. Therefore, the present results emphasize the need for well-publicized educational seat belt use campaigns for correcting the mistaken beliefs of the car occupants concerning the relevance of seat belt use to safety in different traveling conditions. Also, the present results indicated the need for strong seat belt laws that apply to all car occupants groups and high enforcements to increase seat belt use rates in Turkey.

The present findings showing that habit was among the frequently reported reasons for using a seat belt indicate the potential for increased habitual seat belt use among the car occupants. When seat belt use becomes a habit it is performed automatically for each car trip. Therefore, for increased seat belt use rates promoting habitual seat belt use among more car occupants should be among the prior aims of the seat belt use interventions. Forming implementation intentions related to seat belt use can be a good start for turning seat belt use into a habit. Further research should be directed to the investigation of formation of implementation intentions and habit related to seat belt use. Also, more comprehensive models of seat belt use covering the role of larger socio-economic factors, such as the culture and economy, in explaining seat belt use should be developed by further research.
References


