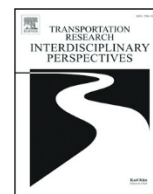




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Understanding young drivers in Turkey: Time perspective, driving skills, and driver behaviors



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ABSTRACT

Many studies have focused on the tendency of young drivers to drive riskily. However, little is known regarding time perspective, driving skills, and driver behaviors, even though time perspective is an important predictor of many risky behaviors. Time perspective is a general construct of the thoughts relating to present, past, and future. Broadly, (i) past time perspective is related to the recall of reconstructed past scenarios; (ii) present time perspective means attending to immediate and salient stimulus; and (iii) future time perspective is related to anticipation and imagining future consequences. In the present study, we investigated the effect of time perspective on driving skills and driver behaviors. Young drivers ($N = 203$, aged 18 to 30, $M = 25.36$, $SD = 3.09$) who drive their own vehicle at least 1000 km per year completed the Driving Skill Inventory, Driver Behavior Questionnaire, and Time Perspective Inventory. The canonical correlation findings revealed significant associations between the study variables. Lower scores on present hedonistic time perspective were associated with lower scores on perceptual-motor skills. Lower scores on past negative and present fatalistic time perspectives, and higher scores on past positive and future time perspectives were associated with higher scores on safety skills and lower scores on errors and traffic violations. These results provide a better understanding of the causes of young drivers' risky behaviors.

1. Introduction

Driving skills are one of the major issues that need to be addressed to ensure traffic safety in traffic. They are defined as a competence related to cognitive-motor abilities, information processing, motor skills, and knowledge (Elander et al., 1993). According to Lajunen and Summala (1995), driving skills have two components: perceptual-motor skills and safety skills. Perceptual-motor skills for operating the vehicle, such as the ability to maneuver, improve with practice and increased mileage. Safety skills refer to skills to avoid crashes and increase safety, such as avoiding unnecessary risks, conforming to speed limits, or obeying traffic lights. People with higher safety skills act more carefully and are more aware of potential hazards (Lajunen and Summala, 1995).

The difference between these two components matters because improving perceptual-motor skills but not safety skills may lead to overestimating one's abilities and driving more riskily (Sümer et al., 2006). Research shows that overestimating perceptual-motor skills can predispose drivers to evaluating risky situations over-optimistically (e.g. McKenna, 1993). Accordingly, perceptual-motor skills are positively related to the number of

crashes or penalties a driver experiences whereas safety skills are negatively related to these events (Lajunen et al., 1998; Sümer et al., 2006). In short, a safe driver must have both high perceptual-motor and safety skills.

Driver behaviors also need to be considered to ensure traffic safety. According to the taxonomy of aberrant behavior developed by Reason et al. (1990), driver behaviors can be classified as errors or violations due to their different psychological origins. Errors are failures of planned action related to individual cognitive processes whereas violations are deliberate actions to perform or not perform a specific behavior. Violations have a social context related to rules, norms, operation procedures, or codes of practice (Özkan and Lajunen, 2005; Reason et al., 1990). Both of these action types undermine the safe operation of traffic systems.

Research has repeatedly shown that young drivers commonly engage in risky driver behaviors, such as speeding, disobeying road signs, dangerous overtaking, distracted driving, lack of seat belt use, and driving under the influence of alcohol and other substances (Carter et al., 2014; Dunlop and Romer, 2010; Klauer et al., 2014). These risky behaviors can be linked with adolescence since egocentrism, impulsivity, and sensation-seeking are typical adolescent characteristics that usually diminish with age (Begg and Langley, 2001; Dahlen et al., 2005).

Traffic psychologists frequently focus on the personality factors believed to be inherently more dangerous than others in the traffic environment (Hennessy, 2011). Certain personality characteristics can be related

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to risky behaviors in traffic. These include type-A behavior (which be defined by high ambition, competitiveness, aggressive behaviors, time-urgency and impatience) (Chesney et al., 1981), tenseness and inability to relax, impatience, irritability, negative emotions, and neuroticism (Lajunen and Summala, 1995). The present study considers another individual factor, time perspective, as a possible predictor of risky driving.

Time perspective (or time orientation) relates to how people (or cultures) evaluate or place themselves in time. Briefly, ‘present-orientation’ relates to attending to immediate and salient stimuli; ‘future orientation’ relates to anticipation and imagining future consequences; ‘past-orientation’ relates to the recall of reconstructed past scenarios. These perspectives play an important role in decision-making (Zimbardo et al., 1997).

Time perspective has been described in terms of the following five dimensions (Gonzalez and Zimbardo, 1985; Zimbardo and Boyd, 1999). *Past-negative time perspective*, characterized by a pessimistic attitude towards the past and related to a conservative, anxious, and avoidant personality. *Past-positive time perspective* is characterized by a positive construction of the past and the opposite personality features of the past-negative time perspective. Consequently, the two perspectives may have differing associations with driver behaviors. *Present-fatalistic time perspective* is characterized by the belief that the future cannot be influenced by individual factors. It is thus associated with a belief in fate, high levels of anxiety, and low levels of perceived control. *Present-hedonistic time perspective* is characterized by enjoyment, excitement, and a focus on present pleasures rather than future rewards. Both present time perspectives are associated with risky behaviors, such as substance use, unsafe traffic behaviors, and bike-riding without mandatory helmets (Zimbardo and Boyd, 1999; Zimbardo et al., 1997). Finally, *Future time perspective* focuses on future goals and is associated with low levels of risk taking, high levels of problem-solving abilities, and a preference for consistency. Future time-oriented people may therefore adopt less risky behaviors in traffic.

Studies of these time perspectives have focused on associations with related constructs, such as sensation seeking, anxiety, and risk taking (Arnett, 1996; Carter et al., 2014; Ryb et al., 2006; Zimbardo and Boyd, 2008). However, little is known regarding the relationship between time perspective, driving skills, and driver behaviors. The current study therefore aims to investigate the multiple systematic associations between the time perspectives of young drivers, and their driving skills and driver behaviors to fill this gap in the literature. Given previous research findings, the study hypotheses are listed below while the expected results are summarized in Table 1.

Hypothesis 1. Young drivers' past negative, present fatalistic, and present hedonistic time perspectives are positively associated with risky driver behaviors, such as violations and traffic errors whereas past positive and future time perspectives are negatively associated with them.

Hypothesis 2. Young drivers' past negative, present fatalistic, and present hedonistic time perspectives are negatively associated with better traffic safety skills whereas past positive and future time perspectives are positively associated with them.

Hypothesis 3. Young drivers' time perspectives may be negatively and/or positively associated with perceptual-motor skills. (We have no specific expectations about the direction of the association depending on time perspective types because of insufficient findings in the literature.)

2. Method

2.1. Participants

The present study sampled 203 young drivers who drive their vehicle for at least 1000 km per year. The participants were recruited using snow-ball technique and convenience sampling. The sample included 107 females (52.7%) and 96 males (47.3%), aged 18 to 30, with a mean age of 25.36 ($SD = 3.09$). Participants either had undergraduate ($N = 137$; 67.5%) or graduate ($N = 66$; 32.5%) degrees. All participants had a formal driving license while had been driving actively for 1 to 16 years, with a mean of 5.33 years ($SD = 3.39$). The majority ($N = 146$; 71.9%) reported having had at least one active crash (i.e. the participant hit a vehicle, a pedestrian, or an object) and/or passive crash (i.e. another vehicle or a pedestrian hit the participant's car) while a majority ($N = 122$; 60.1%) had received a traffic fine. The mean total kilometers driven in the past year was 11,632.23 km ($SD = 15,208.64$). The participants' preferred average intra-city speed ranged from 20 km/h to 140 km/h ($M = 74.43$; $SD = 16.34$) whereas their preferred average intercity speed ranged from 60 km/h to 180 km/h ($M = 115.89$; $SD = 18.55$). However, the maximum speed limits in Turkey are 50 km/h for intra-city roads and 120 km/h for inter-city roads.

2.2. Instruments

2.2.1. Driving Skill Inventory (DSI)

This 20-item scale was developed by Lajunen and Summala (1995) to test drivers' perceptual-motor skills and safety skills. It was translated into Turkish by Sümer and Özkan (2002) and Lajunen and Özkan (2004). The DSI asks drivers to rate how weak or strong they consider themselves for the given skills using a 5-point scale ranging from “definitely weak” to “definitely strong”. In our study, the principal component analysis revealed that two factors perceptual-motor skills (13-item, $\alpha = 0.84$) and safety skills (7-item, $\alpha = 0.69$), explained 25.18% and 14.20% of the variance, respectively. Higher mean scores on these factors indicate stronger perceptual-motor skills and/or traffic safety skills (see Appendix A).

2.2.2. Driver Behavior Questionnaire (DBQ)

This 28-item scale was developed by Reason et al. (1990) to measure drivers' aberrant behaviors in traffic, specifically aggressive violations, ordinary violations, errors, and lapses. Lajunen and Özkan (2004) adapted the measure into Turkish and validated the scale for non-professional drivers. In the present study, participants reported how often they performed each of the 28 driver behaviors in the previous year using a 6-point scale ranging from “never” to “nearly all the time”. The principal component analysis revealed that items for errors and lapses items loaded onto one factor (errors in traffic) whereas the items for aggressive violations and ordinary violations loaded onto another factor (violations in traffic). The two factors, errors in traffic (16-item, $\alpha = 0.72$) and violations in traffic (12-item, $\alpha = 0.81$), explained 20.00% and 8.57% of the variance, respectively. Higher mean scores on these factors indicate more frequent errors and/or violations in traffic (see Appendix B).

Table 1
Predicted associations between tested variables.

Variables	Perceptual-motor skills	Safety skills	Errors in traffic	Violations in traffic
Past negative time perspective	?	–	+	+
Past positive time perspective	?	+	–	–
Present fatalistic time perspective	?	–	+	+
Present hedonistic time perspective	?	–	+	+
Future time perspective	?	+	–	–

Note. The question mark indicates an uncertain hypothesized association between the variables due to insufficient findings in the literature.

2.2.3. Time Perspective Inventory (TPI)

This 47-item scale was developed by **Zimbardo and Boyd (1999)** and adapted to Turkish by **Erginbilgiç-Kışlalı (n.d.)** to explore how perception of time affects thoughts, motivations, and behavior. In the present study, participants responded to statements using a 5-point scale ranging from “strongly disagree” to “strongly agree”. The principal component analysis revealed that the expected five factors, past negative time perspective (10 items, $\alpha = 0.85$), present hedonistic time perspective (12 items, $\alpha = 0.76$), future time perspective (12 items, $\alpha = 0.74$), past positive time perspective (6 items, $\alpha = 0.62$), and present fatalistic time perspective (7 items, $\alpha = 0.67$), explained 12.17%, 10.12%, 7.93%, 5.38%, and 4.00% of the variance, respectively. Higher mean scores on each factor indicate stronger identification with the respective perspective (see **Appendix C**).

2.2.4. Demographic information form

Participants provided information about their sex, age, education level, driving license, years of driving experience, the number of active and/or passive crashes they had been involved in, the number of traffic fines they had received, their average intracity and intercity driving speeds.

2.3. Procedures

The study was conducted with the permission of the ethical review board of Middle East Technical University in accordance with American Psychological Association ethical standards. After signing the informed consent form, the young drivers, who were aged 18 to 30 and driven their own vehicle at least 1000 km per year, filled out the questionnaire package (demographic information, and driver behaviors, driving skills, and time perspective measures). Data were collected using QUALTRICS software over a 7-week period.

3. Results

3.1. Correlations between study variables

The zero-order correlation results showed that perceptual-motor skills were negatively associated with traffic errors but positively related to traffic violations, present hedonistic time perspective, being male, driving more kilometers in the previous year, average speed on intracity and intercity roads, and overtaking rate. Safety skills were negatively correlated with errors and violations, and past negative and present fatalistic time perspectives, total driving per year, average speed on intracity/intercity roads, and overtaking rate, but positively associated with past positive time perspective.

Driver errors were positively related to violations, past negative time perspective, distance driven per year, and average speed on intracity and intercity roads, but negatively correlated with age. Violations were positively associated with past negative, present fatalistic and present hedonistic time perspectives, distance driven per year, average speed on intracity and intercity roads, and overtaking rate, but negatively correlated with past positive and future time perspectives, and education level (see **Table 2**).

3.2. Systematic associations

To explore the systematic multivariate associations between drivers' time perspectives, and their driving skills and behaviors in traffic, a canonical correlation analysis pertaining to the group of regression methods was performed. This aimed to find multiple significant associations by focusing on the predictive power of a set of predictor variables (time perspectives set) on a set of criterion variables (driving skills and driver behaviors set). Because multivariate associations may reflect reality better than univariate associations, canonical correlation analysis was conducted rather than testing univariate associations individuals. To mitigate the risk of overfitting,

Table 2
Means, standard deviations, and correlations of study variables.

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Perceptual-motor skills	3.94	0.52	-														
2. Safety skills	3.55	0.60	0.08	-													
3. Errors in traffic	1.66	0.43	-0.27**	-0.37**	-												
4. Violations in traffic	2.34	0.70	0.21**	-0.64**	0.45**	-											
5. Past negative time perspective	2.80	0.75	-0.08	-0.16*	0.17*	0.18*	-										
6. Past positive time perspective	3.50	0.63	-0.02	0.16*	-0.01	-0.15*	0.04	-									
7. Present fatalistic time perspective	2.62	0.62	-0.11	-0.17*	0.07	0.14*	0.52**	0.08	-								
8. Present hedonistic time perspective	3.58	0.51	0.33**	0.01	-0.04	0.16*	0.01	0.19**	0.10	-							
9. Future time perspective	3.59	0.52	0.03	0.13	-0.06	-0.18**	-0.01	0.14*	-0.25**	-0.21**	-						
10. Sex	1.47	0.50	0.21**	-0.02	0.03	0.11	0.10	-0.03	-0.07	0.03	-0.06	-					
11. Age	25.36	3.09	0.05	0.04	-0.16*	-0.10	-0.20**	0.03	-0.19**	-0.14*	0.01	0.14*	-				
12. Education level	1.33	0.47	-0.11	-0.03	-0.03	-0.14*	-0.18**	0.16*	-0.11	0.01	-0.19**	-0.19**	0.33**	-			
13. Total km in a year	11,632	15,208.6	0.32**	-0.16*	0.16*	0.31**	-0.01	-0.09	-0.09	0.05	0.06	0.21**	0.24**	0.03	-		
14. Average speed on intracity roads	74.43	16.34	0.21**	-0.25**	0.18*	0.44**	0.03	-0.04	0.20**	0.17*	-0.16*	-0.13	0.02	-0.09	0.25**	-	
15. Average speed on intercity roads	115.89	18.55	0.27**	-0.33**	0.17*	0.43**	0.04	0.01	0.03	0.10	-0.13	0.07	0.12	-0.12	0.28**	0.57**	-
16. Overtaking rate	2.00	0.78	0.31**	-0.26**	-0.04	0.37**	0.07	-0.04	0.14*	0.22**	-0.23**	0.16*	0.05	-0.14*	0.19*	0.24**	0.41**

Note. Scales ranged from 1 (definitely weak) to 5 (definitely strong) for perceptual-motor and safety skills; from 0 (never) to 5 (nearly all the time) for errors and violations in traffic; from 1 (strongly disagree) to 5 (strongly agree) for time perspectives; and from 1 (low) to 3 (high) for overtaking rate. Participants were coded on the sex variable as 1 = female, 2 = male; on education level variable as 1 = undergraduate student, 2 = graduate student.
** $p < .01$.
* $p < .05$.

the findings were evaluated conservatively, with 0.40 defined as the threshold for significant loadings. Four pairs of canonical variates (including the weighted sum of the study variables) were calculated based on the number of variables within the sets. As can be seen in Table 3, the first function was statistically significant ($Wilks' \lambda = 0.74, R_c^2 = 0.15, \chi^2(20, N = 203) = 59.25, p < .001$) and explained 15% of the overlapping variance between the variable sets. These findings indicated that lower scores on present hedonistic time perspective are associated with lower scores on perceptual-motor skills.

As Table 3 shows, the second function was also significant ($Wilks' \lambda = 0.87, R_c^2 = 0.10, \chi^2(12, N = 203) = 27.30, p = .007$) and explained 10% of the overlapping variance. These findings indicated that lower scores on past negative and present fatalistic time perspectives and higher scores on past positive and future time perspectives were associated with higher scores on safety skills and lower scores on errors and violations in traffic. The time perspective of drivers explained 8% of the unique variance in driver skills and behaviors with these two significant functions. The third and the fourth functions were not significant: $\chi^2(6, N = 203) = 5.82, p = .44; \chi^2(2, N = 203) = 0.830, p = .66$, respectively.

4. Discussion

This study primarily aimed to investigate the associations between time perspective, driving skills, and driver behaviors using a sample of young drivers. Time perspective was considered as a predictor of risky driving by young drivers since past, present, and future time orientations generally shape attitudes, beliefs, and behaviors.

The first finding is that lower scores on present hedonistic time perspective are associated with lower scores on perceptual-motor skills. This can be explained by a theoretical understanding of the present hedonistic time perspective, which suggests that this time perspective is associated with engaging in playful, immediate acts that bring pleasure (Keough et al., 1999). A person with this time perspective tends not to consider the future consequences of behavior, behaves to meet physical needs and respond to immediate stimuli, and may engage in risky actions leading to accidents and

injuries (Hefferon and Boniwell, 2018). Additionally, individuals with more driving experience tend to have better perceptual-motor skills (Lajunen and Summala, 1995). The link between present hedonistic time perspective and perceptual-motor skills suggests that driving in a careless and enjoyable way, such as speeding, may improve perceptual-motor skills. However, this conclusion may need further investigation.

The second finding is that lower scores on past negative and present fatalistic time perspectives and higher scores on past positive and future time perspectives are associated with higher scores on safety skills and lower scores on driving errors and traffic violations. A past negative time perspective reflects an anxious cognitive style; anxiety is positively associated with both errors and violations (Lucidi et al., 2010). A present-fatalistic time perspective is based on the idea that the future cannot be influenced by individual acts. Thus, it is related to low levels of perceived control, perceived responsibility, and safety concerns (Zimbardo et al., 1997). Similarly to past negative time perspective, it is positively associated with higher levels of anxiety.

Third, past positive and future time perspectives are positively associated with safety skills and negatively associated with errors and violations in traffic. People with a stronger past positive time perspective positively evaluate their past experiences, which reflects lower anxiety levels. In addition, Zimbardo (1992) claimed that people who are past positive time orientated avoid risky behaviors and feel responsible for their social environment. Thus, a past positive time perspective can lead people to consider their mistakes and avoid repeating them, especially since they lack hedonistic characteristics or a preference for risky behaviors. Because the future time perspective focuses on goals better levels of problem-solving ability, empirical thinking, and healthy decision-making. Future time-oriented people are good at resisting temptation and pay attention to responsibility (Zimbardo, 1992; Zimbardo and Boyd, 1999). The characteristics of past positive time-oriented and future time-oriented people are compatible with the definition of a "safe driver"; that is, somebody who allows wide safety margins (Näätänen and Summala, 1976; Summala, 1980).

The last finding is that age is negatively associated with present time and past negative time perspectives. Although we only collected data from young drivers, the negative correlation between age and particular types of time perspective (present-hedonistic, present-fatalistic, past-negative) confirms our expectations. This finding can be explained by previous research showing that young drivers tend to be egocentric, impulsive, or sensation-seeking (Begg and Langley, 2001; Dahlen et al., 2005).

5. Conclusion

To sum up, the present study aimed to help explain young drivers' over-representation in traffic accident statistics by investigating the links between time perspectives, driving skills, and risky driving behaviors. Overall, past-positive and future time perspectives appear to enhance road safety whereas past-negative, present-hedonistic, and present-fatalistic time perspectives impair it. Researchers of time perspectives suggest that a balanced, flexible perception of time, known as the balanced time perspective, is strongly related to well-being, happiness, and mindfulness (Drake et al., 2008; Zimbardo and Boyd, 2008).

More specifically, an individual with a balanced time perspective should combine a high-level past positive time perspective, mid-level present hedonistic and future time perspectives, and low-level present fatalistic and past negative time perspectives (Sobol-Kwapinska and Jankowski, 2016; Zimbardo and Boyd, 2008). Thus, it is interesting that the particular perspectives that should be low in a balanced time perspective are also those that are positively related to more risky driving behavior or poorer driving skills in the present study. That is, a balanced time perspective may lead to safer driving.

Table 3

Systematic associations between time perspective set and driving skills and driver behaviors set.

Variable sets	Canonical loadings		M	SD
	First function	Second function		
Set 1: time perspective				
Past negative time perspective	0.14	-0.60	2.80	0.75
Past positive time perspective	0.04	0.52	3.50	0.63
Present fatalistic time perspective	0.26	-0.60	2.62	0.62
Present hedonistic time perspective	-0.90	-0.16	3.58	0.51
Future time perspective	-0.01	0.61	3.59	0.52
Redundancy	0.03	0.03	Total = 0.06	
Set 2: driving skills and driver behaviors				
Perceptual-motor skills	-0.98	0.07	3.94	0.52
Safety skills	-0.13	0.80	3.55	0.60
Errors in traffic	0.17	-0.40	1.66	0.43
Violations in traffic	-0.32	-0.93	2.34	0.70
Redundancy	0.04	0.04	Total = 0.08	
Canonical R ²	0.15	0.10		
Wilks' lambda	0.74	0.87		
χ^2	59.25**	27.30**		

Note. Scales ranged from 1 (strongly disagree) to 5 (strongly agree) for time perspectives; from 1 (definitely weak) to 5 (definitely strong) for perceptual-motor and safety skills; and from 0 (never) to 5 (nearly all the time) for errors and violations in traffic. Redundancy means the proportion of unique explained variance by the opposite canonical variate. 0.40 was defined as the cutoff point for significant correlation loadings shown in bold-font.

** $p < .01$.

The present study also has practical implications. Clearer understanding of the link between young drivers' time perspectives and their driving skills and behaviors in traffic can be used to develop more effective driver training programs and public service advertising. According to the dialectical behavioral theory of Linehan (1993), individuals can develop mindfulness skills for themselves and the social world. Better awareness of time perspective-based behaviors and their positive and/or negative consequences can help motivate young drivers to exercise more self-control. Alongside the usual skills-based driving education, time perspective-based discourses may improve driving-related safety literacy, thereby creating a safer traffic environment.

According to the theory of Özkan and Lajunen (2011), the multilevel socio-cultural and technical traffic environment has four levels: micro, meso, macro, and magna. The micro level includes individual driver characteristics, such as age, sex, attitudes, cognitive process and biases, and personality. The meso level includes organizational/company and group/community factors, primarily focused on professional drivers. The macro level includes national factors, such as governance quality, cultural factors, and safety regulations and practices. The magna level includes ecocultural sociopolitical factors, such as the economy and culture. Time perspective can be considered a micro level factor as it represents an individual characteristic. To achieve behavioral changes in drivers, it might be effective to start by focusing on micro level factors, such as time perspective.

5.1. Limitations

The present study has several limitations. First, the survey-based research design means that the findings were based on a correlational analysis, preventing us from drawing causal conclusions. Second, the data were collected from a convenience sample of young drivers between the ages of 18 and 30 whereas young drivers are generally defined as between 18 and 25 years old in the literature, although several other studies have also used an age range of 18 to 30 (e.g. Bianchi and Summala, 2004). Overall, however, the sample for this study was older than in most previous young driver research.

Third, time perspective was the only variable considered in this study although many others are associated with driving skills and driver behaviors. These include personality, impulsivity, sensation seeking, religiousness, and traffic safety culture, which should also be taken into consideration in predicting driver behaviors. Fourth, there may be significant differences between reported driver intentions and behaviors and actual driver behaviors. Future studies should therefore focus on actual behaviors to test the validity and reliability of our findings. Fifth, certain demographic variables may act as confounding factors. These include number of active or passive crashes, number of traffic fines, total distance driven each year, average speed, and overtaking rate. While these variables were measured in the present study using single-item questions, they were not controlled for in the main data analysis. This should be considered in further research. Future research should also compare the time perspectives of young and older, more experienced drivers to determine the extent to which the present findings can be generalized.

CRediT authorship contribution statement

Burcu Tekeş: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Fatih Özdemir:** Formal analysis, Methodology, Writing - original draft, Writing - review & editing. **Türker Özkan:** Conceptualization, Supervision.

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Appendix A. Psychometric characteristics of Driving Skill Inventory based on principal component analysis

Driving Skill Inventory	Item loading	Item total r	Item excluded α value
<i>Factor 1. Perceptual-motor skills</i> eigenvalue = 5.04; explained variance (%) = 25.18; alpha value (α) = 0.84			
1. Performance in specific situations	0.72	0.62	0.82
2. Overtaking	0.70	0.60	0.82
3. Fluent driving	0.68	0.58	0.82
4. Perceiving hazards in traffic	0.65	0.55	0.83
5. Making firm decisions	0.65	0.55	0.82
6. Preview of traffic situations	0.63	0.53	0.83
7. Controlling the vehicle	0.62	0.53	0.83
8. Managing car through a slide	0.60	0.50	0.83
9. Managing the car through hill	0.58	0.50	0.83
10. Reverse parking	0.56	.047	0.83
11. Adjusting the speed to the conditions	0.53	0.45	0.83
12. Fluent lane-changing in heavy traffic	0.46	0.33	0.84
13. Relinquishing one's rights	0.38	0.33	0.84
<i>Factor 2. Safety skills</i> eigenvalue = 2.84; explained variance (%) = 14.20; alpha value (α) = 0.69			
1. Avoiding unnecessary risks	0.74	0.52	0.61
2. Conforming to the speed limits	0.69	0.47	0.62
3. Keeping sufficient following distance	0.64	0.40	0.64
4. Following a slow car in patient	0.55	0.38	0.65
5. Keeping calm in annoying situations	0.50	0.39	0.65
6. Following the traffic lights carefully	0.47	0.31	0.66
7. Tolerating other drivers' blunders calmly	0.34	0.31	0.66

Note. Promax rotation.

Appendix B. Psychometric characteristics of Driver Behavior Questionnaire based on principal component analysis

Driver Behavior Questionnaire	Item loading	Item total r	Item excluded α value
<i>Factor 1. Errors in traffic</i> eigenvalue = 5.60; explained variance (%) = 20.00; alpha value (α) = 0.72			
1. Turning left, nearly hit cyclist	0.65	0.40	0.70
2. Ignored give-way signs	0.65	0.44	0.70
3. Queuing, nearly hit the car in front	0.62	0.48	0.69
4. Misjudged speed of oncoming vehicle	0.58	0.45	0.70
5. Speeded in roundabout	0.51	0.44	0.70
6. Failed to see pedestrians crossing	0.50	0.39	0.70
7. Braked too quickly	0.49	0.43	0.70
8. Intended to use lights but switched on wipers	0.48	0.29	0.71
9. Hit something when reversing	0.48	0.25	0.71
10. Tried to pass a vehicle turning left	0.47	0.34	0.71
11. Took the wrong exit from a roundabout	0.47	0.36	0.71
12. Forgot where car was parked	0.42	0.34	0.71
13. Took usual route by mistake	0.36	0.30	0.71
14. No recollection of recent road	0.36	0.33	0.71
15. Maneuvered without checking mirror	0.31	0.25	0.72
16. Attempted to drive off in third gear	0.30	0.24	0.72
<i>Factor 2. Violations in traffic</i> eigenvalue = 2.40; explained variance (%) = 8.57; alpha value (α) = 0.81			
1. Violated speed limit on city roads	0.70	0.55	0.79
2. Raced through traffic lights	0.69	0.49	0.80
3. Overtook on the right on motorway	0.64	0.54	0.79
4. Got angry, gave chase	0.62	0.53	0.80
5. Have an aversion to a particular type of road user	0.62	0.56	0.79
6. Violated speed limit on motorway	0.58	0.47	0.80
7. Drove on an about-to-close lane on a motorway	0.51	0.55	0.79
8. Tail-gated	0.46	0.46	0.80
9. Got angry, hooted	0.44	0.35	0.81

(continued on next page)

Appendix B (continued)

Driver Behavior Questionnaire	Item loading	Item total r	Item excluded α value
10. Drank and drove	0.43	0.24	0.81
11. Got into the wrong lane at a roundabout	0.37	0.46	0.80
12. Jumped the traffic lights	0.36	0.43	0.80

Note. Promax rotation.

Appendix C. Psychometric characteristics of Time Perspective Inventory based on principal component analysis

Time Perspective Inventory	Item loading	Item total r	Item excluded α value
Factor 1. Past negative time perspective eigenvalue = 5.98; explained variance (%) = 12.17; alpha value (α) = 0.85			
1. I think about the bad things that have happened to me in the past.	0.76	0.66	0.82
2. I've made mistakes in the past that I wish I could undo.	0.72	0.61	0.83
3. It's hard for me to forget unpleasant images of my youth.	0.71	0.67	0.82
4. Painful past experiences keep being replayed in my mind.	0.69	0.67	0.82
5. The past has too many unpleasant memories that I prefer not to think about.	0.69	0.59	0.83
6. I think about the good things that I have missed out on in my life.	0.63	0.53	0.83
7. Even when I am enjoying the present, I am drawn back to comparisons with similar past experiences.	0.61	0.50	0.84
8. I've taken my share of abuse and rejection in the past.	0.58	0.45	0.84
9. I often think of what I should have done differently in my life.	0.52	0.43	0.84
10. On balance, there is much more good to recall than bad in my past.*	0.35	0.32	0.85
Factor 2. Present hedonistic time perspective eigenvalue = 4.76; explained variance (%) = 10.12; alpha value (α) = 0.76			
1. Taking risks keeps my life from becoming boring.	0.70	0.39	0.75
2. It is more important for me to enjoy life's journey than to focus only on the destination.	0.70	0.55	0.73
3. I take risks to put excitement in my life.	0.67	0.46	0.74
4. I do things impulsively.	0.62	0.48	0.74
5. I try to live my life as fully as possible, one day at a time.	0.59	0.49	0.74
6. I find myself getting swept up in the excitement of the moment.	0.57	0.45	0.74
7. I feel that it's more important to enjoy what you're doing than to get work done on time.	0.53	0.44	0.74
8. It is important to put excitement in my life.	0.51	0.51	0.73
9. Ideally, I would live each day as if it were my last.	0.41	0.22	0.76
10. I believe that getting together with one's friends to party is one of life's important pleasures.	0.35	0.34	0.75
11. I like my close relationships to be passionate.	0.33	0.30	0.75
12. When listening to my favorite music, I often lose all track of time.	0.31	0.23	0.76
Factor 3. Future time perspective eigenvalue = 3.73; explained variance (%) = 7.93; alpha value (α) = 0.74			
1. I complete projects on time by making steady progress.	0.79	0.59	0.70
2. I meet my obligations to friends and authorities on time.	0.69	0.56	0.71
3. I am able to resist temptations when I know that there is work to be done.	0.66	0.38	0.72
4. Meeting tomorrow's deadlines and doing other necessary work comes before tonight's play.	0.60	0.43	0.72
5. When I want to achieve something, I set goals and consider specific means for reaching those goals.	0.53	0.42	0.72
6. It upsets me to be late for appointments.	0.51	0.39	0.72
7. I make lists of things to do.	0.45	0.43	0.72
8. I take each day as it is rather than try to plan it out.*	0.41	0.44	0.71
9. If things don't get done on time, I don't worry about it.*	0.39	0.37	0.72

Appendix C (continued)

Time Perspective Inventory	Item loading	Item total r	Item excluded α value
10. I believe that a person's day should be planned ahead each morning.	0.39	0.20	0.74
11. Before making a decision, I weigh the costs against the benefits.	0.37	0.29	0.73
12. I keep working at difficult, uninteresting tasks if they will help me get ahead.	0.35	0.23	0.74
Factor 4. Past positive time perspective eigenvalue = 2.53; explained variance (%) = 5.38; alpha value (α) = 0.62			
1. I get nostalgic about my childhood.	0.58	0.42	0.54
2. It gives me pleasure to think about my past.	0.57	0.27	0.62
3. I enjoy stories about how things used to be in the "good old times."	0.55	0.44	0.54
4. I like family rituals and traditions that are regularly repeated.	0.48	0.38	0.56
5. I find myself tuning out when family members talk about the way things used to be.*	0.48	0.37	0.57
6. Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories.	0.43	0.32	0.59
Factor 5. Present fatalistic time perspective eigenvalue = 1.88; explained variance (%) = 4.00; alpha value (α) = 0.67			
1. Since whatever will be will be, it doesn't really matter what I do.	-0.72	0.42	0.63
2. It doesn't make sense to worry about the future, since there is nothing that I can do about it anyway.	-0.57	0.47	0.61
3. Fate determines much in my life.	-0.44	0.35	0.65
4. My life path is controlled by forces I cannot influence.	-0.40	0.52	0.60
5. You can't really plan for the future because things change so much.	-0.35	0.39	0.64
6. My decisions are mostly influenced by people and things around me.	-0.35	0.29	0.66
7. Often luck pays off better than hard work.	-0.32	0.26	0.67

Note. Promax rotation.

* Reverse-scored item.

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