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TRAFFIC VIOLATIONS AND ERRORS: THE EFFECTS OF SENSATION SEEKING AND ATTENTION

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Summary: The purpose of this study was to examine the effects of sensation seeking and attention in traffic violations and errors. Participants were 716 volunteer male drivers from Ankara, Turkey. Drivers were asked to respond to computerized measures of monotonous and selective attention tests, and also to complete the Driver Behavior Questionnaire, Driving Skills Inventory, and Arnett Inventory of Sensation Seeking. We first categorized participants into four groups according to their correct responses of monotonous and selective attention tests by using median-split: Group 1 = low scores on both monotonous and selective attention tests, Group 2 = high scores on both monotonous and selective attention tests, Group 3 = low on monotonous attention and high on selective attention, and Group 4 = high on monotonous attention and low on selective attention. Participants were also classified into two groups regarding their total sensation seeking scores as low and high sensation seekers. A 4 (attention groups) X 2 (sensation seeking groups) MANOVA was conducted on traffic violations and errors as dependent variables. MANOVA analysis indicated that high sensation seekers with high monotonous and selective attention are more likely to have a higher number of traffic violations and errors than other groups. Since these drivers also reported lower levels of safety skills than other groups, it could be interpreted as an indication of drivers' overconfidence in their skills and underestimation of the hazards in traffic. Such drivers were more likely to be risk takers in traffic situations.

INTRODUCTION

Previous studies have shown that many factors play an important role in predicting traffic accidents, such as gender, age, driving skills and styles, personality traits, and motivational factors (Elander, West, & French, 1993; Lajunen & Summala, 1995; Natanen & Summala, 1974; Reason, et al., 1990). One of the personality traits that predicts accident involvement is sensation seeking. Jonah (1997) pointed out that sensation seeking was significantly related to aberrant driver behaviors such as driving while intoxicated, driving over the speed of 80 mph, driving 20 mph or more over the speed limit, racing the car, passing in a no-passing zone, high speed and low seat belt usage. Studies on the relationship between sensation seeking and risky driving indicated that high sensation seekers are more likely to report risky driving behaviors (e.g., speeding, not wearing seat belts, driving after drinking, perceiving a low risk of driving while

intoxicated, and aggressive driving) than low sensation seekers (Furnham & Saipe, 1993; Jonah, Thiessen, & Au-Yeung, 2001; Rimmo & Aberg, 1999; Rosenbloom, 2003). Results also showed that high sensation seekers performed better on focused attention tasks than low sensation seekers (Ball & Zuckerman, 1992; Buckhalt & Oates, 2002; Martin, 1986).

In general, attention has been defined as "the process of seeking out and focusing on stimuli that are of interest" (Goldstein, 2002, pp. 597). Driving behavior requires different aspects of attention (e.g., monotonous, selective, and divided attention) to process multiple stimuli in traffic situations. Several studies showed a significant relationship between performance in an auditory selective attention task and number of accidents, ranging from 0.24 to 0.40 (Arthur & Doverspike, 1992; Avolio, Kroeck, & Panek, 1985; Mihal & Barrett, 1976). Furthermore, Arthur, Strong, and Williamson (1994) administrated a computerized visual selective attention test to the drivers, and found that the overall correlation between the number of errors in a selective attention task and accident rate was $r = 0.31$.

Although studies indicated that there was a significant relationship between sensation seeking, selective attention, driver skills, driver behaviors and accident rates, the effects of the interaction between sensation seeking and selective attention on driving behaviors have not been investigated. However, a traffic accident is usually a result of interaction between personality traits (e.g., sensation seeking), and risky driving style (violations), and driver behavior and skills in the traffic situation. In the present study, the effect of the interaction between sensation seeking as a personality trait, and selective attention as a cognitive process was investigated on traffic violations and errors.

METHOD

Participants

Participants were 716 volunteer male drivers. The mean age of the participants was 36.59 years (range 20-61 years, SD = 7.59). Average annual kilometers driven were 22,755 km (range 100 – 150,000 km, SD = 20,742). They had been involved in 0.58 accidents on average (range 0-2, SD = 0.72) and received 0.59 offences, including dangerous overtaking, speeding, parking, crossing at red light, and others, on average (range 0-9, SD = 1.12).

Measures and Procedures

Participants were asked to respond to computer-based monotonous and selective attention tasks and were also asked to complete following questionnaires. Monotonous and selective attention tests were developed by the authors as a part of a project aimed at assessing the cognitive and psychomotor abilities of convicted drivers in Turkey.

Traffic Monotonous Attention Test (TMAT). The TMAT is a computer-based cancellation task, consisting of differently designed versions of a road traffic sign arranged in an 11X17 matrix. The task was to identify 50 target items randomly distributed within the matrix. The participants were given a maximum of 2.5 minutes to complete the task. The number of correct (hits), incorrect (commissions), and missing (omissions) responses and the time taken to complete the task were recorded for each participant.

Traffic Selective Attention Test (SAT). The SAT is also a computer-based task, consisting of 60 different visual stimuli; each stimulus involves 4X4 matrix of squares. A traffic sign filled the last three squares of the first row and column. The rest of the squares were unfilled. One of the traffic signs on the row and column was the same. The task of the participants was to point out the square displayed in the row and columns corresponding to the intersection of the same traffic sign as accurately and quickly as possible. Each matrix was presented for 3 sec. As in the TMAT, the number of correct (hits), incorrect (commissions), and missing (omissions) responses and the time taken to complete the task were recorded for each participant.

Driver Behaviors Questionnaire (DBQ). A Turkish version of the Driver Behavior Questionnaire (DBQ; Reason, et al., 1990) with additional items was used to measure driver behaviors (e.g., disregard the speed limit on a residential road). The DBQ was used in previous studies in Turkey on similar samples (e.g., Sumer, 2003). Participants were asked to indicate how often they committed each of the behaviors in the previous year on a six-point scale (0 = never, and 5 = nearly all the time). Factor analyses on the Turkish DBQ items yielded two interpretable components representing driving violations and inattention errors. Reliability coefficients were satisfactory for both subscales (α = .89 and .79, respectively).

Driver Skill Inventory (DSI). The DSI is a 20-item self-reported measure of perceptual motor and safety skills developed by Lajunen and Summala (1995). The DSI was translated into Turkish by previous researchers (Sumer & Ozkan, 2002) and shown to have high reliability and validity coefficients. Drivers were asked to rate how weak or strong they were on the given skills using 5-point scales (0 = very weak, and 4 = very strong). The DSI has two subscales, driving (perceptual-motor) skills (e.g., fluent driving) and safety skills (e.g., "conforming to the speed limits"). Reliability coefficients were satisfactory for both subscales (α. = .89 and .83, respectively).

Arnett Inventory of Sensation Seeking (AISS). The AISS was developed to measure the general sensation seeking tendencies of the participants (Arnett, 1994), consisting of two subscales: novelty and intensity. The wording of some items in the AISS was changed based on the findings of previous studies (Sumer, 2000); in addition, 4 items of thrill-seeking/risk-taking of the Multidimensional Self-Destructiveness Scale (MSS) (Persing & Schick, 1999) were added to assess the risk-taking levels of participants. Participants were asked to rate a total of 25 items on a 4-point scale (1 = describes me very well, and 4 = does not describe me at all). Factor analysis for 25 items suggested that a single factor solution with 19 items represented a better fit to the data, with an alpha coefficient of 0.85.

Demographic questionnaire. Participants also completed a demographic questionnaire including questions about their traffic accident history, traffic violation or offence tickets received in their last three years' driving, and their driving experiences, such as average speed on intercity motorways and on city roads.

RESULTS

In this study, monotonous and selective attention test scores of participants were categorized into four groups by using a median-split: Group 1 = low scores on both monotonous and selective attention tests, Group 2 = high scores on both monotonous and selective attention tests, Group 3

= low on monotonous attention and high on selective attention, and Group 4 = high on monotonous attention and low on selective attention. In addition, participants were classified into two groups regarding their total sensation seeking scores as low and high sensation seekers. Means and standart deviations for these categories according to traffic violations and errors are presented in Table 1.

Table 1. Means and Standard Deviations for Violations and Errors

		Attention Groups			
	Sensation Seeking	Group 1 Mean (Std.)	Group 2 Mean (Std.)	Group 3 Mean (Std.)	Group 4 Mean (Std.)
Violations	Low	14.71(12.50)	18.75 (11.81)	21.78 (14.53)	18.30 (14.89)
	High	14.22 (8.47)	26.52 (13.46)	16,71 (10.63)	17,267 (9.40)
Errors	Low	9.22 (6.30)	11.20 (8.12)	11.76 (8.11)	12.68 (7.93)
	High	10.12 (6.10)	14.03 (9.73)	8.43 (5.07)	9.80 (6.37)

Data were analyzed using 4 (attention groups) X 2 (sensation seeking groups) MANOVA for traffic violations and errors as dependent variables. MANOVA analyses indicated that the main effect of attention (Wilks' $\lambda = 7.76$, $p < .001$) and interaction effect between attention and sensation seeking (Wilks' $\lambda = 4.95$, $p < .001$) were significant. Univariate analysis for both violations and errors also yielded that the main effect of attention (Violations: $F(3, 591) = 13.84$, $p < .001$; Errors: $F(3, 591) = 5.25$, $p < .001$) was significant.

Post-hoc comparisons revealed that mean violation scores of Group 2 (high on both monotonous and selective attention) were higher than Group 1 (low on both monotonous and selective attention). However, Group 3 (low on monotonous attention and high on selective attention) and Group 4 (high on monotonous attention and low on selective attention) did not differ in terms of violation scores (Figure 1). Similar results were also obtained in the errors ratings. In addition, as illustrated in Figure 2, Group 4 reported significantly more traffic errors than Group 1.

According to univariate analysis, the interaction effects between attention and sensation seeking for violations ($F(3, 591) = 7.88$, $p < .001$) and errors ($F(3, 591) = 5.42$, $p < .001$) were significant. Obtained pattern of interactions are presented in Figures 3 and 4.

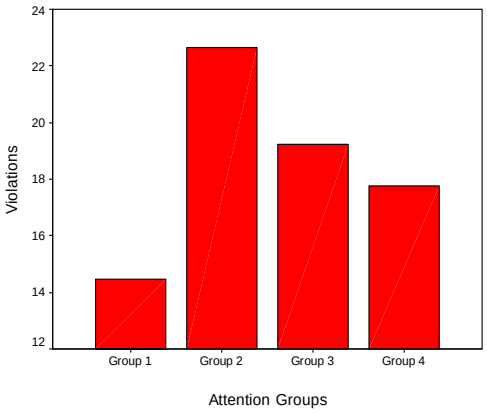

Figure 1. Mean Violations by Attention Groups

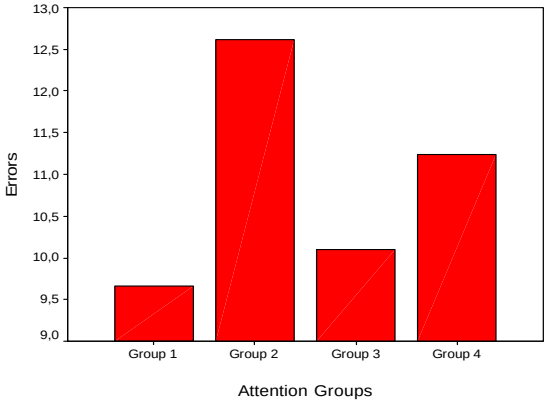

Figure 2. Mean Errors by Attention Groups

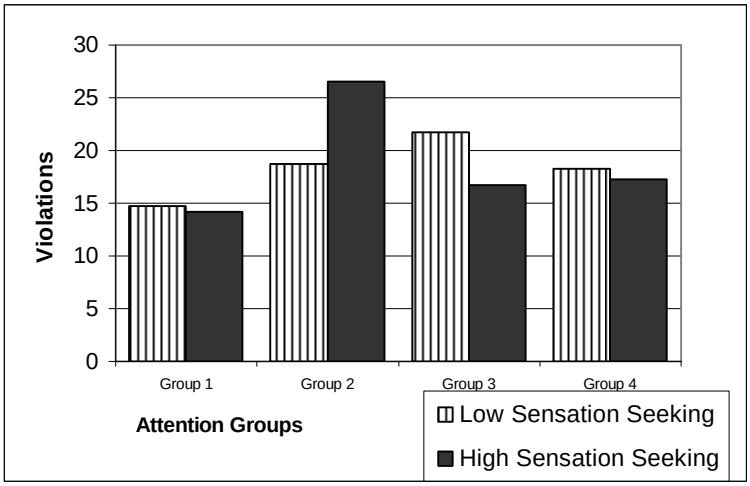

Figure 3. The Interaction Effect Between Attention and Sensation Seeking for Violations

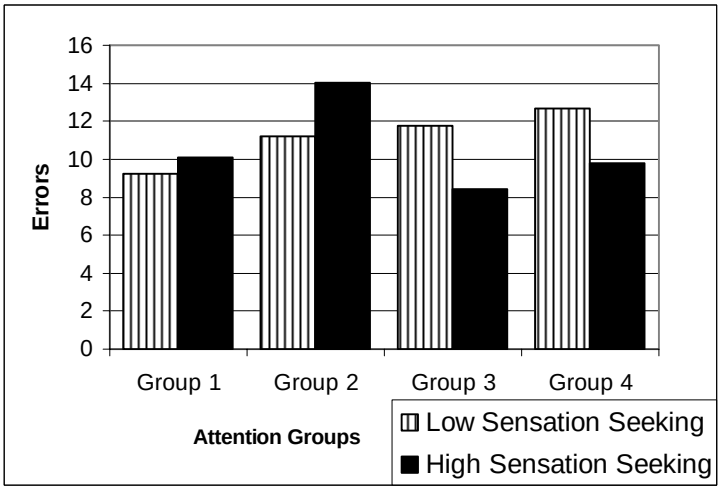

Figure 4. The Interaction Effect Between Attention and Sensation Seeking for Errors

As can be seen in Figures 3 and 4, further post-hoc analysis revealed that high sensation seekers with high monotonous and selective attention are more likely to have a higher number of traffic violations and errors than the other groups. We also performed a series of analyses on two subscales (driving and safety skills) of the DSI. The interaction effects between attention and sensation seeking were not obtained on the DSI scores. However, drivers with high sensation seeking indicated higher levels of driving skills ($M = 35.27$, $SD = 5.89$) than those with low sensation seeking ($M = 34.47$, $SD = 5.89$), $F(1, 586) = 8.97$, $p < .001$. Additionally, Group 2 (high on both monotonous and selective attention) reported lower levels of safety skills than the other attention groups, $F(3, 586) = 18.39$, $p < .001$.

DISCUSSION

Consistent with Ball and Zuckerman's findings (1992), results showed that high sensation seekers performed better on attention tasks than low sensation seekers. Results from this study also indicated that attention and sensation seeking are related to driver behaviors (traffic violations and errors) (see Table 1). It was shown that drivers who have a tendency to make traffic violations and errors possessed higher levels of monotonous and selective attention, and sensation seeking than those who had low levels of violations and errors. Since drivers with high attention levels reported lower levels of safety skills than other groups, and high sensation seekers reported higher levels of driving skills, it could be interpreted as an indication of drivers' overconfidence in their skills. Drivers with high sensation seeking and attention seemed to overestimate their own driving abilities while underestimating traffic hazards. Therefore, they were more likely to be risk takers in traffic situations. It means that those who committed driving violations possessed higher levels of attention and sensation seeking than those who had low levels of driving violations. In addition, they also seem to have a tendency to take more risks than those who possessed low levels of selective attention and sensation seeking. Drivers who had high levels of attention reported lower levels of driving skills than the other three groups. Since, they do not have higher levels of driving skills to compensate for their risky behaviors, they might have a relatively higher number of errors, accidents and offences (e.g., speeding) than the other groups. McKenna and Horswill (1998) suggested that drivers seemed to overestimate their own driving abilities while underestimating certain traffic hazards..

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