



Anger amongst Turkish drivers: Driving Anger Scale and its adapted, long and short version [☆]

Yesim Yasak^a, Burcu Esiyok^{b,*}

^aTSOF-Psikoteknik: Driver Selection and Rehabilitation Center, Menekse 2 Sk., 16/2, Kizilay, Ankara, Turkey

^bMedical School of Ankara University, Forensic Medicine Department, Ankara, Turkey

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ABSTRACT

Driver anger is a situation which has a negative impact on behaviours of drivers in traffic, distracts attention of drivers and causes the violation of rules and dangerous behaviours. Recently adopted regulations in Turkey have revealed the necessity to investigate the causes of violations in a framework of psychological evaluation. One aim of this study was to contribute to the development of psychological tools which could be used for psychological evaluation of drivers. To this aim, the reliability of Driving Anger Scale (DAS) for Turkish drivers, originally developed by Deffenbacher et al. [Deffenbacher, J.L., Oetting, E.R, Lynch, R.S., 1994. Development of a driving anger scale. *Psychological Reports* 74, 83–91], was investigated. The sample of the study included 200 Turkish drivers. The factor structure of the DAS replicated with Turkish driving. A number of relationships between DAS scores and some psychological symptoms (anxiety, hostility, etc.), and trait anger were also found. A 14-item short form of DAS which was correlated with DAS subscales, Brief Symptom Inventory (BSI), anger symptoms and anger-eliciting situations was developed. The results showed that DAS was a reliable and valid scale for Turkish culture.

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1. Introduction

Road traffic accidents endanger public health over the world. According to a report issued by WHO in 2004, 127 thousand people die and over 2.4 million people are injured or disabled due to traffic accidents in Europe every year. Road traffic accidents were the ninth most frequent cause of death in 1990, but it is predicted that they are likely to be the third most common cause of death in 2020 (Peden et al., 2004). In Turkey, there were 570,419 road traffic accidents, 3215 people died (only including the ones found dead at accident scenes) and 123,985 people were injured in 2005 (Traffic Statistics, 2005). Considering the fact that 4% of the injured die after accidents (Esiyok et al., 2005), about 9000 people die in Turkey every year. There have been no records about how many people are disabled or have psychological problems due to road traffic accidents in Turkey.

Data on road traffic accidents reveal that human factor plays an important role in 92–94% of the road traffic accidents (Evans, 2004). Human factor and driver psychology are associated with a range of subjects such as safe driving, personality traits and attitude. Anger, as a personality trait, is one of the most important issues which have been investigated extensively. Anger increases the

probability of risky driving behaviours such as driving too fast, flashing bright head lights and aggressive verbal or physical behaviours. These risky behaviours can increase the risk of accidents. Anger while driving, as Deffenbacher et al. (1994) emphasized, can interfere with the driving abilities such as attention, perception, information processing, and motor performance, which may cause an accident directly or indirectly. In their study, using Driving Anger Scale (DAS), the investigators asked the drivers to imagine some situations in traffic and to rate their anger level in each situation. Deffenbacher et al. (1994), divided the situations causing road anger into six different categories. These are “discourtesy” including the situations “someone cuts in front of you on the freeway, someone coming towards you at night does not dim their headlights, etc.”, “hostile gestures” including the situations “someone makes an obscene gesture towards you about your driving, someone honks at you about your driving, etc.”, “traffic obstruction” including the situations “you hit a deep pothole that was not marked, a truck kicks up sand or gravel on the car you are driving, etc.”, “slow driving” including the situations “someone is driving too slowly in the passing lane holding up traffic, a pedestrian walks slowly across the middle of the street, slowing you, etc.”, “police presence” including the situations “you pass a radar speed trap, a police car is driving in traffic close to you, etc.” and “illegal driving” including the situations “someone is weaving in and out of traffic, someone runs a red light or stop sign, etc.” These six subscales have been reported to show generally positive correlations with each other, which indicate a general trend for driving anger in addition

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* Corresponding author. Tel.: +90 3123191514.

E-mail address: burcuesiyok@yahoo.com (B. Esiyok).

to independent reactions to different types of situations. Deffenbacher et al. (1994) reported that Driving Anger Scale allowed measuring a personal trait, driving anger, which could help research on health risk. The results of their study regarding reliabilities of DAS showed that the scale was an internally consistent measure of the general trait, driving anger.

Results of another study using DAS (Deffenbacher et al., 2001) generally supported predictions from the state-trait theory and the construct validity of the Driving Anger Scale. That is, there was a positive relation between driving anger and anger in normal traffic, rush hour traffic, and being yelled at by another driver. In addition, there was a positive correlation between trait driving anger and crash-related conditions such as loss of concentration, loss of vehicular control, and close calls when driving (Deffenbacher et al., 2001). However, trait driving anger (DAS) was not found to be related to the number of times or miles driven in a day, but positively correlated with the frequency and intensity of state anger and the frequency of aggression and risky behaviour during driving. Furthermore, using The Trait Anger Scale and The Trait Anxiety Inventory, Deffenbacher et al. (2003b) reported that drivers with high road anger had higher-level anxiety and trait anger than those with low road anger.

There have been a number of other studies on road anger. Underwood et al. (1999) in their study on underlying causes and possible effects of driver anger found a significant relation between driver anger and the number of near accidents and illegal driving. Lajunen et al. (1998) adapted Driving Anger Scale (DAS) and obtained a new version of the scale including three dimensions reckless driving, direct hostility and impeded progress by others. They found that younger drivers and low mileage drivers tend to get angry more frequently than others. They did not report any gender differences. Lajunen and Parker (2001) performed another study on 270 British drivers. They advocated that the impacts of verbal aggressiveness on driver aggression were mediated by driver anger and that high anger drivers attempted more aggressive and risky behaviours on road and had less adaptive/constructive responses. They also added that high anger drivers felt angrier and had verbal and physical aggression when they were in high impedance situations and involved in more accidents than low anger drivers. Consistent with their results, other investigators also reached the conclusion that high anger drivers got angry more frequently (Deffenbacher et al., 2003a,b). In addition, to examine propensity for driving anger, Maxwell et al. (2005) worked with 245 British drivers and used Propensity for Angry Driving Scale (PADS) as a measurement tool. They found a relationship between aggression and driving violations. In fact, they reported that aggressive drivers commit more driving violations than non-aggressive drivers.

As shown above, investigations on the factors associated with driving anger have revealed psychological symptoms such as anxiety and hostility and trait anger. It has been reported in the literature that road anger is positively correlated with trait anger, hostile automatic thoughts, impulsiveness, and trait anxiety (Deffenbacher, 2000; Dahlen et al., 2005; Schwebel et al., 2006; Parkinson, 2001; Dahlen and White, 2006; Sumer, 2003).

One scale used to measure psychological symptoms in the literature concerning road anger is Brief Symptom Inventory (BSI). For example, using BSI a study on 295 Turkish professional drivers revealed significant positive correlations between BSI subscales “anxiety”, “depression”, hostility”, and “psychosis” and risky driving and trait anger (Sumer, 2003). Another scale used in some studies (Dahlen and White, 2006) is a 50-item International Personality Item Pool (IPIP), which was developed by Goldberg. Other relevant scales were The Big Inventory (BFI), developed by Benet-Martinez and John and Derryberry, and the short form of the Adult Temperament Questionnaire (ATQ), developed by Rothbart (Schwebel et al., 2006). One scale concerning trait anger is “the aggres-

sion questionnaire”, developed by Buss and Perry, and it has been used in several studies (Lajunen and Parker, 2001; Sumer, 2003). In some studies, State Anger Scale (SAS), Trait Anger Scale (TAS), State-Trait Anger Expression Inventory, developed by Spielberger, have been used (Deffenbacher et al., 2003a,b). In this study, apart from DAS, BSI was used to measure psychological symptoms. In fact, BSI, explained in detail in Methods, has been frequently used to measure psychological symptoms in Turkish population (Sumer, 2003; Balkaya and Sahin, 2003; Sahin et al., 2002). To measure trait anger, we used Multidimensional Anger Scale (MAS), the validity and reliability of which have been tested for Turkish population and which has been frequently used in recent years (Balkaya and Sahin, 2003; Batigun and Sahin, 2003; Batigun and Utku, 2006). Detailed information about MAS will be given in Methods.

There has been an increase in the number of studies on human factor and driver psychology in Turkey in the last ten years (Yasak, 1996). In addition, since the changes in “Highway Traffic Law” in 1997, driving licences of the drivers who commit such crimes such as speed violations and drunk driving have been seized. The law requires that these drivers should be exposed to psychological assessment. The assessment includes two steps. The first step determines whether the drivers have the abilities of safe driving and the second step determines whether drivers have reliable personality traits. Although many measurement tools for abilities of safe driving whose validities and reliabilities have been proved are available, there are few measurement tools for personality traits (Yasak, 2002). In fact, there is not a reliable and valid scale which can be used to determine any direct relations between trait anger and driver anger.

DAS, adapted into various cultures, is a scale used to measure driver anger. Although anger is a universal feeling, the things which cause anger vary with cultures. For example, Lajunen et al. (1998) using DAS in their study on British drivers found that the drivers got very low scores on the subscale “police presence” and omitted this subscale. Considering such variations between cultures, we wanted to know whether DAS could be used for Turkish population. The aim of this study was to investigate the underlying causes of road anger in Turkey and to adapt DAS, developed by Deffenbacher et al., for Turkish drivers.

2. Method

2.1. Participants

The study included 100 female and 100 male drivers aged between 21 years and 64 years (mean = 37.54, SD = 7.91). They participated voluntarily. “Snowball”, a sampling procedure based on the expansion of a group through the references of each participant, was used to form the study sample. Twenty participants who did not complete at least one scale were excluded from the study.

Twenty-seven percent of the participants graduated from primary, secondary or high school and 73% from university. Ninety-four percent of the drivers reported to drive an automobile. Seventy-nine percent of them drove their own vehicles, whereas 21% of the participants drove a company car. Driving experience of the subjects varied from 1 year to 40 years. The mean duration of driving experience was 11 years (SD = 6.85). Twenty-six percent of the drivers had a driving experience of 5 years, 52% 6 to 15 years and 22% 16 years and above. A hundred and four drivers (52%) noted that they were not fined in the last five years because of any traffic violations such as driving under the influence of alcohol, speeding violation, overtaking improperly, driving through a red light, parking fine, etc. In the last five years, 66.5% of them reported to have no accident; however,

25.5% of the respondents noted one accident and 8% of the respondents stated two and more.

2.2. Materials

The questionnaire consisted of questions about gender, age, education level, type of vehicle, duration of active driving (as year), annual mileage, number of accidents and number of traffic violation penalties over the past 5 years, driving anger, psychological symptoms and general anger. Driving anger was measured using a 33-item-version of the Driving Anger Scale (DAS), developed by Deffenbacher et al. (1994). As mentioned above, since drivers with high driving anger have significant high anxiety and trait anger, the Brief Symptom Inventory (BSI), the validity and reliability of which were confirmed for Turkish population, was used for measuring psychological symptoms in this study (Sahin and Durak, 1994). General anger, another dimension in this article, was measured by Multidimensional Anger Scale, developed by Balkaya (2001). Brief explanations of each inventory are given below.

2.2.1. Driving Anger Scale (DAS)

This scale was developed by Deffenbacher et al. (1994). Drivers are asked to imagine the situations that could happen to them and to rate their anger elicited by each. It is a five point likert scale. The score of each item ranges from 1 to 5 and the scale includes 33-items. DAS is composed of six factors and Cronbach Alpha Coefficients of the subscales ranges from 0.78 to 0.87. The subscales are called “Hostile Gestures”, “Illegal Driving”, “Police Presence”, “Slow Driving”, “Discourtesy” and “Traffic Obstructions”. Researchers also developed a short form of DAS. They selected items from each subscale that were highly correlated with the subscale. And these selected items also had substantial correlations with the total score on the long scale. As a result, the short scale was composed of 14 items which had an alpha reliability of .80. The total scale reliability was found to be .90, indicating that the scale provided an internally consistent measure of the general trait, driving anger.

2.2.2. Multidimensional Anger Scale (MAS)

MAS was developed by Balkaya (2001). It is a new and original scale which can measure anger on a multidimensional level. MAS is a five-point likert scale used for self-report. The score of each item ranges from 1 to 5. MAS contains five dimensions called “anger symptoms”, “anger eliciting situations”, “anger related cognitions”, “anger reactions” and “interpersonal anger”. In this study, the dimensions of “anger symptoms” and “anger eliciting situations” were used. “Anger Symptoms” ($\alpha = 0.83$) included 14 items about how often anger symptoms appear. “Anger Eliciting Situations” ($\alpha = 0.95$) included 41 situations that cause anger. The latter factor was composed of three subscales; namely, “not to be taken seriously” (20 items), “suffering from unfairness” (17 items) and “to be criticized” (5 items). Cronbach Alpha Coefficients of the subscales ranged from 0.64 to 0.92 (Balkaya and Sahin, 2003).

2.2.3. The Brief Symptom Inventory (BSI)

The Brief Symptom Inventory, which was adapted by Sahin and Durak (1994), is a scale used in psychopathological evaluations. The original version of BSI is SCL-90-R, developed by Derogatis (1992). SCL-90-R included 9 factors and 90 items. BSI, a short version of SCL-90-R, had 53 items with the highest factor loading. It is a five-point likert scale used for self-report. The score of each item ranges from 0 to 4. Increased total score means higher frequencies of symptoms. BSI consists of five factors: “anxiety” (13 items), “depression” (12 items), “negative self” (12 items), “somatization” (9 items), and “hostility” (7 items). Sahin and Durak (1994) reported that Cronbach Alpha Reliability of BSI was 0.96 and that

Cronbach Alpha Coefficients of BSI subscales ranged from 0.75 to 0.88 (Sahin and Durak, 1994).

2.3. Procedure

The aim of the study was introduced briefly to the respondents before the questionnaires were distributed. Participants completed the questionnaires almost in 50 min.

3. Results

Table 1 shows the mean and standard deviations of each DAS item. Table 2 shows the mean values obtained from the subscales of DAS in this study and other studies. In general, the mean values of the subscales obtained from Turkish drivers were compatible with those obtained from American drivers. However, there were differences in police presence (USA 3.0, Turkey 2.2) and illegal driving (USA 2.7, Turkey 3.5) between Turkish drivers and American drivers.

3.1. Factor analysis

To determine whether the original DAS, including 33 items, was reliable and valid for the Turkish population, and to reduce the data to categories, data obtained were subjected to Principal Component Analysis, and the items were exposed to factor analysis (Varimax Rotation). As a result, a total of six factors with the eigenvalues of more than 1 and factor loadings of more than .30 were determined. These six factors accounted for 62.24% of the total variance ($\alpha = .95$). The items for each factor were similar to those in the original scale. As a result, the first factor with 9 items was called “discourtesy”, accounting for the variance of 37.78%, and had an eigenvalue of 12.47 ($\alpha = .87$). Item 8 (Someone cuts in and takes the parking spot you have been waiting for) loaded on factor 2, was called “hostile gestures”. But based on its meaning, and Cronbach Alpha values of internal consistency analyses, item 8 was thought to belong to “discourtesy” and was included in that factor. Factor 2 included 3 items, which was responsible for 7.35% of the total variance ($\alpha = .81$) and had an eigenvalue of 2.43. Factor 3, called “traffic obstruction”, included 7 items, accounted for 4.99% ($\alpha = .85$) of the total variance and had an eigenvalue of 1.65. Unlike the original scale, in this study, item 22 (you hit a deep pothole that was not marked) did not load on factor 3. However, based on its meaning, it was thought to belong to this factor. As in item 8, item 22, as a result of Cronbach Alpha internal consistency analyses, was included in factor 3. Factor 4, called “Slow driving”, included 6 items, accounted for 4.83% ($\alpha = .84$) of the total variance and had an eigenvalue of 1.60. Factor 5, called “Police presence”, was composed of 4 items, was responsible for 3.88% ($\alpha = .73$) of the total variance and had an eigenvalue of 1.28. However, item 33 (A police car is driving in traffic close to you) did not load on factor 5. But based on its meaning, it was thought to be under factor 5. And as in items 8 and 22, as a result of Cronbach Alpha internal consistency analyses, we kept item 33 under factor 5. Factor 6, called “Illegal driving”, was comprised of 4 items and responsible for 3.40% ($\alpha = .79$) of the total variance and had an eigenvalue of 1.12.

3.2. The relationship between driving anger and other dimensions

Table 3 shows correlation coefficients obtained from the subscales of DAS.

As shown in Table 3, there were significant correlations [ranging from $r = .35$ ($p < .01$) to $r = .72$ ($p < .01$)] between the subscales of DAS. As expected, there were positive correlations among the subscale scores and total DAS score. Moreover, Table 4

Table 1
Mean scores from driving anger scale items and their SDs

Item no.	Item	Mean	SD
<i>Hostile gestures</i>			
21 ^a	Someone makes an obscene gesture toward you about your driving	3.80	1.15
23	Someone honks at you about your driving	3.27	1.12
26	Someone yells at you about your driving	3.19	1.11
	Average	3.42	0.96
<i>Illegal driving</i>			
2	Someone is driving too fast for the road conditions	3.20	1.16
6	Someone is weaving in and out of traffic	3.93	1.02
13	Someone runs a red light or stop sign	3.72	1.11
24	Someone is driving way over the speed limit	3.15	1.18
	Average	3.50	0.88
<i>Police presence</i>			
11	You see a police car watching traffic from a hidden position	1.94	1.06
16	You pass a radar speed trap	2.57	1.15
27	A police officer pulls you over	2.08	1.06
33	A police car is driving in traffic close to you	2.30	1.19
	Average	2.22	0.83
<i>Slow driving</i>			
1	Someone in front of you does not start up when the light turns green	2.35	0.91
3	A pedestrian walks slowly across the middle of the street, slowing you	2.79	1.01
4	Someone is driving too slowly in the passing lane holding up traffic	3.25	1.09
9	Someone is driving slower than reasonable for the traffic flow	2.78	1.06
10	A slow vehicle on a mountain road will not pull over and let people by	3.42	1.03
18	Someone is slow in parking and holding up traffic	2.70	1.11
	Average	2.88	0.77
<i>Discourtesy</i>			
5	Someone is driving right up on your back bumper	3.64	1.01
7	Someone cuts in front of you on the freeway	3.86	1.00
8	Someone cuts in and takes the parking spot you have been waiting for	3.56	1.14
12	Someone backs right out in front of you without looking	3.76	1.04
14	Someone coming toward you at night does not dim their headlights	3.80	1.00
15	At night someone is driving right behind you with bright lights on	3.89	1.04
17	Someone speeds up when you try to pass them	3.20	1.13
20	Someone pulls right in front of you when there is no one behind you	3.64	1.08
32	A bicyclist is riding in the middle of the lane and slowing traffic	3.18	1.15
	Average	3.61	0.74
<i>Traffic obstruction</i>			
19	You are stuck in a traffic jam	2.89	1.11
22	You hit a deep pothole that was not marked	3.86	1.08
25	You are driving behind a truck which is material flapping around in the back	3.16	1.20
28	You are behind a vehicle that is smoking badly or giving off diesel fumes	2.99	1.12
29	A truck kicks up sand or gravel on the car you are driving	3.55	1.13
30	You are behind a large truck and cannot see around it	2.91	1.20
31	You encounter road construction and detours	2.36	1.09
	Average	3.10	0.83

^a Note: The number before the item indicates the number in the item sequence in the questionnaire sheet.

Table 2

Mean Scores of DAS Factors from the USA (Deffenbacher et al., 1994), the UK (Lajunen et al., 1998), NZ (Sullman, 2006) and Turkey

	Number of items	USA	UK	NZ	Turkey
Discourtesy	9	3.9	2.7	3.5	3.6
Traffic obstructions	7	3.3	2.0	2.7	3.1
Hostile gestures	3	3.2	2.3	2.7	3.4
Slow driving	6	3.2	2.0	2.8	2.9
Police presence	4	3.0	1.4	1.9	2.2
Illegal driving	4	2.7	2.3	3.3	3.5

Note: USA: United States of America; UK: United Kingdom; NZ: New Zealand.

Table 3

Pearson correlations of subscales of DAS

Subscales of DAS	1	2	3	4	5	6	7
1. Hostile gestures	–	.49*	.49*	.55*	.63*	.63*	.75*
2. Illegal driving		–	.35*	.52*	.66*	.56*	.73*
3. Police presence			–	.54*	.50*	.63*	.70*
4. Slow driving				–	.71*	.63*	.83*
5. Discourtesy					–	.72*	.90*
6. Traffic obstructions						–	.88*
7. DAS total							–

* $p < .01$.

demonstrates correlations between total DAS, its subscales and total BSI, anger symptoms, and anger-eliciting situations scores.

As demonstrated in Table 4, there were significant and positive correlations [ranging from $r = .14$ ($p < .05$) to $r = .54$ ($p < .01$)] between subscale scores of DAS and scores of other scales. “Depression” and “somatization” subscales of BSI were the subscales with the least number of correlations. In fact, there was a significant and positive correlation between “somatization” and “police presence” and “slow driving”. As for the “depression” subscale, there was a significant and positive correlation between “depression” and “hostile gestures”, “illegal driving”, and total DAS scores. There were also significant and positive correlations between “anger-eliciting situations” and DAS and its subscales. The correlations between anger symptoms and DAS and its subscales except for illegal driving were positive and significant. Anger symptoms had the highest correlation with slow driving.

3.3. Demographics and descriptive variables

Effects of gender, age, education, crash involvement, being fined and duration of driving experience on DAS, BSI, anger symptoms and anger-eliciting situations were investigated. A multivariate analysis of variance (MANOVA) with repeated measures showed that gender did not have statistically significant effects on the DAS total and DAS subscales scores, anger symptoms and anger-eliciting situation scores. However, gender was found to have small but significant effects on BSI subscales of negative self and hostility. In fact, males reported more negative self (female: $M = 5.12$, $SD = 4.10$; male: $M = 6.89$, $SD = 5.11$) ($F(1, 198) = 7.30$, $p < .01$, $\eta^2 = .04$) and more hostility (female: $M = 4.13$, $SD = 3.06$; male: $M = 5.27$, $SD = 3.19$) ($F(1, 198) = 6.64$, $p < .05$, $\eta^2 = .03$) than females.

One-way ANOVA was conducted to determine the effect of age as an independent variable on driving anger, psychological symptoms and trait anger as dependent variables. Age was found to have a small but significant effect on the BSI subscale of depression only. Indeed, Turkey post hoc comparisons revealed that participants aged between 21 years and 30 years ($M = 8.65$, $SD = 5.84$) had significantly higher scores of depression [$F(2, 197) = 3.46$, $p < .05$, $\eta^2 = .03$] than those aged 41 years or over ($M = 5.92$, $SD = 5.43$).

Table 4
Pearson correlations between subscales of DAS and other scales

	Hostile gestures	Illegal driving	Police presence	Slow driving	Discourtesy	Traffic obstructions	DAS total
<i>Subscales of BSI</i>							
Anxiety	.23**	–	.19**	.19**	.16*	.17*	.21**
Depression	.14*	.15*	–	–	–	–	.15*
Negative self image	.24**	–	–	.24**	.17*	–	.21**
Somatization	–	–	.19**	.15*	–	–	–
Hostility	.21**	.16*	.18**	.29**	.22**	.17*	.25**
BSI total	.20**	.14*	.18**	.22**	.17*	.14*	.21**
Anger symptoms	.23**	–	.22**	.24**	.21**	.19**	.25**
<i>Anger-eliciting situations</i>							
Not to be taken seriously	.38**	.44**	.31**	.48**	.50**	.41**	.53**
Suffering from unfairness	.35**	.48**	.19**	.42**	.56**	.37**	.50**
To be criticized	.49**	.43**	.36**	.43**	.50**	.42**	.54**

* $p < .05$.

** $p < .01$.

A multivariate analysis of variance (MANOVA) with repeated measures was made to determine whether education had an effect on DAS, BSI, anger symptoms and anger-eliciting situations. Thus, participants were distributed into two groups by their education levels: primary, secondary and high school graduates and university graduates. Education was found to have a small effect on the “slow driving” subscale of DAS ($F(1, 198) = 8.21, p < .01, \eta^2 = .04$). Results revealed that the former group of drivers had significantly higher scores of slow driving than university graduates (primary, secondary and high school graduates: $M = 18.80, SD = 4.56$; university graduates: $M = 16.72, SD = 4.55$). In other words, primary, secondary and high school graduates became angrier with slow drivers than university graduates. However, primary, secondary and high school graduates had significantly higher scores of “negative self” [primary, secondary and high school: $M = 7.39, SD = 4.93$; university: $M = 5.49, SD = 4.53$ ($F(1, 198) = 6.58, p < .05, \eta^2 = .03$)] and “hostility” [primary, secondary and high school: $M = 5.81, SD = 3.29$; university: $M = 4.29, SD = 3.04$ ($F(1, 198) = 9.53, p < .01, \eta^2 = .05$)] subscales of BSI than university graduates. In addition, primary, secondary and high school graduates had significantly higher scores of “not to be taken seriously” dimension of “anger-eliciting situation subscale” than university graduates [primary, secondary and high school: $M = 71.37, SD = 15.36$; university: $M = 65.15, SD = 17.41$] ($F(1, 198) = 5.35, p < .05, \eta^2 = .03$). That is to say, primary, secondary and high school graduates became angrier when they believed that they were not taken seriously, and they had more symptoms of negative self and hostility compared to university graduates.

There were no differences in “crash involvement in the past 5 years” between DAS and its subscales. However, a multivariate analysis of variance (MANOVA) with repeated measures showed that “being fined” had a statistically small but significant effect on “illegal driving” subscale of DAS. In fact, drivers not fined ($M = 14.50, SD = 3.51$) had significantly higher scores of illegal driving than those fined [($M = 13.42, SD = 3.46$) ($F(1, 198) = 4.82, p < .05, \eta^2 = .02$)]. That is, drivers not fined for illegal driving such as crossing through a red light, overtaking improperly and violating the speed limits were angrier at drivers who drove illegally than those fined.

One-way ANOVA was performed to determine the effect of “driving experience” as an independent variable on driving anger, psychological symptoms and trait anger as dependent variables. Duration of driving experience was found to have a small but significant effect on the DAS subscale of “hostile gestures”. Tukey post hoc comparisons revealed that drivers with a five-year driving experience had significantly lower scores of “hostile gestures” ($M = 9.25, SD = 3.16$) than those with a 6–15-year experience ($M = 10.62, SD = 2.66$) [$F(2, 197) = 4.42, p < .05, \eta^2 = .04$]. In other

words, drivers with a 5-year experience got less angry at drivers who showed “hostile gestures”. “Driving experience” was also found to have a small significant effect on the DAS subscale of “police presence” [$F(2, 197) = 3.54, p < .05, \eta^2 = .04$]. However, post hoc comparisons did not reveal any significant difference between the groups, though more experienced drivers had a higher tendency to get angry with police presence than others.

3.4. Turkish version of DAS short form

In view of the results obtained so far and Cronbach Alpha internal consistency coefficient for the long form of DAS with 33 items, the scale was shortened. To this aim, the items which had correlations of $r = .70$ and over with DAS items and DAS subscales were selected. In addition, the items of DAS which showed correlations of $r = .30$ and over with BSI, anger symptoms and anger-eliciting situations were determined. Finally, 14 items that fulfilled both criteria were determined and the short form of DAS was developed. Table 5 shows DAS items which took place in the short form of DAS. Cronbach Alpha reliability of this short form of DAS was found to be .91.

Table 5

DAS items which were correlated with DAS subscales, BSI subscales, anger symptoms and anger-eliciting situations

Item number and items	Subscale of long form
4. Someone is driving too slowly in the passing lane holding up traffic	Slow driving
6. Someone is weaving in and out of traffic	Illegal driving
9. Someone is driving slower than reasonable for the traffic flow	Slow driving
10. A slow vehicle on a mountain road will not pull over and let people by	Slow driving
13. Someone runs a red light or stop sign	Illegal driving
14. Someone coming toward you at night does not dim their headlights	Discourtesy
15. At night someone is driving right behind you with bright lights on	Discourtesy
17. Someone speeds up when you try to pass them	Discourtesy
18. Someone is slow in parking and holding up traffic	Slow driving
20. Someone pulls right in front of you when there is no one behind you	Discourtesy
21. Someone makes an obscene gesture toward you about your driving	Hostile gestures
24. Someone is driving way over the speed limit	Illegal driving
26. Someone yells at you about your driving	Hostile gestures
29. A truck kicks up sand or gravel on the car you are driving	Traffic obstruction

Table 6
Pearson correlations of Adapted, Turkish Version of Short Form of DAS

	Turkish version of short form total	DAS total
<i>DAS</i>		
Hostile gestures	.74**	.75**
Illegal driving	.77**	.73**
Police presence	.55**	.70**
Slow driving	.81**	.83**
Discourtesy	.92**	.90**
Traffic obstructions	.79**	.88**
DAS total	.96**	
<i>BSI</i>		
Anxiety	.17*	.21**
Depression	–	.15*
Negative self-image	.21**	.21**
Somatization	–	–
Hostility	.24**	.25**
BSI total	.19**	.21**
Anger Symptoms	.20**	.25**
<i>Anger-eliciting situations</i>		
Not to be taken seriously	.54**	.53**
Suffering from unfairness	.55**	.50**
To be criticized	.53**	.54**

* $p < .05$.

** $p < .01$.

Table 6 shows correlations between the Turkish short version of DAS and the long form of DAS, BSI, subscales of BSI, anger symptoms and subscales of anger-eliciting situations. As shown in the table, correlation coefficients of the short form and those of the long form and the subscales were similar. In addition, the correlation coefficient between the total scores of short and long DAS was $r = .96$ ($p < .01$).

4. Discussion

The results of this study showed that DAS with its 33 items was a scale with high reliability and could be used for Turkish population to measure a personal trait, driving anger.

Factor analyses revealed that the six factor structure of DAS—Traffic obstruction, illegal driving, police presence, slow driving, discourtesy and hostile gestures—were similar to that of DAS developed by Deffenbacher et al. (1994). DAS was used in a study from the UK (Lajunen et al., 1998), but its subscale “Police Presence” was omitted and the scale included three factors with 21 items. In another study from New Zealand, the number of DAS items was the same, but the scale had four factors (Sullman, 2006). In this study, the factor structure of the scale was preserved, but the scale was shortened and this short version included 14 items which were highly correlated with DAS subscales, and correlated with psychological symptoms, anger symptoms and anger-eliciting situations. Seven items of this short form were also used in a short form of DAS with 14 items developed by Deffenbacher et al. (1994). High correlations between the adapted, short version of DAS for Turkish drivers and the long form of DAS and other scales and the high alpha reliability indicated that the Turkish short version of DAS could be used in further studies.

There were no effects of gender, age and crash involvement on DAS and its subscales. Deffenbacher et al. (1994) and Lajunen et al. (1998) noted some gender effects, but they pointed out that this gender effect on total DAS scores was not significant and not systematic. Sullman (2006) reported higher anger levels among female drivers. But in this study no gender effects on driving anger were found, which is consistent with the results of the studies from the UK, the USA and Turkey (Esiyok et al., 2007). However, the way anger is expressed may differ between genders. In fact, in a study by Esiyok et al. (2007), male drivers had higher scores for express-

ing anger through body language, which is consistent with the results of studies by Deffenbacher et al. (2002b).

This study did not reveal an impact of age on driving anger. There have already been some contradictory findings related to an impact of age on driving anger. Both Lajunen et al. (1998) and Sullman (2006) reported a negative correlation between age and anger. The sample of the study by Deffenbacher et al. (1994) included only university students and therefore they did not investigate effects of age on driving anger. However, using DAS, Parkinson (2001) in his study on 113 drivers with a mean age of 30.04 years reported that age was not correlated with either driving anger or driving aggression scales. In this study, the results related to age is consistent with the results of the study by Parkinson.

There have been studies with conflicting results on the relation between driving anger and crash involvement. Several investigators studied the relation between road anger and types of accidents and the feeling of responsibility for the accident and drew the conclusion that drivers getting angrier more frequently violated traffic rules and caused accidents (Underwood et al., 1999; Deffenbacher et al., 2003b; Lajunen et al., 1998). However, other investigators reported that driver anger was not related to the number of crash involvement (Deffenbacher et al., 2001; Sullman, 2006), which is consistent with the results of the present study.

Getting fined for speeding violations, driving under the influence of alcohol, driving through a red light, overtaking improperly and not wearing a seat-belt etc may indicate risky driving behaviours. In this study, drivers not fined in the past five years had higher scores of the DAS subscale “illegal driving,” which is comparable to the results of the studies by Deffenbacher et al. (2003a) and Sullman (2006). In other words, drivers who violated traffic rules and had fines were indifferent to traffic violations of other drivers. This indifference may result from a belief that traffic rules have to be obeyed, but that actually people never have respect for them, which was also found by Yasak and Oner in their study on values and traffic rules in 1999.

As for the impact of driving experience on driving anger, drivers with a five-year-driving experience got less angry with aggressive behaviour of other drivers than drivers with a six-to-fifteen-year-driving experience, which is consistent with the results of a study by Sullman (2006). It may be that being less experienced causes anxiety and low self-confidence and therefore that less experienced drivers do not get so angry with aggressiveness of other drivers. However, it is claimed that young and inexperienced drivers are more tolerant with deviant behaviours. In a study by Parker et al. (1992), young drivers were found to be relatively more tolerant with traffic violations than old drivers and they believe that it is not possible not to violate rules in traffic.

In this study, primary, secondary and high school graduates had higher scores of the DAS subscale “slow driving” and the subscales “negative self image” and “hostility” of other scales than university graduates and they thought that they were not taken seriously. Their anger at slow drivers might have resulted from how they felt about themselves. Studies using DAS have not analyzed the effects of education on driving anger (e.g., Underwood et al., 1999; Deffenbacher et al., 1994, 2003a; Lajunen et al., 1998; Sullman, 2006). In Turkey there is a general opinion that drivers should have a higher education level to prevent road traffic accidents (GNAT, 2004, 2006). It is believed that a higher education level can be the key to safe driving. However, several studies on traffic violations and crash involvement among Turkish drivers revealed that as the education level increased and so did traffic violations (Yigit-Isik and Yasak, 1997; Sumer et al., 2006). This finding about education may clarify the contradiction between the common belief in Turkish traffic culture and scientific research findings. In fact, like the other demographic variables, education should be considered multidimensional as one of the many aspects of safe driving.

There were significant inter-correlations among the subscales of DAS, BSI and MAS. In fact, as total BSI score increased and so did all DAS subscale scores. There was a significant correlation between “anger symptoms” and all DAS subscales except for “illegal driving”. All subscale scores of “anger-eliciting situations” increased and so did all subscale scores of DAS, which is consistent with the results of a study by Deffenbacher (2000). Overall, correlation analyses revealed that there was a weak but significant relation between BSI and DAS subscales, but that there were relatively strong correlations between anger symptoms and anger-eliciting situations and DAS subscales. Other researchers who investigated the relation between psychological symptoms and driving anger also emphasized that driving anger is positively correlated with trait anger, hostile automatic thoughts, impulsiveness, and trait anxiety (Deffenbacher, 2000; Dahlen et al., 2005; Schwebel et al., 2006; Parkinson, 2001; Dahlen and White, 2006). As shown above, the results of the present study were consistent with the literature. This is the first study on the adaptation of DAS for Turkish population. It is clear that the relation between driving anger and personality traits concerning traffic and drivers’ attitude and behaviour as well as trait anger and psychological symptoms should be investigated in detail.

To conclude, DAS with its six factors is a reliable scale which can be used for Turkish drivers. Thirty-three items of the scale can also be decreased. Its short form with 14 items are highly correlated with subscales of DAS and correlated with psychological symptoms, anger symptoms and anger-eliciting situations. Furthermore, some factors which could be the underlying driving anger are the psychological symptoms of “anxiety”, “hostility”, “anger symptoms”, and anger-eliciting situations of “to be criticized”, “suffering from unfairness”, “not to be taken seriously”. As a result, DAS can be used to determine drivers who habitually violate traffic rules and to select and evaluate safe drivers. Regarding driver improvement courses and attitude change programs, DAS can also be used to determine road anger levels and accordingly high anger drivers can be trained for coping strategies against road anger. If drivers learn how to overcome road anger, they will be less likely to violate the rules and they will become safer drivers (Deffenbacher et al., 2003a, 2002a).

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