

Anger Expression on the Road: Validity and Reliability of the Driving Anger Expression Inventory

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Abstract

Purpose: The purpose of the current study was to check the validity and reliability of DAX (The Driving Anger Expression Inventory) in a Turkish population.

Method: The study included 220 randomly chosen drivers between the ages of 20 and 65 years from Ankara, Istanbul, and Samsun. The assessment instruments were DAX, The Driving Anger Scale, Brief Symptom Inventory, and the anger symptoms dimension, anger reactions dimension, and anger-eliciting situations dimension of the Multidimensional Anger Scale.

Results: Psychometric analyses of the scale showed that the Turkish-adapted DAX has the same factor structure and, like the original DAX, consists of 4 subscales and 1 index. The analyses revealed that male drivers between 21 and 30 years old reported more physically aggressive expression and that they used their vehicle to express anger, whereas female drivers reported more adaptive/constructive expression. Furthermore, it was found that drivers who were university graduates expressed their anger verbally when driving, while drivers who were primary and secondary school graduates expressed anger physically. Regression analyses showed that traffic violation penalty, police presence, discourteous or disrespectful behavior to other drivers, and driving slow were predictive variables for total aggressive expression (verbal, physical aggressive expression, and using of the vehicle to express anger).

Conclusion: The current study revealed that the Turkish version of DAX might be a valid and reliable scale to measure forms of anger expression related to driving and important signs related to coping with driving-related anger were identified. Furthermore, it can be suggested that DAX could be used as an assessment instrument for driver selection, and it can be used during the psycho-technical assessment procedure.

Key Words: Anger, driver behaviors, road rage, driver anger expression

INTRODUCTION

Anger is a fundamental human emotion, which develops during the first years of life (Lewis, Alessandri, and Sullivan, 1990). When describing characteristics of anger, Deffenbacher and Stark (1992) proposed that anger is not an emotion created as a result of a planned action, but an inherent emotion that is expressed without much difficulty, is experienced by everyone, and has many forms. In addition, although the feeling that results in an anger reaction is psychologically stimulating and makes an individual stronger, at the same time it makes the individual more fragile. Deffenbacher and Stark (1992) stated that anger reactions are behaviors learned throughout the course of life, and therefore,

incorrect and harmful behaviors can be replaced with healthy ones. Moreover, they suggested that anger could suddenly arise in various situations, such as inhibition, injustice, and disappointment, and it is unhealthy to suppress or immediately express anger, and therefore, it is very important to understand the situations that lead to anger and acknowledge them.

Recently, traffic rage has become one of the most fundamental problems in the daily lives of the people living in big cities. Aggressive drivers and their actions directed towards other drivers have received much attention by the media. The term traffic monster, which has been used frequently by the media since the beginning of the 1990's, describes a driver who cannot control his/her

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anger and violates traffic laws, which results in an accident. In a study that explores the causes of anger in drivers, it was found that drivers who become angry in situations, such as not being taken seriously, suffering from unfairness, and being criticized, and individuals with severe psychological symptoms experience more anger in traffic (Yasak, Eşiyok, Korkusuz, Başbulut, and Oral, 2005). In their study that evaluated the state trait theory in terms of traffic-related anger, Deffenbacher, Lynch, Oetting, and Yingling (2001) reported that individuals with trait traffic anger as a personality characteristic are prone to be continuously angry while driving. The authors reported that this tendency, which is not directly related to the accident rate, is related to situations that result in accidents, such as loss of concentration and loss of control of the vehicle. Another study reported that individuals who have more anger symptoms when driving are more violent in comparison to others, display more risky behaviors that result in accidents, and use less adaptive/constructive anger expressions, such as driving more carefully and thinking about results before responding to the other driver. (Deffenbacher, Lynch, Filetti, Dahlen, and Oetting, 2003). Deffenbacher et al. (2002) found that there are 4 different types of anger expression in traffic: 1. Verbally aggressive expression, such as yelling to the other driver and asking questions such as, "where did you get your license?"; 2. Physically aggressive expression, which generally includes hostile behaviors, such as flipping "the finger" to the other driver and opening the car window in order to express anger; 3. Use of the vehicle to express anger with the aim of threatening the other driver with the vehicle, such as driving very close to the other car's bumper and accelerating more than usual; 4. Adaptive/constructive expressions, such as being more careful in order to be a safer driver, thinking about outcomes before responding to the situation, etc., which involve cognitive and behavioral strategies like driving safely, problem solving, lack of concentration, and thinking about the situation. The first 3 of these anger expressions, which are called hostile expressions of anger, were found to be related to hostility and risky behaviors. Adaptive/constructive expression was found to be negatively related to these variables. Researchers concluded that these expression styles are reliable and valid for understanding driving behaviors (Deffenbacher et al., 2002). In a study conducted with both high-level anger and low-level anger drivers who had been driving for the same amount of years, it was found that drivers with high levels of anger experienced intense and frequent anger, were more hostile when driving, displayed dangerous behaviors, engaged in illegal driving, and used

less adaptive/constructive anger expression (Deffenbacher, Deffenbacher, Lynch, and Richards, 2003).

The aims of the present study were to investigate how Turkish drivers express their anger toward others drivers and to determine whether the Driving Anger Expression Inventory (DAX), which measures how drivers express anger, is a valid and reliable scale for use in Turkey.

METHOD

Sample

The study sample included drivers from Ankara, Istanbul, and Samsun with at least one year of driving experience. In determining the sample, snowball sampling, a non-probability sampling method based on expanding the group with the referrals of existing subjects, was employed (Cozby, 1993; Bailey, 1987). Having a driver's license and using any vehicle, independent of its duration, were the inclusion criteria. A total of 250 individuals volunteered to participate in the study, 30 of which were excluded, as they did not complete at least 1 of the 4 scales. Therefore, the sample included 220 drivers between the ages of 20 and 64 years. Mean age was 36.96 years (SD = 8.35 years). The study group included 110 (50%) women and 110 (50%) men; 25.9% (n = 57) were primary school and high school graduates, and 74.1% (n = 163) were university graduates. Among the drivers, 94.5% reported that they drive a car and 5.5% reported that they drive a van or service van. Driving experience among the study group was 5 years (28.8%), 6-15 years (51.4%), and 16 or more years (20.5%). In all, 148 of the drivers (67.3%) reported no involvement in an accident in the last 5 years and 72 (32.7%) reported at least one accident; 52.7% of the sample had no traffic fines in the last 5 years, while 47.3% did, due to overtaking improperly, exceeding the speed limit, or running a red light.

Instruments

Brief Symptom Inventory (BSI)

The Brief Symptom Inventory (BSI) was developed by Derogatis (1992) for screening various psychological symptoms. BSI is the short form of the SCL-90-R 90-item symptom checklist. The brief form was developed by selecting 53 of the 90 items that had the highest factor loads in SCL-90-R. It is a self-report scale scored between 0 and 4. High scores indicate frequent psychological symptoms. Five factors were found in the Turkish adaptation of the scale (Şahin and Durak, 1994). These

Table I. Factor structure of DAX.

Item	Factor 1	Factor 2	Factor 3	Factor 4
1. I give the other driver the finger		0.36		
2. I drive right up on the other driver's bumper				0.31
3. I drive a little faster than I was				0.49
4. I try to cut in front of the other driver				0.45
5. I call the other driver names aloud	0.67			
6. I make negative comments about the other driver	0.71			
7. I follow right behind the other driver for a long time				0.33
8. I try to get out of the car and tell the other driver off		0.73		
9. I yell questions like "Where did you get your license?"	0.41			
10. I roll down the window to help communicate my anger		0.52		
11. I glare at the other driver	0.67			
12. I shake my fist at the other driver		0.47		
13. I stick my tongue out at the other driver		0.46		
14. I call the other driver names under my breath	0.66			
15. I speed up to frustrate the other driver				0.60
16. I purposely block the other driver from doing what he/she wants to do				0.57
17. I bump the other driver's bumper with mine		0.44		
19. I leave my brights on in the other driver's rear view mirror				0.24
20. I try to force the other driver to the side of the road		0.71		
21. I try to scare the other driver		0.70		
22. I do to other drivers what they did to me				0.25
23. I pay even closer attention to being a safe driver			0.38	
24. I think about things that distract me from thinking about the other driver			0.51	
25. I think things through before I respond			0.57	
26. I try to think of positive solutions to deal with the situation			0.65	
27. I drive a lot faster than I was				0.53
28. I swear at the other driver aloud	0.54			
29. I tell myself its not worth getting all mad about			0.66	
30. I decide not to stoop to their level			0.58	
31. I swear at the other driver under my breath	0.66			

factors are anxiety (13 items), depression (12 items), negative self (12 items), somatization (9 items), and hostility (7 items). In 3 separate studies conducted by Şahin and Durak (1994), Cronbach's alpha internal consistency coefficients of the total scores ranged between 0.96 and 0.95, and coefficients for the subscales ranged from 0.75 to 0.88. Cronbach's alpha reliability coefficients of

the subscales of the scale for this sample ranged between 0.67 and 0.85.

Multidimensional Anger Scale (MAS):

Balkaya (2001) developed MAS in order to determine the emotions, thoughts, and attitudes towards anger; it

Table 1 Continued

Item	Factor 1	Factor 2	Factor 3	Factor 4
32. I turn on the radio or music to calm down			0.35	
34. I make hostile gestures other than giving the finger		.59		
35. I try to think of positive things to do			.74	
36. I tell myself it's not worth getting involved in			.75	
37. I shake my head at the other driver	.55			
38. I yell at the other driver	.63			
39. I make negative comments about the other driver under my breath	.69			
40. I give the other driver a dirty look	.69			
41. I try to get out of the car and have a physical fight with the other driver		.63		
42. I just try to accept that there are bad drivers on the road			.63	
43. I think things like "Where did you get your license?"	.51			
44. I do things like take deep breaths to calm down			.48	
45. I just try and accept that there are frustrating situations while driving			.68	
46. I slow down to frustrate the other driver				.27
47. I think about things that distract me from the frustration on the road			.63	
48. I tell myself to ignore it			.66	
49. I pay even closer attention to other's driving to avoid accidents			.45	

includes 5 parts. The Likert-type scale is scored between 1 and 5. In the present study, the anger symptoms and anger-eliciting situations dimensions of the scale were used. In the anger symptoms dimension ($\alpha = 0.83$) there are 14 items that include anger symptoms and their frequencies related to anger. In the anger-eliciting situations dimension ($\alpha = 0.95$) a total 41 expressions that might lead to anger are listed and the degree of anger towards the situations is measured. The sub-dimensions found in the factor analysis were: not being taken seriously (20 items), suffering from unfairness (17 items), and being criticized (5 items). Cronbach's alpha reliability coefficients of these subscales range from 0.64 to 0.92.

On the anger reactions ($\alpha = 0.83$) sub-dimension there are 26 statements listed under the question, "which of the below behaviors describe you better in response to situations that evoke anger". Based on the results of the factor analysis, 3 subscales were developed: 1. Aggressive behaviors (12 items); 2. Calm behaviors (10 items); 3. Anxious behaviors (4 items). Cronbach's alpha reliability

scores were between 0.68 and 0.84 (Balkaya and Şahin, 2003). In the present study, Cronbach's alpha reliability coefficients ranged between 0.95 (anger-eliciting situations - not being taken seriously) and 0.62 (anger reactions-anxious behaviors).

The Driving Anger Scale (DAS).

DAS is a self-report scale that assesses situations that provoke anger and the degree of anger (Deffenbacher, Oetting and Lynch, 1994). There are 33 items scored between 1 and 5. The scale has 6 factors with Cronbach's alpha coefficients ranging between 0.78 and 0.87. In the Turkish adaptation study (Yasak et al., 2005), similar to the original scale, 6 factors with Cronbach's alpha coefficients between 0.73 and 0.87 were found. These factors are hostile gestures (3 items), illegal driving (4 items), police presence (4 items), slow driving (6 items), discourtesy (9 items), and traffic obstructions (7 items). In a study conducted by Yasak et al. (2005) the total score and the subscales of the scale showed positive correla-

Table II. Coorelations between the scales.

Eigen values		9.71	5.18	3.67	1.83																						
Variance explained (%)		19.82	10.58	7.49	3.74																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1	-																										
2	.38**	-																									
3	.40**	.65**	-																								
4	-0.12	-0.26**	-0.33**	-																							
5	0.23**	0.27**	0.35**	-0.08	-																						
6	0.16*	0.16*	0.23**	-0.00	0.79**	-																					
7	0.17*	0.35**	0.32**	-0.05	0.77**	0.75**	-																				
8	0.14*	0.18**	0.25**	-0.09	0.68**	0.72**	0.60**	-																			
9	0.27**	0.40**	0.39**	-0.00	0.66**	0.62**	0.68**	0.53**	-																		
10	0.22**	0.30**	0.35**	-0.05	0.92**	0.92**	0.88**	0.80**	0.78**	-																	
11	0.33**	0.14*	0.31**	-0.05	0.63**	0.59**	0.53**	0.50**	0.57**	0.66**	-																
12	0.40**	0.49**	0.44**	-0.23**	0.37**	0.32**	0.40**	0.28**	0.48**	0.43**	0.38**	-															
13	-0.13	-0.21**	-0.22**	0.51**	-0.08	-0.01	-0.05	-0.06	-0.05	-0.05	-0.16*	-0.14*	-														
14	0.34**	0.11	0.10	0.19**	0.18**	0.19**	0.24**	0.06	0.25**	0.22**	0.27**	0.29**	0.21**	-													
15	0.27**	0.20**	0.17*	0.26**	0.24**	0.25**	0.29**	0.15*	0.34**	0.30**	0.21**	0.62**	0.64**	0.62**	-												
16	0.87**	0.72**	0.76**	-0.25**	0.34**	0.22**	0.31**	0.22**	0.41**	0.34**	0.35**	0.53**	-0.21**	0.28**	0.28**	-											
17	0.32**	0.15*	0.20**	-0.10	0.25**	0.14*	0.23**	0.05	0.26**	0.22**	0.20**	0.37**	-0.09	0.24**	0.24**	0.31**	-										
18	0.21**	0.07	0.03	0.13*	0.16*	0.16*	0.15*	0.03	0.20**	0.17*	0.19**	0.20**	0.13	0.31**	0.30**	0.16*	0.50**	-									
19	0.71**	0.40**	0.70**	-0.25**	0.26**	0.18**	0.22**	0.14*	0.29**	0.25**	0.33**	0.37**	-0.19**	0.21**	0.17*	0.79**	0.27**	0.08	-								
20	0.23**	0.25**	0.30**	-0.03	0.22**	0.16*	0.24**	0.15*	0.34**	0.25**	0.28**	0.42**	0.01	0.32**	0.37**	0.31**	0.55**	0.51**	0.20**	-							
21	0.29**	0.12	0.22**	0.04	0.19**	0.13	0.18**	0.06	0.28**	0.19**	0.26**	0.31**	0.07	0.41**	0.36**	0.29**	0.65**	0.67**	0.27**	0.71**	-						
22	0.23**	0.16*	0.21**	0.05	0.19**	0.11	0.12	0.05	0.22**	0.16*	0.23**	0.32**	0.01	0.33**	0.30**	0.26**	0.65**	0.57**	0.17*	0.62**	0.73**	-					
23	0.20**	0.14*	0.13	0.09	0.22**	0.14*	0.18**	0.12	0.23**	0.21**	0.22**	0.34**	0.05	0.33**	0.35**	0.21**	0.42**	0.47**	0.11	0.49**	0.54**	0.45**	-				
24	0.25**	0.09	0.08	0.17*	0.18**	0.12	0.16*	0.06	0.25**	0.18**	0.20**	0.27**	0.15*	0.39**	0.39**	0.21**	0.39**	0.50**	0.16*	0.44**	0.59**	0.39**	0.75**	-			
25	0.36**	0.12	0.18**	-0.07	0.35**	0.26**	0.32**	0.20**	0.38**	0.35**	0.39**	0.33**	-0.09	0.35**	0.25**	0.32**	0.51**	0.46**	0.31**	0.42**	0.51**	0.42**	0.52**	0.63**	-		
26	0.30**	0.20**	0.26**	0.00	0.24**	0.17*	0.21**	0.11	0.32**	0.24**	0.30**	0.40	0.02	0.38**	0.37**	0.33**	0.76**	0.74**	0.25**	0.82**	0.91**	0.88**	0.56**	0.53**	0.55**	-	

1. Verbal expression of anger, 2. Physical expression of anger, 3. Anger expression with the vehicle, 4. Adaptive/constructive expression, 5. BSI-Anxiety subscale, 6. BSI-Depression subscale, 7. BSI-Negative self subscale, 8. BSI-Somatization subscale, 9. BSI-Hostility subscale, 10. BSI- Total score, 11. MAS-Anger symptoms, 12. MAS-Attitudes toward anger-aggressive, 13. MAS-Attitudes toward anger-calm, 14. MAS-Attitudes toward anger-anxious, 15. MAS-Attitudes toward anger-total score 16. Anger expression index, 17. DAS-hostile gestures, 18. DAS-illegal driving, 19. DAS-police presence, 20. DAS-slow driving, 21. DAS-discourtesy, 22. DAS-traffic obstructions, 23. MAS-not being taken seriously, 24. MAS-suffering from unfairness, 25. MAS-being criticized, 26. MAS-total score.

* p < 0.05, ** p < 0.01

tions that ranged between 0.14 and 0.56 with BSI total score, and the anger symptoms and anger-eliciting situations sub-dimensions of the MAS. Only the relationship between the sub-dimension of illegal driving and the anger symptoms sub-dimension of MAS was not signifi-

cant. Cronbach's alpha reliability coefficients of the scale for this sample ranged between 0.73 and 0.87.

The Driving Anger Expression Inventory (DAX).

DAX (Deffenbacher, Lynch, Oetting, and Swaim,

Table III. Comparison of DAX factor subscales in terms of gender.

DAX Subscales	Women n = 110		Men n = 110		t
	X	SD	X	SD	
Verbal expression of anger	24.86	6.39	23.87	6.56	1.14
Physical expression of anger	11.16	2.14	12.50	3.20	3.64**
Anger expression with the vehicle	13.27	3.16	14.85	3.47	3.53**
Adaptive/constructive expression	41.82	8.15	39.48	8.18	2.12*
Aggressive Expression Index	49.30	9.34	51.23	11.05	1.40

*p < 0.05 **p < 0.001

2002) is a self-report scale that measures the frequency and style of anger in the scale's described situations. There are 49 items scored between 1 and 4. The scale includes 4 factors that have Cronbach's alpha reliability coefficients between 0.80 and 0.90. The first factor (verbal aggressive expression) includes 12 items, such as yelling to the other driver and asking questions such as, "where did you get your license?". The second factor (personal physical aggressive expression) includes 11 items that generally include hostile behaviors, such as flipping "the finger" to the other driver and opening the car window in order to express anger. The expressions in this factor involve anger expressions with the body, not the vehicle, in order to threaten, attack, or obstruct the other driver. The third factor (use of the vehicle to express anger) features 11 items, including threatening the other driver with the vehicle, such as getting very close to the other car's bumper and accelerating more than usual. The fourth factor (adaptive/constructive expression) includes 15 items that measure cognitive and behavioral strategies, such as safe driving, problem solving, and thinking about the situation. In addition to these 4 factors, an aggressive expression index (total aggressive expression index, $\alpha = 0.90$) was formed from the total of factors, excluding the adaptive/constructive expression factor. As the aim of the present study was to determine whether DAX can be used in the Turkish population. The findings of the Turkish adaptation study are explained in the following sections.

Procedure

The scales described above were arranged in a different order to form a test battery with the addition of a constant sociodemographic form in the beginning. The sociodemographic form collected data on sex, age, duration of driving, and accidents and traffic fines in the last 5 years.

All the study participants volunteered and were told

that the questionnaire involves various questions about feelings and reactions experienced during certain situations in traffic, there are no right or wrong answers to the questions, and that their individual ideas are important. Additionally, participants were informed that that all the answers would be kept confidential and that individual evaluations would not be done; therefore, they did not need to identify themselves on the questionnaires. While assembling the study population, the number of men and women participants was made equal in accordance with the aims of the researchers. Data were collected over the course of approximately 3 months and the questionnaires were provided to the participants by an interviewer and were completed individually in their own environments. All the forms were completed in approximately 50 minutes.

Data were analyzed with SPSS v.13.0 package program using appropriate statistical techniques, such as descriptive statistics, correlation, t-test, one-way variance analysis (ANOVA), and regression analysis.

RESULTS

I. Factor Structure

In order to assess whether the original structure of the scale was relevant for this sample, principal component analysis with varimax rotation was applied on the obtained data; on item basis and 13 factors with eigen values > 1 and factor loads < 0.30 were found. In addition, following the scree test and according to the interpretations it was seen that these factors could be reduced to 4, and data were forced in to a new 4-factor analysis. Items and factor loads of all factors are presented in Table I.

As seen in Table I, the first factor involves 12 items and total variance was 9.82% ($\alpha = 0.88$). When the items in this factor were considered (5, 6, 9, 11, 14, 28, 31,

Table IV. Comparison of DAX factor subscales in terms of having a traffic fine.

DAX Subscales	Traffic offense n = 116		No traffic offense n = 104		t
	X	SD	X	SD	
Verbal expression of anger	23.84	7.00	24.96	5.82	1.30
Physical expression of anger	11.37	2.04	12.35	3.40	2.55*
Anger expression with the vehicle	13.22	2.75	15.00	3.81	3.92**
Adaptive/constructive expression	40.84	9.06	40.44	7.23	.36
Aggressive Expression Index	48.43	9.53	52.31	10.68	2.83*

*p < 0.05 **p < 0.001

37, 38, 39, 40, and 43) it was seen that they point out to verbal aggressive expression similar to the original scale. Therefore, the factor was called the verbal aggressive expression sub-dimension. The second factor was called personal physical aggressive expression and involves 10 items (1, 8, 10, 12, 13, 17, 20, 21, 34, and 41), which explains the 10.58% ($\alpha = 0.79$). Differing from the original scale, items 7, 19, 22, and 46 were placed in this factor; however, it was seen that theoretically these items belonged to the use of the vehicle to express anger sub-dimension and following the analyses related to Cronbach's alpha internal consistency values they were not included in this factor, which is consistent with the original scale. In addition, item 18 ("I go crazy behind the wheel") was excluded from the scale, as it did not fit any of the factors. The third factor, use of the vehicle to express anger, included 10 items (2, 3, 4, 7, 15, 16, 19, 22, 27, and 46) and explained 7.49% ($\alpha = .79$) of the total variance. Item 33, which is an original study factor ("I flash my lights at the other driver") was excluded from this questionnaire, as it did not enter to this and to other factors. The fourth factor, adaptive/constructive expression, included 15 items (23, 24, 25, 26, 29, 30, 32, 35, 36, 42, 44, 45, 47, 48, and 49), as does the original scale. The fourth factor's items accounted for 3.74% ($\alpha = 0.87$) of the total variance. In addition to these factors, an aggressive expression index (total aggressive expression index, $\alpha = 0.90$) was formed from the total of factors, excluding the adaptive/constructive expression factor.

II. Findings Related to Correlations Among the Scales

The Correlation coefficients of the sample are presented in Table II.

As seen in the table, there was a significant correla-

tion between the subscales of DAX and the other scales, ranging between $r = 0.92$ ($p < 0.001$) and $r = 0.13$ ($p < 0.05$). In line with our expectations, the adaptive/constructive expression sub-dimension showed a significant negative correlation with other sub-dimensions, except for the verbal aggressive expression sub-dimension. The correlation between this sub-dimension and the verbal aggressive expression sub-dimension was negative, but not significant. Correlations with the other sub-dimensions of DAX were positive. Parallel to these findings, the correlations between the sub-dimensions of DAX and the anger expression index were significant, negative with the adaptive/constructive expression sub-dimension, and positive with the other dimensions. In other words, as verbal expression, physical expression, and expression of anger increased, adaptive/constructive expressions decreased.

The correlations between all sub-dimensions of DAS and the verbal aggressive expression sub-dimension were positive and significant. Correlation coefficients ranged between $r = 0.71$ ($p < 0.01$) and $r = 0.21$ ($p < 0.01$). In other words, as hostile gestures, discourtesy, illegal driving, slow driving, police presence, and traffic obstructions increased, verbal expression of anger also increased. The correlations between the physical aggressive expression sub-dimension and the hostile gestures, police presence, slow driving, and traffic obstructions sub-dimensions of DAS were positive and significant. Correlation coefficients were between $r = 0.40$ ($p < 0.01$) and $r = 0.15$ ($p < 0.05$).

However, it is striking that there was no significant relationship between this sub-dimension, and the illegal driving and discourtesy behavior sub-dimensions of DAS. The relationships between the use of the vehicle to express anger sub-dimension and all DAS sub-dimen-

Table V. Variables that predict DAX.

	Adapted R ²	B	Beta	F	p
1. Demographic variables	0.06	45.29		4.41	0.002
Sex			0.08		0.250
Age			-0.18		0.007
Education			0.06		0.439
Traffic ticket			0.18		0.008
2. DAS Subscales	0.65	15.98		42.32	0.000
Discourtesy			-0.16		0.036
Police presence			0.76		0.000
Hostile gestures			0.01		0.864
Illegal driving			0.09		0.123
Slow driving			0.13		0.033
Traffic obstructions			0.11		0.084
3. BSI Subscales	0.67	16.50		31.06	0.000
Somatization			0.10		0.093
Hostility			0.14		0.026
Negative self			0.03		0.696
Depression			-0.17		0.025
Anxiety			0.07		0.361
4. MAS-anger symptoms		16.75	-0.02		0.750
5. MAS-anger reactions subscales	0.71	14.32		29.04	0.000
Calm			-0.06		0.127
Anxious			0.12		0.009
Aggressive			0.19		0.000
6. MAS-anger eliciting situations	0.71	13.96		24.86	0.000
Not being taken seriously			-.01		.926
Being criticized			-.05		.361
Suffering from unfairness			.04		.590

sions, except for the traffic obstructions sub-dimension, were positive and significant. Correlation coefficients were between $r = 0.70$ ($p < 0.01$) and $r = 0.21$ ($p < 0.01$). As the relationship between the adaptive/constructive expression sub-dimension and DAS-traffic obstructions sub-dimension was positive and significant, the relationship was negative and significant with the DAS-police presence sub-dimension. In other words, as illegal driving of the other driver increased, the adaptive/constructive expression increased, whereas and on the other hand, the

adaptive/constructive expression decreased as the presence of police increased. The relationships between the DAX-verbal aggressive expression sub-dimension, and the anger symptoms sub-dimensions of the anger-eliciting situations subscale (not being taken seriously, being criticized, and suffering from unfairness), and the hostility and anxious behaviors sub-dimensions of the anger reactions dimension of the MAS subscales were significant and positive. Correlation coefficients were between $r = 0.40$ ($p < 0.01$) and $r = 0.20$ ($p < 0.01$). In addition,

the correlation between the calm behaviors sub-dimension and the DAX-verbal aggressive expression sub-dimension was negative, but not significant. As expected, the relationships between the DAX-physical aggressive expression sub-dimension, and the MAS-anger reactions sub-dimension and aggressive behaviors sub-dimension were positive and significant ($r = 0.49$, $p < 0.01$). Similarly, the correlation with calm behaviors was negative and significant ($r = -0.21$, $p < 0.01$). In addition, there was a significant positive correlation between anger symptoms, and the not being taken seriously sub-dimension of the anger-eliciting situations dimension and the physical aggressive expression sub-dimension. The correlation between the DAX-use of the vehicle to express anger sub-dimension and the calm behaviors sub-dimension of the MAS-anger reactions sub-dimension was negative and significant ($r = -0.22$, $p < 0.01$). In addition, the correlations between the MAS-anger symptoms, anger reactions-hostility, and behaviors leading to anger-being criticized alternate sub-dimensions were positive and significant. Correlation coefficients were between $r = 0.44$ ($p < 0.01$) and $r = 0.17$ ($p < 0.05$). There was no relationship between other dimensions and the anger expression with the vehicle sub-dimension. The correlation coefficients between the adaptive/constructive expression sub-dimension and the calm behaviors, anxious behaviors, and unfairness sub-dimension of the anger-eliciting situations scale were positive and significant. Correlation coefficients were between $r = 0.51$ ($p < 0.01$) and $r = 0.17$ ($p < 0.05$). In line with our expectations the correlation between this dimension and the hostility behaviors sub-dimension of the anger reactions scale of MAS was significant and negative ($r = -0.23$, $p < 0.01$). The correlation between the adaptive/constructive expression sub-dimension, and the anger symptoms and the being criticized dimensions of the anger-eliciting situations scale was negative, but not significant.

The correlations between the DAX-verbal aggressive expression sub-dimension, and the subscale and total scores of BSI were positive and significant. Correlation coefficients were between $r = 0.27$ ($p < 0.01$) and $r = 0.16$ ($p < 0.05$). Similarly, the correlations between the DAX-physical anger expression and expression of anger with the vehicle sub-dimensions, and BSI subscale and total scores were significant and positive. Correlation coefficients ranged between $r = 0.40$ ($p < 0.01$) and $r = 0.16$ ($p < 0.05$). There were negative relationships between the adaptive/constructive expression sub-dimension and BSI subscale and total scores, but they were not significant.

III. Findings Related to Demographic Variables

Differentiations between the sub-dimensions of DAX, according to age, education, sex, taking part in an accident, traffic fines, and duration of driving a vehicle were explored. As the number of drivers using vehicles other than cars were low, no analyses were performed according to the type of vehicle driven. In order to understand the total effect of age, which is a continuous variable, the sample was divided in to 3 age groups; 21-30, 31-40, and ≥ 41 . The main effect of age was in the physical and vehicle expression of anger sub-dimensions. According to Tukey test results, the scores of the 21-30-year-old age group ($x = 12.94$, $SD = 4.13$) of the physical aggressive expression sub-dimension [$F(2, 217) = 5.91$, $p < 0.01$] were higher than for the 31-40-year-old age group ($x = 11.38$, $SD = 1.98$) and ≥ 41 -year-old age group ($x = 11.62$, $SD = 2.31$). In other words, drivers aged between 21 and 30 years reported to use the physical expression of anger more than drivers aged over 31 years. Similarly, according to the results of the Tukey test for the use of the vehicle to express anger sub-dimension [$F(2, 217) = 8.03$, $p < 0.001$], the 21-30-year-old age group ($x = 15.64$, $SD = 4.43$) had higher scores than both the 31-40-year-old age group ($x = 13.63$, $SD = 2.72$) and the ≥ 41 -year-old age group ($x = 13.46$, $SD = 3.04$). In other words, drivers aged between 21 and 30 years reported to use the vehicle to express their anger more than the drivers aged 31 years and above. In accordance with our expectations a similar pattern was found for the anger expression index. The 21-30-year-old age group also scored higher than the other age groups on this index.

There was a significant difference in terms of sex on the physically aggressive expression, use of the vehicle to express anger, and adaptive/constructive expression sub-dimensions. On the physical and vehicle anger expression dimensions men scored higher than women, whereas women scored higher than men on the adaptive/constructive expression dimension (Table III).

The total scores of the DAX subscales were compared in terms of education level. Education level was divided into 2 groups: primary/secondary school and university education. Results of the t test showed that the university education group ($x = 25.10$, $SD = 6.42$) scored higher on the verbal aggressive expression sub-dimension than the primary/secondary school group ($x = 22.28$, $SD = 6.23$) ($t = 2.92$, $p < 0.001$). On the physically aggressive expression sub-dimension the primary/secondary school group scored higher than the university educa-

tion group (primary/secondary school: $x = 12.75$, $SD = 3.71$; university education group: $x = 11.51$, $SD = 2.33$) ($t = 2.38$, $p < 0.05$). There were no differences in the use of the vehicle to express anger, adaptive/constructive expression, and anger expression index subscales of DAX, in terms of education.

There were differences among the DAX subscales in terms of the traffic fines variable. These differences were examined with the t test and it was found that drivers who had a traffic fine scored higher on the physically aggressive expression sub-dimension in comparison to the group who did not have a traffic fine (traffic fine group: $x = 12.35$, $SD = 3.40$; no traffic fine group: $x = 11.37$, $SD = 2.04$) ($t = 2.55$, $p < 0.05$). Similarly, scores of the group who had a traffic fine were higher than the group who did not have a traffic fine on the use of the vehicle to express anger sub-dimension (traffic fine group: $x = 15.00$, $SD = 3.81$; no traffic fine group: $x = 13.22$, $SD = 2.75$) ($t = 3.92$, $p < 0.001$). In addition, the same pattern was found on the aggressive expression index sub-dimension (traffic fine group: $x = 52.31$, $SD = 10.68$; no traffic fine group: $x = 48.43$, $SD = 9.53$) ($t = 2.83$, $p < 0.05$). There were no differences in the verbal aggressive expression and adaptive/constructive expression sub-dimensions in terms of the traffic fine variable (Table IV). In other words, drivers who had a traffic fine due to running a red light, overtaking improperly, exceeding the speed limit, etc. in the last 5 years reported expressing their anger more than the drivers who did not have a traffic fine in the last 5 years. There was no effect of owning the car, participating in an accident in the last 5 years, and duration of driving on anger expression according to the DAX subscales on the anger expression index.

III. Findings Related to Regression Analysis

In line with the aim of this research, a hierarchical regression analysis was conducted in order to determine the predictive variables of anger expression in traffic (anger expression index) and the results are presented in Table V.

As seen in the table, the variables age, education, sex, and having a traffic fine were entered in the 1st row of the equation, followed by things that make drivers angry in the 2nd row, psychological symptoms in the 3rd row, anger symptoms in the 4th row, behaviors causing anger in the 5th row, and anger-eliciting situations in the 6th row. In the first phase it was seen that sociodemographic variables had a predictive value when entered as a block [Freq (4, 215) = 4.41, $p < 0.002$], and that the variables

age ($t = 2.70$, $p < 0.01$) and traffic fines had independent contributions ($t = 2.66$, $p < 0.05$). Things that make drivers angry, which was entered in the 2nd row, had a predictive value, together with age, education, sex, and involvement in an accident [Freq (10, 209) = 42.32, $p < 0.000$], whereas police presence ($t = 17.33$, $p < 0.000$), slow driving ($t = 2.14$, $p < 0.05$), and discourtesy ($t = 2.11$, $p < 0.05$) were found to have independent predictive value.

It is interesting that illegal driving did not directly predict anger expression. In addition, it was striking that psychological symptoms in the third block predicted values in addition to the variables in the second block [Freq (15, 204) = 31.06, $p < 0.000$]. In addition, the variables depression ($t = 2.25$, $p < .005$) and hostility ($t = 2.25$, $p < 0.05$) had independent predictive value. The anger symptoms variable in the fourth block had predictive value, together with the variables in the third block [Freq (16, 203) = 29.00, $p < 0.000$]; however, these variables did not have independent predictive value. Anger reactions, in the fifth block, had predictive value when evaluated with the variables in the first four blocks [Freq (19, 200) = 29.04, $p < 0.000$], and the variable, aggressive behaviors ($t = 4.08$, $p < 0.000$) and anxious behaviors ($t = 2.63$, $p < 0.01$) had independent predictive value. Lastly, the anger-eliciting situations variable in the sixth block had predictive value when evaluated with the variables in the first five blocks [Freq (22, 197) = 24.86, $p < 0.000$].

DISCUSSION

When findings summarized up to now are evaluated it can be proposed that the adapted DAX, which was reduced to a 47-item scale, is a reliable and a valid instrument that can be used in the Turkish population.

Factor analysis revealed a 4-factor structure, which includes verbally aggressive expression, personal physical aggressive expression, and expression of anger with the vehicle, adaptive/constructive expression, similarly to Deffenbacher et al.'s (2002) findings. Similar to the original scale, 3 factors invoiced hostile expression of anger (using the vehicle to express anger, verbal and physical expression) and the fourth factor is adaptive/constructive ways in anger expression (for example, trying to drive safely). In addition, it was found that the anger expression index, composed of the total of the first 3 factors of the original scale, is a reliable and valid index in the adapted DAX (Deffenbacher et al., 2002).

The items, "I go crazy behind the wheel" and "I flash

my lights at the other driver” in the original scale did not load onto any factors in the present study. In Turkish culture flashing lights at the other driver is not only an expression of anger, but can be considered a warning; therefore, this finding was not surprising in the light of cultural differences.

When DAX was evaluated in terms of sociodemographic variables, there was no effect on anger expression of owning the car, participating in an accident, and duration of driving. In their studies, Deffenbacher et al. (2003, 2001) found the same results. On the other hand, age, sex, education, and traffic offenses did have an influence on the types of anger expression used. The finding that physically expressing anger and using the vehicle to express anger were more frequent among men has also been reported in studies from the West (Lajunen and Parker 2001; Deffenbacher et al., 2002, 2003). In the present study, when the findings related to the education variable were analyzed it was found that there were no differences in the adaptive/constructive expression general aggressive expression index.

However, the university group used verbal expression more and the primary/secondary school group used physical expression more. This finding is expected, because as the level of education increases, so does the ability of verbal expression. In a study on risk-taking behavior in different types of drivers conducted by Yasak and Öz (1997), it was found that as the level of education increased, social risk-taking behavior also increased. As the related literature generally includes university students, our findings related to the education variable is believed to have important relevance beyond cultural differences. A similar situation is evident for our age variable. In the present study we found that drivers in the 21-30-year-old age group used physical and vehicle expression methods more than the drivers in the other 2 age groups. The same finding is valid for the anger expression index. This finding supports the literature, which reports that 18-24-year-old drivers engage in more risk-taking behaviors (Gregersen, 1995). In addition, according to the statistics of the Security General Directorate, it is striking that 34% of the 615,285 drivers who participated 407103 accidents took place in 2002 in our country was in the 21-30 age group. Using the vehicle or physical expression methods for anger can be among the reasons for the high percentage of accident participation in this group. One of the important points of this study was the finding related to traffic offenses. In line with our expectations, drivers who had a traffic offense due to running a red light, going into the lane of oncoming traffic exceed-

ing the speed limit in the last 5 years used physical anger expression and anger expression with the vehicle, and scored higher in the general aggressive expression index than the other study participants.

Results of the correlation analysis conducted to determine intervariable relationships showed that the relationships between the scores obtained from DAX and DAS, BSI and MAS scales and subscales were significant. Reports in the literature related to these variables are similar (Deffenbacher et al., 2002, 2003). In addition, the finding related to the relationship between the adaptive/constructive expression variable, which is a sub-dimension of DAX, and the illegal driving and police presence sub-dimensions of DAS is striking. As previously mentioned, the findings revealed that the adaptive/constructive expression of anger increased as illegal driving of the other driver increased, and decreased as police presence increased. This finding highlights the importance of the perception of traffic rules and the traffic inspection mechanism. Yasak and Öner (1999) studied the perception of traffic rules in Turkish drivers and found that traffic rules are believed to be rules that should be obeyed but are not, and traffic police hinder traffic. The most prevalent belief about traffic was that nobody respects the rules and individual behavior will not change anything. Therefore, as discourteous or disrespectful behaviors of the other driver evoke anger, illegal driving does not cause anger and is accepted to be normal. The presence of the police causing anger and leading to physical anger expression and anger expression with the vehicle is also a very interesting finding. A similar finding was reported by Deffenbacher et al. (1994). The results of the present study revealed that male drivers became angrier in the presence of traffic police more than women and this caused more anger than other drivers driving slow.

Regression analysis revealed that all the variables contributed to predicting the general aggressive expression index, when considered together, and many of the sub-dimensions had an independent predictive value. Similar findings were reported in the study conducted with the original scale. In this study an additional predictive affect of general aggressive expression in traffic was found for the traffic offenses and age variables.

In conclusion, it can be proposed that DAX, which is composed of 4 subscales and an index, is a reliable and a valid tool for use in Turkey. This study is important, as it is one of the first to examine the expression of anger in traffic in Turkey. In addition, the results revealed the im-

portance of promoting adaptive/constructive methods in coping with traffic anger. This study will therefore shed a light on psychoeducative methods towards anger coping in traffic.

Although not included in this study, Dahlen, Martin, Ragan, and Kuhlman (2005) reported a relationship between the expression of anger with a vehicle and impulsivity. In addition, the relationship between dangerous driving, and risk-taking tendency and impulsivity were also reported. Therefore, it can be proposed to further evaluate the impulsivity of drivers who were found to have high levels of anger and expressed their anger with the vehicle. Similarly, in cases with high impulsivity, driving behavior can be examined by the results of DAS and DAX. In addition, in drivers with high traffic penalty scores, and in drivers whose licenses were revoked

and who were referred for psycho-technical evaluation, general anger expression in traffic seems to be one of the points used in the evaluation process. It is believed that DAX can be used in Turkey for determining individuals who drive safely.

The most important limitation of this study is the sample characteristics. The majority of the participants were university graduates. As it was very difficult to enroll female primary school graduates in the study, the number of individuals who were primary school graduates was insufficient. Therefore, when analyzing the effect of education level the sample was divided into 2 groups; primary/secondary school and university education. Examining the effect of education level more comprehensively in further studies would be beneficial.

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