

## Summary

# Stress and Traffic: The Mediating Role of Driver's Angry Thoughts on the Relationship between Stress and Driving Anger Expression in Traffic

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Driving anger is an important problem; its negative consequences led to increased research attention in the recent years and therefore it has been studied extensively. It has been reported that people who have constant anger as a personality characteristic tend to be highly angry whilst driving (Deffenbacher, Lynch, Oetting, & Yingling, 2001). Studies in the West indicate that those with higher levels of anger generally get more angry and with higher frequency, and that these people tend to take more risks, drive more recklessly in comparison with other drivers, break rules more often, and are involved in more accidents (Deffenbacher, Oetting, & Lynch, 1994). Studies in Turkey showed positive relationships between risky driving behaviours and anger (Sumer, 2003) and indicated that those with higher anger symptoms and psychological symptoms experienced more driving anger (Yasak, Eşiyok, Basbulut, & Korkusuz, 2005).

Both driving anger and style of anger expression, which are personality characteristics that negatively influence safe driving, are important research topics. Those who get angry a lot whilst driving have been shown to be more aggressive when compared with others and to use adaptive/constructive expression of anger such as thinking before responding to the other driver less often than the other groups (Deffenbacher, Deffenbacher, Lynch, & Richards, 2003a). In a study, drivers with equal driving hours were grouped as those with high anger levels and those with low anger levels. The results showed that those with high anger levels showed more aggression, experienced more frequent and high anger, displayed more dangerous behaviours and broke rules more but used adaptive/constructive anger expression (Deffenbacher et al., 2003a).

Investigating the cognitive processes associated with anger expression is as important as the anger expression in traffic in understanding driving anger (Def-

fenbacher, Pettrilli, Lynch, Oetting, & Swain, 2003b). Identifying the dysfunctional beliefs related to traffic that lead to risky behaviours has a functional importance during the psychosocial training of risky drivers. The studies indicate a great correlation between driver's anger expression and driver's angry thoughts. There is a negative relationship between the expression of anger and coping self-instruction thoughts, while a positive relationship was documented to adaptive/constructive anger expression (Deffenbacher, White, & Lynch, 2004).

A review of literature reveals that stress is one of the variables that have been studied in relation to traffic rage. Today where change is unavoidable so is stress. Individuals who can cope with stress in a positive way are known to be emotionally and physically healthier and perform better at work. Research points out the effects of felt general stress on people in traffic beyond the stress that is caused by the traffic (Rowden, Matthews, Watson, & Biggs, 2011). In other words, life stress combined with driving anger in heavy congestion in daily traffic leads to dangerous driving, and to breaking the rules and also to accidents. Therefore, in general stress coping mechanisms and anger management in traffic are relevant for the welfare of individuals as well as the society. The main purpose of this study is to determine the relationships between the general stress levels of individuals and anger components (anger expression and angry thoughts) in traffic, and to investigate the mediating variables between general stress level and anger expression in traffic. In addition, demographic variable such as sex and age will also be investigated.

## Method

### Participants

The sample of the study was composed of random-

ly assigned drivers who reside in Ankara and who had had a driving licence for at least 1 year at the time of the study. It consisted of 208 (45.5%) women and 24.9 (54.5%) men, a total of 457 individuals. The age of the participants ranged between 20 and 60 with an average of 36.56 years ( $SD = 1.28$ ). 33% of them were graduated from primary to high school and 67% were university graduates. The participants had driving experience from 1 year up to 40 years ( $M = 12.3$  and  $SD = 1.04$ ). The participants drove an average of 9784 km per year ( $SD = 1108$ ). 40.3% of the drivers reported no traffic tickets in the previous 5 years and 59.7% reported at least one ticket. Similarly, 62.1 % were involved in no accidents and remaining 37% had at least one accident.

### Measures

**Driving Anger Expression Inventory (DAX).** This is a Likert type scale that was developed by Deffenbacher et al. (2002) to identify frequency and style of anger in given situations. The scale has 49 items that are scored between 1 and 4. Esiyok et al. (2007) completed the adaptation study of the scale to Turkish samples. The analysis produced 4 components, namely verbal aggressive expression ( $\alpha = .88$ ), personal physical aggressive expression ( $\alpha = .79$ ), use of the vehicle to express anger ( $\alpha = .87$ ) and adaptive/constructive expression ( $\alpha = .79$ ). The correlations of these factors to the subscales of Short Symptom List and the subscales of Multidimensional Anger Inventory vary between .49 ( $p < .001$ ) and  $-.22$  ( $p < .001$ ). There is satisfactory evidence for the reliability and the validity of the scale. The items in the adaptive/constructive style factor were reversed for this study and a total score was used for diagnosis. According to this, higher scores from the inventory indicate negative driving anger expression.

**Driver's Angry Thoughts Scale (DATS).** This scale was developed to determine the frequency of thoughts that people have when they get angry whilst they drive. It has 65 items and they are scored between 1 and 5. Batigun and Yasak (2015) provide evidence for the Turkish adaptation of the scale. In this study, the scale was found to have 5 factors. These are judgmental and disbelieving thinking ( $\alpha = .95$ ), revenge and retaliatory thinking ( $\alpha = .93$ ), coping self-instruction ( $\alpha = .86$ ), physically aggressive thoughts ( $\alpha = .93$ ), pejorative labelling and verbally aggressive thinking ( $\alpha = .86$ ). The correlations of these subscales with the subscales of Driving Anger Scale were between .37 ( $p < .001$ ) and  $-.11$  ( $p < .001$ ) and with the subscales of Driving Anger Expression inventory were between .59 ( $p < .001$ ) and .11 ( $p < .05$ ).

**Stress Symptoms Scale (SSS).** This scale is one dimension of a 3-dimensional test battery that was developed by Miller, Smith, and Mahler (1988). The items are scored between 1 and 5. The higher the scores from the

scale the more intense the stress symptoms are. This dimension has 6 subscales that include both physiological and psychological symptoms of stress. These subscales are Muscular system ( $\alpha = .92$ ), parasympathetic nervous system ( $\alpha = .91$ ), sympathetic nervous system ( $\alpha = .94$ ), emotional system ( $\alpha = .93$ ), cognitive system ( $\alpha = .91$ ), endocrine system ( $\alpha = .95$ ), and immune system ( $\alpha = .96$ ) (Sahin & Durak, 1994). The first Turkish reliability and validity studies of the scale were done by Day (1992) and these findings have been since verified in a number of studies (Onbasioglu, 2006; Batigun, Sahin, & Karsli, 2011).

**Style of Coping with Stress Scale (SCSS).** Lazarus and Folkman developed this 30-item scale to measure effective and ineffective styles of coping with stress. The items are scored between 1 and 4. The scale was adapted to Turkish population by Sahin and Durak (1995), and the analyses revealed 5 components: optimistic approach ( $\alpha = .68$ ), self-confident approach ( $\alpha = .80$ ), helpless approach ( $\alpha = .73$ ), surrendering approach ( $\alpha = .70$ ), and social help seeking ( $\alpha = .47$ ). These components can be grouped in two dimensions: effective coping and ineffective coping. The correlations of these subscales with Stress Symptoms Scale range between  $-.13$  ( $p < .01$ ) and .53 ( $p < .001$ ) (Sahin & Durak, 1995).

### Procedure

Participation in the study was completely voluntary and we collected no information regarding the identity of the participants. The questionnaires took between 30 to 40 minutes to complete.

### Results

The sample was divided into four age groups: 20-24, 25-30, 31-40, and 41-60. Therefore, we administered a 2x4 MANOVA to explore the effects of age and sex on stress symptoms, style of coping with stress, driving anger expression and angry thoughts in traffic. According to the analysis, Wilks'  $\lambda$  co-efficient for sex was .81, ( $SD = 446$ ,  $F = 8.48$ ,  $p < .001$ ,  $\eta^2 = .190$ ) and for age, it was .83, ( $SD = 446$ ,  $F = 2.37$ ,  $p < .001$ ,  $\eta^2 = .061$ ). This indicates significant differences amongst DVs on both IVs.

Sex had significant main effects on verbal expression ( $F_{1,446} = 4.22$ ,  $p < .05$ ,  $\eta^2 = .009$ ), physical expression ( $F_{1,446} = 35.79$ ,  $p < .001$ ,  $\eta^2 = .074$ ), with vehicle ( $F_{1,446} = 49.54$ ,  $p < .001$ ,  $\eta^2 = .100$ ) and adaptive/constructive expression ( $F_{1,446} = 9.01$ ,  $p < .01$ ,  $\eta^2 = .020$ ); on the revenge thoughts ( $F_{1,446} = 23.70$ ,  $p < .001$ ,  $\eta^2 = .050$ ) and aggressive thoughts ( $F_{1,446} = 14.17$ ,  $p < .001$ ,  $\eta^2 = .031$ ) of DATS; and on the total score of Stress Symptoms Scale ( $F_{1,446} = 14.79$ ,  $p < .001$ ,  $\eta^2 = .032$ ). Men scored higher verbal aggressive expression, personal physical expression, vehicular expression than women,

and women scored higher on adaptive/constructive expression subscale than men on DAX. Men also scored higher than women on revenge thoughts and aggressive thoughts subscales of DATS. It is notable that women scored significantly higher on Stress Symptoms Scale.

Age also had significant effects on verbal aggressive expression ( $F_{3,446} = 9.98, p < .001, \eta^2 = .063$ ), personal physical expression ( $F_{3,446} = 6.22, p < .001, \eta^2 = .040$ ), vehicular expression ( $F_{3,446} = 9.72, p < .001, \eta^2 = .061$ ) and adaptive/constructive expression ( $F_{3,446} = 5.37, p < .001, \eta^2 = .035$ ) of DAX; and on revenge thoughts ( $F_{3,446} = 5.83, p < .001, \eta^2 = .038$ ), positive coping self-instruction ( $F_{3,446} = 4.91, p < .001, \eta^2 = .032$ ), physically aggressive thoughts ( $F_{3,446} = 9.73, p < .001, \eta^2 = .061$ ), pejorative thoughts ( $F_{3,446} = 3.80, p < .01, \eta^2 = .025$ ) dimensions of DATS; on effective coping subscale of Coping with Stress Scale ( $F_{3,446} = 6.14, p < .001, \eta^2 = .040$ ). According to the results of the post-hoc tests, those who were 20-24 years old scored significantly higher than those who were 31-40 years old on verbal aggressive expression, personal physical expression and expression using the vehicle; those who were 41-60 years old used adaptive/constructive expression significantly more than those who were 20-24 years old and those who were 25-30 years old. In addition, 20-24 year olds had significantly higher scores than 31-40 and 41-60 year olds on revenge thoughts, verbal aggressive thoughts and pejorative thoughts, and had significantly lower scores on positive thoughts subscale. Effective coping with stress scores were significantly lower amongst 20-24 year olds than the other two groups.

The mediating roles of driver's angry thoughts and style of coping with stress on the relationship between driving anger expression and stress symptoms we analysed the significance of this indirect mediation effects using PROCESS Multiple Mediation 4 (Hayes & Preacher, 2014), which is a bootstrapping method offered by Preacher and Hayes (2008). Stress symptoms had significant direct effect on driving rage expression ( $\beta = .09, t = 4.92, p < .001$ ) (Step 1). Stress symptoms also had significant direct effects on the mediating variables, namely: judgmental approach ( $\beta = .07, t = 3.36, p < .001$ ), thought of revenge ( $\beta = .03, t = 3.24, p < .001$ ), physically aggressive thoughts ( $\beta = .02, t = 2.87, p < .01$ ), pejorative thoughts ( $\beta = .02, t = 4.51, p < .001$ ), effective coping ( $\beta = -.03, t = 4.32, p < .001$ ) and ineffective coping ( $\beta = .03, t = 5.90, p < .001$ ) (Step 2). When the predictive effects of mediators on the DVs were investigated, we found that the mediators, revenge thoughts ( $\beta = 1.05, t = 9.98, p < .001$ ), physically aggressive thoughts ( $\beta = .28, t = 2.00, p < .05$ ), pejorative thoughts ( $\beta = .58, t = 3.21, p < .001$ ) and effective coping ( $\beta = -.56, t = -6.49, p < .001$ ) had significant direct effects on driving anger expression while judgmental thinking ( $\beta = -.04, t = .87, p > .05$ ) and

ineffective coping ( $\beta = .00, t = .01, p > .05$ ) did not have significant effects (Step 3). When stress symptoms and all other mediator variables were entered in the equation at the same time (Step 4), the relationship between stress symptoms and driving anger expression disappeared ( $\beta = .03, t = 1.95, p > .05$ ). Therefore, we concluded that the mediating variables had full mediating effects on the relationship between stress symptoms and driving anger expression. The full model was significant and explained 55 % of the variance ( $F_{7,449} = 81.62, p < .001$ ).

The total indirect effects of the mediating variables were found to be significant [point estimation = .07 and %95 BCa GA (.0301, .1007)]. In other words, all four mediating variables fully mediate the relationship between stress symptoms and driver's rage expression. Moreover, when treated individually, these variables also had full mediating effects.

## Discussion

Our analyses on correlation and mediating variables showed expected and significant relationships between these variables. Furthermore, we determined a full mediation role of driver's angry thoughts on the relationship between stress symptoms and driving anger expression. In other words, the relationship between the general stress levels of individuals and the anger that they expressed in traffic becomes significant by the addition of driver's cognitive processes such as revenge thoughts, physical aggressiveness, judgmental thinking and pejorative thoughts. The high levels of revenge thoughts, physical aggressiveness, and pejorative thoughts in individuals who had high levels of general stress increased the rage expression in traffic. We have not come across a study in the literature that aimed to identify the mediating variables on the relationship between general stress levels of individuals and their anger expression. However, studies exist on the relationships between job stress and driving anger (e.g., McLinton & Dollard, 2010); general life stress and breaking the rules (e.g. Rowden et al., 2011); driving stress and driving anger (e.g., Hennessy & Wiesenthal, 1999); and general stress levels and anxious driving behaviours (e.g., Clapp, Olsen, Danoff-Burg, Hagedwood, Hickling, Hwan,g & Beck, 2011) in literature. These studies also draw attention to the relationships between stress, anger and breaking the rules. In our study, the higher the number of anger expression and pejorative thoughts ("stupid driver", "jerk", "jackass" etc.) the higher the number of accidents they were involved in. Additionally, positive coping thoughts ("Never mind! Calm down", "I should let others know that I am going to be late", "Don't even bother with looking at such people") decreased the number of accidents involved in.

We conducted a MANOVA in order to investigate the effects of sex and age. The analysis revealed that men scored higher than women on the verbal, physical and vehicular expression of anger; whilst women scored higher than men on the adaptive/constructive expression of anger. Similarly, men had higher scores on the revenge and physically aggressive thoughts subscales of Driver's Angry Thoughts Scale when compared with women. These findings are in line with the findings of the previous studies (Esiyok et al., 2007; Deffenbacher et al., 2002; Deffenbacher et al., 2003b; Deffenbacher et al., 2004) and generally with conclusions of anger literature. According to the clinical observation results, men have difficulty in expressing their feelings other than anger and they can express feelings such as jealousy and sadness only by transforming them into anger. Sharkin (1993) and Evers et al. (2005) suggest that the reason for this is that anger is considered to be an indication of strength, toughness and aggressiveness, "more manly", "suitable for men" and "empowering for men". Therefore, anger is treated generally as a feeling of men and is seen as a positive feeling that men should have. Undoubtedly, this is true for Turkish culture and can explain the anger displayed by men in traffic. Indeed, it is known that men who have a dominantly macho personality drive more aggressively (Krahe & Fenske, 2002); that individuals with high masculine gender role think that skills in traffic are more important whilst those with feminine gender role think skills related to safety are more important (Ozkan & Lajunen, 2006).

Young people (aged between 20-24) scored higher on the verbal, personally physical and vehicular expression of anger in comparison with the others. They also had higher scores on the revenge, aggression and pejorative thoughts subscales of Driver's Angry Thoughts Scale. The older group (aged between 41-60) had higher scores on adaptive/constructive thoughts subscale. In addition, the scores of the younger group on effective coping with stress were also lower than the others. That is, individuals who were aged between 20-24 displayed more aggression; revenge and pejorative thoughts and positive stress coping less than the older groups. In their study where the relationship between anger and age was investigated, Phillips, Henry, Hosie, and Milne (2006) found that older people expressed their anger less and tried to take their anger under control internally and used

strategies of self-instruction more often than others.

Balkaya (2001) indicates that there is a noticeable decrease in angry experiences and reactions and an increase in calmer behaviours in older ages. Similar findings have been reported by studies on drivers. For example, drivers between ages 21 and 30 have higher anger expression index and they used more physical and vehicular anger expressions (Esiyok et al., 2007). Furthermore, in the studies on involvement in traffic accidents and breaking the rules, 18-24 year olds have been found to be riskier than the other age groups (Gregersen, 1995). Of the 1207354 traffic accidents recorded in Turkey in 2013, 21-30 year olds were involved in more than 19% (TUIK, 2014). It is reasonable to conclude that these findings contribute to the reasons that people between ages 18 and 24 are considered in the vulnerable road users. That this age group does not have better skills in coping with stress and have a lot of thoughts of aggressiveness may be leading them to display more angry behaviours in traffic and therefore get involved in more traffic accidents.

As a result, the most important finding of this study is the identification of full mediating role of the cognitive processes on the relationship between general stress levels and rage expression in traffic. The findings can be used during the psychological training of the drivers who have been suspended from traffic due to breaking the rules. First of all, it would be possible to focus on the cognitions on traffic during the psychological counselling/therapy keeping in mind the possibility of the relationship between the general stress levels and the underlying reasons of frequent involvement in traffic accidents. In other words, it would be possible to identify general stress levels and driver's angry thoughts and these can be used during the trainings designed with consideration to the relationships between these and rage expression (verbal, physical, vehicular and destructive expressions). If planned in the light of these findings, trainings on coping with stress, awareness trainings and rage control trainings may lead to safe driving behaviours in traffic.

Study has some shortcomings. For example more than half of the sample (67%) was comprised of university graduates. It would be useful if the findings are interpreted with this in mind and further studies are conducted with a more balanced level of education variable.