Road Rage: User-Reported Antecedents and Potential Solutions

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ABSTRACT

Road rage (intentional high risk driving behavior) is a factor that increases the likelihood that a driver will be involved in a vehicle crash. The focus of this study was to determine potential antecedents of road rage and methods to prevent road rage. A sample of 372 participants were surveyed. Based upon responses, participant profiles were established to analyze the data. Analyses using Chi-square and Fisher's Exact test revealed a significant negative relationship between age and the tendency toward aggressive driving, particularly tailgating. In addition, content analysis revealed a number of potential antecedents of and solutions to road rage. Human factors implications are discussed.

INTRODUCTION

The National Highway Traffic Safety Administration (NHTSA) released a 1997 estimate indicating that over 13,000 people were injured or killed between 1990 and 1996 in accidents involving aggressive driving (NHTSA, 1997). 'Aggressive driving' is the general term used to describe events involving intentional use of a vehicle to direct aggression toward another driver or pedestrian. Road rage is generally used to describe extreme incidents in which the driver intentionally engages in behaviors that are known to have a high risk of causing accidents (Wells-Parker et al., 2002). Increasing traffic, work demands, and complex and crowded commuting patterns are environmental factors that have and will continue to be precipitating factors for road rage.

Road rage is one factor that increases the likelihood that a driver will be involved in a vehicle crash. A typical scenario is one in which an angry or impatient driver decides to express their increasing frustration using high-risk behaviors. To identify situations that contribute to road rage, researchers must apply a systematic approach and first understand the symptoms and antecedents of road rage.

Matthews and Desmond (2001) discuss a transactional model of driver stress that identifies three factors that precede performance degradation under stressful situations: environmental stressors, cognitive stress processes, and personality. A representation of the transactional model is shown in Figure 1.
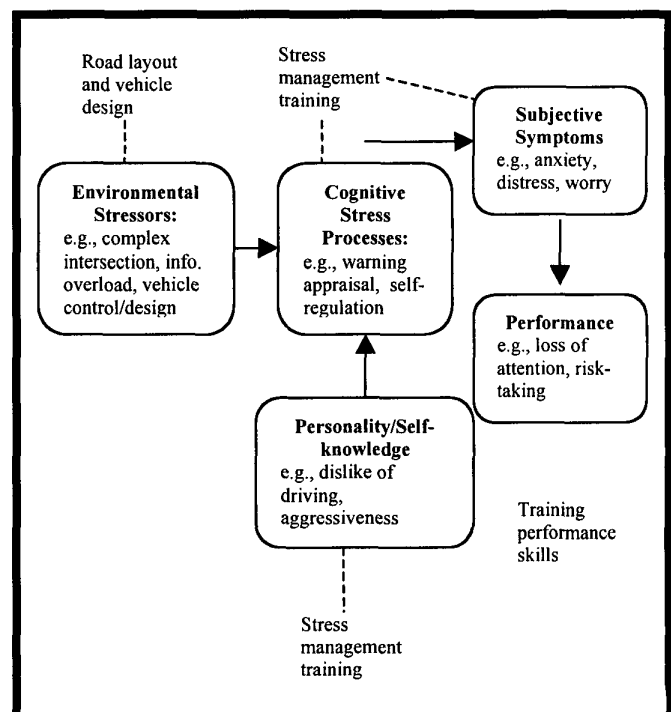

Figure 1. Applications of the transactional model of driver stress (adapted from Matthews and Desmond, 2001, p. 218).

The model can be used as a guide to develop interventions that are specific to the model's antecedents such as driver stress management training to control emotional states.

There is some research on the specific traits that are associated with road rage. These include sensation seeking, impulsivity, type A behavior, and anger (Boyce and Geller, 2002; DePascale, Geller, Clarke, and Littleton, 2001; Jonah, Thiessen, and Au-Yeung, 2001). Yagel (2001) found that people who were inclined toward aggression were more likely to display aggressive behaviors. Beirness (1993) found that thrill seeking, impulsiveness, and hostility were personality traits associated with aggressive driving. A number of other studies have associated Type A behavior pattern with aggressive driving and behaviors reflective of road rage (Blanchard, Barton, and Malta; 2001; Karlberg Unden, Elofsson, Krakau, 1998; Lowenstein, 1998; Perry and Baldwin, 2000).

However, attempts to identify situational antecedents have been virtually non-existent, and no studies have focused exclusively on the antecedents or triggers. Two exceptions are studies by Wells-Parker et al. (2002) and McGarva and Steiner (2000). Wells-Parker et al. used factor analysis to identify the behaviors and affective states related to self-reported road rage incidents. Three factors were identified: (1) Angry/threatening driving, (2) verbal/frustration expression, and (3) direct confrontation. McGarva and Steiner found that drivers were more likely to lash out, after provocation, to perceived higher status drivers compared to lower status drivers (using a confederate driving a high- versus a low-status vehicle who initiated the provocation).

The purpose of the present study was to use a descriptive approach to identify the antecedents to road rage related to external and internal factors relevant to the driver. Drivers were asked to identify the causes of road rage and were given the opportunity to suggest ways to reduce road rage.

METHOD

Participants

A total of 372 participants from various locales in North Carolina were surveyed. Some were students and some were non-students recruited from the surrounding community. Mean age of participants was 25.57 ($SD = 10.55$). Males made up 60% of the sample; females 40%. Ninety-eight percent of the sample had a valid driver's license.

Questionnaire and Procedure

After acquiring informed consent, the questionnaire was administered. The questionnaire contained a general definition of road rage as "driver behavior that is self-centered and potentially dangerous." Three questions were asked to elicit a 'profile' of each respondent. The 3 questions began with a prefix clause: "If you are late for an appointment are you more likely to ...." The clause was followed by the suffixes:

- drive faster than normal?,
- tailgate other drivers?,
- comment out loud?"

Participants could respond 'yes' or 'no' to each of the alternatives. Together, these items formed a road-rage profile (see below). To assess general opinions about the risks associated with road rage, participants were asked if they thought road rage was a problem. Lastly, two open-ended questions asked participants to list causes or antecedents to road rage and then to list ways to reduce road rage behavior. Participants could provide up to four responses to each open-ended question.

RESULTS

Binary values from the three profile questions were summed to develop a profile score, which ranged from 0 to 3, with higher values indicating a tendency to display several 'high risk' behaviors when under time stress. The sample was split at the mean to develop an age-group variable. Consequently, 75% of the sample consisted of younger drivers while 25% consisted of older drivers. Eighty-four percent of the participants reported that they believed that road rage has become a problem.

Analyses were conducted to first determine whether age and gender were related to profile. Using the age-group variable, a 2 X 4 Chi-square analysis was conducted using Fishers Exact Test.

This analysis revealed a significant relationship between age-group and profile, $X^2(3) = 9.83$, $p < .05$. Participants with the higher profile scores tended to be younger than those with lower profile scores. Analysis of the individual items comprising the profile score showed that age group and a tendency to tailgate other drivers were strongly related, $X^2(1) = 11.30$, $p < .001$. A similar gender by profile analysis found no relationships.

Content analysis was used to code responses to the open-ended questions related to causes of road rage behavior and ways to reduce road rage behavior. Qualitative coding schemes included both themes and referents (Krippendorff, 1980).

Structures such as poor roads and stop lights, and traffic stimuli such as tractor-trailer trucks

Table 1

Content Analysis Frequencies (f) and Percentages (%) for User-identified Antecedents (Qualitative Codes)

Antecedent	f	%
Slow Driver	138	15
Traffic	132	14
Cut off	109	11
Bad driver	92	10
Late	76	8
Other	60	6
Angry/Bad Attitude	40	4
Tailgate	39	4
Stress	32	3
No signal	26	3
Old drivers	22	2
Construction	18	2
Other drivers	18	2
Speeder	18	2
Accident	16	2
Cell phone	16	2
Stop light	14	1
No patience	12	1
Poor road system	10	1
Weaving	9	1
Not courteous	9	1
Weather	8	.8
Lost	8	.8
Braking suddenly	6	.6
18 Wheelers	5	.5
Not obeying laws, regulations, or signs	5	.5
Young drivers	4	.4
Pedestrians	2	.2
No response	27	

and pedestrians were identified as triggers associated with road rage.

Methods suggested by participants to reduce road rage varied extensively (Table 2). The largest category was coded as "other" due to the range of responses that could not be collapsed into a clear code. For example, some respondents reported that the best way to reduce road rage was to "stay out of their way" or "keep the stupid people off the roads." The category with the next highest frequency related to increasing the enforcement of current laws and regulations. Interestingly, better design and increasing driver education were mentioned by 9% and 7% of the sample, respectively. Data relevant to control of affective states included recommendations for patience/respect for other drivers and anger management. Some of the suggestions also concerned self-focused coping strategies, such as leaving early and defensive driving.

Table 2

Content Analysis Frequencies (f) and Percentages (%) for User-identified Methods to Prevent Road Rage (Qualitative Codes)

Antecedent	f	%
"Other"	87	16
Enforce	52	10
Better design	48	9
Driver's education	35	7
Patience/Respect	32	6
Anger management	30	6
Leave early	29	5
High speed	25	5
Traffic	23	4
Mass transit	21	4
Music/classical/peaceful	21	4
Fewer drivers	20	4
Bad drivers	19	4
Control behavior	18	3
Minimum speed	13	2
Work hours	12	2
Ban cell phones	11	2
Driver's test	10	2
Safe driving	10	2
Age limit	6	1
No drive	5	1
Defensive driving	3	.6
Signs	2	.4
No response	81	

DISCUSSION

This study demonstrated some strong associations between age and tendencies to express high-risk aggressive behaviors. Older persons were less aggressive than younger participants, as indicated by their composite profile. The strongest item within the profile, tailgating, was reported more frequently in younger than older individuals. Gender was not found to be related to the expression of high-risk aggressive behavior.

It is important to note that approximately 50% of the user-identified antecedents were related to factors external to the driver. These external factors included the behavior of other drivers, dense traffic, and being interrupted or cut-off by another driver. These can further be classified as environmental stressors using the transactional model displayed in Figure 1. This is an important finding because much of the previous road-rage research has focused on traits rather than situational factors.

The results also suggest that engineering controls could be useful in decreasing road rage. Road designs such as turn lanes at intersections and multilane highways would make it easier to maneuver around slower drivers. Smart traffic lights and better designed construction zones that enable greater throughput could decrease congestion and waiting times. Better road signage would facilitate decision making and reduce extraneous search behavior. Also improved vehicle designs that encourage safer driving behavior could be useful such as headway warnings to decrease tailgating. New technologies such as navigation systems and infrared vision systems could decrease difficulties of drivers in unfamiliar and degraded environmental conditions such as severe weather and night driving. These and other potential engineering controls are likely to reduce environmental stress during driving and thus reduce the likelihood that road rage is elicited.

Participants frequently mentioned aspects of driver performance as eliciting road rage. These include bad driver, being late, angry/bad attitude, no patience, stress, and speeding. Many of the suggestions to decrease road rage dealt with reducing driver performance antecedents. These include better enforcement of laws, driver education, anger management, peaceful music,

among others. For many of these items, improved hazard communications could be employed to tell people about known situations and beliefs/attitudes that elicit road rage so that they could be avoided.

Antecedents could be further analyzed to develop assessment instruments to identify individuals who may be most sensitive to road rage antecedents. This information could be used to develop more user-focused training and educational campaigns to modify behavior.

Understanding the causes or antecedents would support a systems approach to preventing road rage occurrences. Goetsch (2002) describes the systems safety approach as one that focuses on the whole collection of factors that interact to disrupt performance or introduce hazards. To apply this approach, research must be expanded to include not only the symptoms associated with road rage, but also the environmental or driver events that can lead to road rage.

This study was a preliminary exploration that identified several important antecedents comprising three specific categories. These are: (1) behaviors or characteristics (i.e., age) of *other* drivers, (2) situational characteristics, such as pedestrians, weather, and traffic, and (3) characteristics of the driver, such as stress or emotions. The results suggest interventions that might be undertaken to reduce road rage. Understanding these antecedents could facilitate the identification of user requirements for the development of environments and in-vehicle systems to reduce aggressive responses.

Interestingly, future designs to increase the comfort of the driving experience frequently focus on driver-less or fully automated vehicles. One utopian view is of the totally automated vehicles that control speed and braking behavior, and automatically adjust position and movement according to surrounding vehicles. But, futuristic designs of automated vehicles often do not consider factors that may trigger the operator to disable the automation and operate in 'manual mode.' Even future transportation design will have to consider the potential for aggression. Thus, the better approach is to design traffic systems that do not lead to feelings of frustration or driver stress.

Further studies should examine the contribution of specific traits such as Type A behavior pattern

(Friedman and Rosenman, 1974) and specifically the trigger patterns of Type A drivers. Emphasis on identifying trigger patterns for drivers with this particular trait is necessary because several studies have linked Type A behavior pattern to aggressive driving, involvement in motor vehicle accidents, near accidents, higher incidence of breaking traffic laws, and displays of risky driver behaviors (Blanchard et al., 2001; Karlberg et al., 1998; Lowenstein, 1998; Perry and Baldwin, 2000). Examination of driver opinions or ratings of the effectiveness of certain solutions is also needed to design successful interventions. In addition, driver opinions of the likelihood that they or others would engage in road rage behavior when presented with the antecedents identified in this study would be useful in building prediction models in the future.

REFERENCES

Beirness, D.J. (1993). Do we really drive as we live? The role of personality factors in road crashes. *Alcohol, Drugs & Driving, 9,* 129-143.

Blanchard, E.B., Barton, K.A., and Malta, L. (2000). Psychometric properties of a measure of aggressive driving: The Larson driver's stress profile. *Psychological Reports, 87,* 881-892.

Boyce, T.E. and Geller, E.S. (2002). An instrumented vehicle assessment of problem behavior and driving style: Do younger males really take more risks? *Accident Analysis and Prevention, 34,* 51-64.

DePasquale, J.P., Geller, E.S., Clarke, S.W., and Littleton, L.C. (2001). Measuring road rage: Development of the propensity for angry driving scale. *Journal of Safety Research, 32,* 1 – 16.

Friedman, M. and Rosenman, R. F. (1974). *Type A behavior and your heart.* New York: Knopf.

Goetsch, D.L. (2002). *Occupational Safety and Health for Technologists, Engineers, and Managers, 4th ed.* Upper Saddle River, NJ: Prentice Hall.

Jonah, B.A., Thiessen, R., and Au-Yeung, E. (2001). Sensation seeking, risky driving and behavioral adaptation. *Accident Analysis and Prevention, 33,* 679-684.

Karlberg, L., Unden, A., Elofsson, S., and Krakau, I. (1998). Is there a connection between car accidents, near accidents, and Type A drivers? *Behavioral Medicine, 24,* 99 – 106.

Krippendorff, K (1980). *Content Analysis: An Introduction to Its Methodology.* Newbury Park, London: SAGE Publications.

Lowenstein, L.F. (1998). Research into causes and manifestations of aggression incar driving. *Police Journal, 70,* 263 – 270.

Matthews, G. and Desmond, P.A. (2001). Stress and driving performance: Implications for design and training. In P.A. Hancock and P.A. Desmond (Eds.). *Stress, Workload, and Fatigue* (pp. 211 – 231). Mahwah, NJ: Lawrence Erlbaum Associates.

McGarva, A. R. and Steiner, M. (2000). Provoked driver aggression and status: A field study. *Transportation Research, Part F, 3,* 167-179.

NHTSA (1997). National Highway Traffic Safety Administration, Traffic Safety Facts 1996, U. S. Department of Transportation, December 1997.

Perry, A. R. and Baldwin, D. A. (2000). Further evidence of association of type A personality scores and driving-related attitudes and behaviors. *Perceptual and Motor Skills, 91,* 147 – 154.

Wells-Parker, E., Ceminsky, J., Hallberg, V., Snow, R.W., Dunaway, G., Guiling, S., Williams, M., and Anderson, B. (2002). An exploratory study of the relationship between road rage and crash experience in a representative sample of US drivers. *Accident Analysis and Prevention, 34,* 271-278.

Yagil, D. (2001). Interpersonal antecedents of drivers' aggression. *Transportation Research, Part F, 4,* 119-131.