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Author

Novaco, Raymond W.

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**The University of California
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Automobile Driving and Aggressive Behavior

Raymond W. Novaco

University of California at Irvine

Working Paper No. 42

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Abstract

Automobile driving and aggressive behavior have had an extensive association. Themes of dominance and territoriality have long been part of automobile driving, which has also involved flagrant assaultive actions. Recent episodes of roadway violence in metropolitan areas have raised community concern about aggressive behavior in driving, although common beliefs about why such violence occurs can be seen as pseudoexplanations. Various themes in the psychology of aggression are presented as they pertain to automobile driving. Convergent factors in contemporary urban life that influence roadway aggression are discussed, and it is asserted that such behavior is more prevalent than commonly recognized.

Automobile Driving and Aggressive Behavior

Episodic occurrences of roadway assaults that have erupted in recent years raise questions about anger and aggression and their relationship to driving. Our everyday discussions about driving experiences incorporate considerable lore about aggression on the road, yet this subject has been neglected academically. In common parlance, aggressive behavior on roadways is understood in simplistic terms, such as defective personalities, "copy-cat" behavior, or traffic stress. Although such ideas have some plausibility, they are overly simplified accounts for incidents that vary considerably in their form and causes.

Contemporary manifestations of roadway assaults relate to several long-standing themes in the psychology of aggression literature which this chapter will explicate with regard to automobile driving. Territoriality, frustration, and environmental cues for aggression are factors that heighten the probability of aggressive behavior, as broadly based research has shown, and they are very much a part of driving.

Although assaultive behavior and other forms of aggression on the road have many causes and dissimilarities, a broad range of aggressive behaviors on roadways can be understood in terms of factors or conditions that disinhibit aggressive behavior. That is, aggressive behavior is very much restrained by inhibitory controls within the individual and society. However, personal and social control mechanisms are weakened by various factors that operate in the context of driving. Physiological and emotional arousal, the anonymity of highways, the opportunity to escape, and the promulgation of scripts of "road warrior" behavior by cinematic and mass media sources can override the personal and societal forces that otherwise inhibit and regulate aggressive behavior.

The weakening of controls of aggression is indeed a matter pertaining to urban violence

generally, and automobile driving is just one arena. Violence on roadways does involve particular "activating" and "releasing" mechanisms, and the growing problem of traffic congestion in urban areas may add to the violence risk. Before addressing those contextual matters, there are symbolic aspects of the car itself that are linked with aggression. In a variety of ways, the very image of the car has been cast with aggressive features, and this symbolization of the car is congruent with some aggression-engendering conditions of the roadway.

ELEMENTS OF AGGRESSION IN THE AUTOMOBILE'S SYMBOLIZATION

Far from being a contemporary phenomenon, aggressiveness has been fused with driving at least since chariots careened around the Circus Maximus in ancient Rome, generating clouds of dust and choruses of roars among the spectators (Hibbert, 1985). The association of aggression with automobile driving, however, has indeed been a recurrent element in the symbolization of the car. Car names, advertising themes, design features, and engineered capacities have often cast an image of the car in aggressive terms. It is not incidental that cars have been called Chargers, Cougars, Jaguars, Stingrays, Thunderbirds, Cutlasses, Tornados, Firebirds, Challengers, etc. Such names fit themes of power and excitement packaged by Madison Avenue, so as to induce significant segments of the buying public to get behind the wheel of the latest ego-enhancing product. Aggressiveness blends with automobile excitement and with the sense of self-efficacy.

Dominance is the core concept of the high performance automotive machine. The car is frequently an instrument of competitiveness in various forms of ritualized dueling, from hot rod drag racing to frenetic scampers through freeway traffic by hurried drivers jockeying for lane position. The car or truck can be a means of asserting dominance, and sometimes they are transformed from vehicles to weapons in the hands of enraged drivers. The hood ornament, now

passe, might well have been a metaphor for a gun sight. Indeed, vehicles are used as weapons with tragic frequency. The car is an instrument of the assertion of power, as many people have observed, such as Schmidt-Relenberg (1986) who described the behavior of Mercedes drivers on the autobahn in terms of "power trials."

The car is also a territorial entity, a highly personalized space, sensitized to crowding, jarring, and marring. Especially in circumstances that are otherwise arousing (such as driving under conditions of time urgency, ambient discomfort, and travel impedance), being in a car is to inhabit a micro-environment that can be easily geared for frustration and anger. The car is an extension of a personal space zone, the encroachment of which can elicit aggressive responding. Moreover, ego-investment in one's automobile is associated with alarm about potential damage. New car owners can be found to be exceedingly vigilant about preserving their car's pristine condition, and some maintain this obsession well past the vehicle's freshly minted days. Even the slightest damage can provoke strong antagonistic responses.

These are aggressive themes in the symbolization of the automobile, but they do not correspond to violence. Marketing images, arousal, ritualized competition, and territoriality do not automatically convert to assaultive, harm-doing behavior. Human aggressiveness is not foreign to automobile driving, but violence is a significantly different matter than competitive acceleration, impatience with traffic, and irritability about parking lot dents. Hence, the association between driving and aggression must therefore be mapped in a differentiated way.

In another writing (Novaco, in press), I have developed a typology of roadway aggression forms, differentiating six different types: (1) *roadway shootings/throwings*, (2) *assault with the vehicle*, (3) *sniper/robber attacks*, (4) *drive-by shootings*, (5) *suicide/murder crashes*, and (6) *roadside confrontations*. These various forms were also arrayed in that typology with regard to six contextual factors, which were target location, aggressor location, target identity, temporal

interval, intentional quality, and traffic relevance. A thorough review of the literature pertaining to roadway aggression was also undertaken in that work, and the disinhibition of aggression concept was articulated with a discussion of violence contagions.

This chapter will discuss a number of long-standing themes in the psychology of aggression literature that pertain to automobile driving. These topical areas from research on aggression include territoriality, frustration, and environmental cues. Before elaborating these psychological themes, I will first discuss the highly publicized road aggression episode that prompted my interest in this topic and examine some common misconceptions about its causes.

THE CALIFORNIA FREEWAY SHOOTING EPISODE

When the wave of "freeway shootings" erupted in California in the summer of 1987, it raised concerns about anger and aggression and their relationship to driving. Communities became alarmed about an allegedly new threat of violence in California and elsewhere, signalling the further decay of the social fabric. Many people saw the shootings as a byproduct of the snarl of traffic congestion that has become an increasing bothersome feature of the southern California landscape and of metropolitan areas, nationwide. The potential influence of the mass media as inducers of "copy-cat" behavior was discussed, and resemblances to gang-related drive-by shootings were also noted. Some observers glibly viewed the spree of freeway shootings as a passing fad, while others saw the episode as indicative of the miserable condition of congested roads.

During the summer of 1987, freeway shootings became a daily news item in California, and the publicity spread nationally and internationally. Between mid-June and the end of August, there were approximately 70 shootings and one serious stabbing on southern California roads

reported in newspapers. Over 100 shootings were reported throughout the state, based on my tabulation of newspaper accounts. The incidents were distributed across days of the week, with no particular pattern for time of day, although most of the shootings occurred during the afternoon or in the evening before midnight. Most of the incidents occurred on freeways, but about 25% took place on surface streets. The victims were predominantly males, and the assailants were all males, with female companions in a few cases.

This domain of male exclusivity for California shootings maintained until March 5, 1988, when a female passenger in a red Hyundai punctuated her driver's obscene hand gestures by blasting a car of teenagers who had previously passed them.

The vehicles used in the shootings varied considerably, as shots were fired from cars, trucks, and motorcycles, although pick-up trucks were involved disproportionately. Most "freeway shootings" were perpetrated by solo drivers, although at times there were three or four assailants. Indeed, this form of roadway aggression is to be distinguished from gang-related incidents known as "drive-by" shootings.

Once the wave of shooting passed, the common tendency was to view what happened as a vanishing aberration. Driving on freeways is ingrained in our lifestyles, so we are commonly in the environments where the highly publicized assaults have taken place. The apparent randomness of the shootings certainly heightened the alarm. Yet, few of us want to think that our communities have become so uncivilized that we must worry about being bushwacked on the way to work. The shootings were, however, less random than commonly believed. The majority of incidents involved some prior dispute or conflict about road privilege, based on victims' accounts, which are likely to be underestimates of prior provocation. Death and serious injury victims have often been passengers, which should give drivers pause in becoming ensnared in a dispute about road space.

Far from being an aberration, the conditions that facilitate road violence remain, and this manifestation of aggression was more than an episodic occurrence idiosyncratic to California. In fact, sequential outbreaks of roadway shootings have periodically occurred in other metropolitan areas, and aggression on highways happens more frequently than is generally or officially recognized. Before the California episode, there was a spree of freeway shootings in Houston during 1982. At that time, there was a large influx of newcomers to that city, and its freeways were very congested. There were 12 traffic-related homicides. Another thirteen happened over the next five years. Those were homicides -- shootings were much more numerous. Following the California episode in the summer of 1987, there was a similar freeway shooting contagion that fall in St. Louis, involving 22 confirmed shootings between the end of October through December. Also in Detroit, about a dozen roadway shootings occurred during the year after those in California. The wave of shootings in southern California, therefore, were not at all unique.

Pseudo-Explanations of Freeway Shootings

The road assault incidents had dissimilarities and many causes. Why the assaults occurred, and why they "stopped" remain interesting puzzles, although the answer to the latter question has a twist -- they have not stopped. Roadway assaults taking the form of shootings, throwings, and brandishings that are not gang-related have not abated at all -- what has diminished is the thematic presence in the news media. From data tabulated by the California Highway Patrol, which I have acquired, "freeway violence" has increased from 1988 to 1989. For example, after a rise and decline in the first half of 1988, the CHP tabulations indicate 114 and 98 incidents in July and August of 1988 and then show a steady rise to 250 and 325 for June and July of 1989. The latter figure was an "all time high," according to Commander Cowen-Scott who has provided

me with the incident data, which will be scientifically analyzed. This respected police agency certainly does not consider aggressive behavior on roadways to be a passing fad, although it is fortuitous (from a contagion standpoint) that it has lost its topical value for the "news."

Regarding why the freeway shootings occurred, this particular form of assault must be viewed in the larger context of societal violence and in relation to other forms of aggression in automobile driving. Several explanations having colloquial appeal must be recognized as over-simplifications that fail to address multiple pathways of causation. Attempts to account for freeway shootings as being due to "wackos," "copycats," or even "traffic stress" are too narrow and go astray.

Personality pathology is certainly a relevant factor in road shooting incidents, and it is likely that some of those who did them would have engaged in some other form of aggression, if this particular script had not been salient. A case in point is that of Albert C. Morgan, who was convicted of shooting Paul Gary Nussbaum on the freeway approaching the Costa Mesa Fairgrounds on July 18, 1987. Nussbaum is now paralyzed from the neck down. Morgan was sentenced to ten years imprisonment. During the trial, several significant facts emerged. When captured, Morgan had ammunition in both pockets (four bullets in one, and five in the other). He was drinking heavily prior to the shooting and had a blood alcohol level of .10 four hours after the shooting. His past history had notable aggressive features, including archery hunting for bears and a prior roadway assault in which he fought with another driver. Certainly, in this case and others, **there** is a conspicuous aggression-proneness factor operating.

The expression, "A man drives as he lives," is a theme that was in effect pursued by a number of British researchers in the 1960s and 70s who were investigating the relationship between aggressiveness as a personality trait and motoring offenses, as well as accident liability. This research was partly inspired by an early study by Tillman and Hobbs (1949) on accident

proneness, and includes monographs by Skillman (1965), Parry (1968), Whitlock (1971), and MacMillan (1975), along with a variety of studies in the psychiatric and behavioral literature. This body of work is fully reviewed elsewhere (Novaco, in press), as previously indicated. Here, the point to be made is that aggressive behavior has many causes, some of which are personal dispositions and some are situational. When aggression occurs on the road, we must examine the roadway context as a containing some of the determinants, especially when patterns of aggression occur across individuals.

Personality factors are only part of the picture. Someone such as Mr. Morgan would likely be violent off the road as well as on it. But traffic circumstances, the freeway shooting script, alcohol consumption, and the availability of his weapon surely boosted his aggression potential on that Saturday afternoon, when he was stuck in a traffic jam, had a prior altercation with someone in a blue truck, and then leaned across in front of his wife's face to shoot Gary Nussbaum.

In contrast to being perpetrated by "pathological" types, some of the shootings may have involved ordinary people undergoing periods of stress who lost control of their impulses. They may have used a weapon for attack that they were carrying for defense, despite the illegality. Alternatively, the victims may only have expressed annoyance with words or gestures but then provoked a more aggressive counter-response. More tragically, the victim may not have been the person who initially provoked the assailant. The escalation process need not be confined to the original players. Various disinhibitory processes and cues for aggression can catalyze an angry emotional state into harm-doing behavior. When someone gets very angry, they often do not consider the consequences, and they do not pick targets very carefully.

Another common explanation for the freeway shootings is that they are "copy-cat" incidents. There is some credence to this, as modeling effects are among the most

well-documented phenomena in psychological research on aggression (Bandura, 1973) and are discussed later as one of the major themes pertaining to roadway aggression. However, the "copy cat" explanation plausibly accounts for only part of what happened. Most of the incidents involved some dispute or altercation, so it was not a matter of sensation-seekers merely duplicating a newscast, movie scene, or newspaper story. Millions of drivers were exposed to multimedia coverage, yet only about a hundred did the shooting. Imitative behavior and modeling influences are certainly part of the diffusion or spread of road aggression throughout some geographic area linked by the media, but the effects are more than "copy-cat" phenomena. The escalation of many incidents from disputes to assaults, and the fact that assaults which begin in cars sometimes culminate outside of cars render the "copy-cat" idea as pseudoexplanation. Some examples from my *roadside confrontation* category will easily illustrate this point.

Roadside confrontations refer to traffic disputes that have been extended outside the vehicle. Following a dispute about road space or privilege, one driver may force another off the road or may simply be in a position to impede the other's movement, setting the stage for confrontation. During the California 1987 summer episode, there was a stabbing in Newport Beach that left a man in critical condition after two men who were in a motor scooter began to scuffle with two men who had been in a Corvette. The following January, an irate motorist got out of his car to confront another motorist, who was a pregnant woman. He pushed her against the freeway railing, punched her, and tried to throw her over the railing but was deterred by six passing motorists who received humanitarian awards. In the Detroit episode, which occurred in late 1988 and early 1989, there were two roadside confrontations that were extensions of freeway disputes and which resulted in serious injuries, one of them fatal. The man who died was pursued off the Interstate after he and his companions made obscene gestures. He died from kicks to the head and neck. In the other case, a driver was forced off the road and then badly slashed with

a knife. These events surely indicate that there is more involved than "copying" of previously publicized shootings.

A example that illustrates the limitations of the "copy-cat" and the pathological personality views is the case of Arthur Salomon, Wall Street investment banker and the grandson of Percy Salomon, one of the founders of Salomon Brothers. This prominent 52 year-old, seemingly model citizen, shot an unarmed college student on June 19, 1987 in a road dispute on the Hutchinson River Parkway (Stone, 1987). The conflict began over the right to pass on the freeway. It escalated to verbal exchanges on the side of the road and ended with the shooting of the young man by Salomon, as the victim was walking back to his car, saying that he had the license number of Salomon's Mercedes. Mr. Salomon was reported to be under strain at the time and was also involved with law enforcement hobbies. Although he was known to be stubborn, he was well-known for his generosity, and he loved to work in his garden (Stone, 1987). Apparently, the distinguished citizen became ensnared in a road dispute, which escalated and then resulted in his using a gun for attack that he carried for protection. I doubt that he, his family, or his associates were inclined to account for his behavior in terms of a thrill-seeking wacko fad, copy-cat behavior, or an anti-social personality.

Lastly, viewing the road shooting episode as a product of "traffic stress" is also misguided. The California summer incidents were evenly distributed across days of the week, with no distinct pattern for time of day, although most of the shootings occurred during the afternoons or in the evenings before midnight. The shootings were not done by rush hour commuters stuck in traffic jams. A traffic jam is a rather unlikely place for a road shooting, presuming that the person doing the shooting wishes to escape. It is precisely the anonymity and escape potential of freeways that provides for disinhibition. Albert Morgan, however, was in a traffic jam when he shot Gary Nussbaum, and indeed he was quickly apprehended at the Orange

County Fairgrounds. Morgan was the exception, and he also had several other disinhibitory processes operating -- i.e. readiness of gun and ammunition, alcohol consumption, and arousal from a prior altercation with another driver.

Traffic conditions are not irrelevant. Some years ago, my colleague, Daniel Stokols, and I did several studies on commuter stress, which pioneered naturalistic field research on the effects of automobile commuting (Novaco, Stokols, Campbell, & Stokols, 1979; Stokols, Novaco, Cambell, & Stokols, 1978; Stokols & Novaco, 1981). As psychologists, we were concerned with long-term exposure to traffic congestion, chronic health and behavior effects, individuals who were most at risk, and conditions of the home and job environment that influenced the stress of commuting. It is indeed true that continued exposure to traffic congestion elevates resting blood pressure, increases negative mood states, lowers tolerance for frustration, and can lead to more impatient driving habits. More recently we have found additional negative effects on physical health, work absences, and mood at home in the evening (Novaco, Stokols, & Milanese, in press). However, physiological arousal, irritability, and impatience are qualitatively different from assaultive behavior. These internal states can activate aggression, but aggression is a significantly different matter, because it requires an override of inhibitions about harm-doing. Traffic conditions may affect our mood and produce other stress consequences, but many other factors operate in producing flagrant assaultive behavior.

The convenient explanations for "freeway shootings" must be recognized as overly simplified, as the violent incidents were heterogenous and multi-causal. Moreover, freeway shootings are only one type of aggression that occurs on roadways. They are a relatively uncommon form, perhaps exceeded in novelty only by the veritable highway robbery spree that occurred in South Florida in 1985 when over 100 motorists were ambushed and robbed on Interstate 95 between Ft. Lauderdale and Miami. Other violent behaviors, in addition to shootings

and robbery, involve the use of the vehicle as a weapon. That form has received some scholarly attention, as there is a study of vehicular homicide cases in Columbus, Ohio, by Michalowski (1975) and a British criminal law review by Spencer (1985).

The more common forms of aggression on roadways are the not-so-violent variety, such as verbal nastiness, threat displays, and various antagonistic driving behaviors. The community surveys that I have conducted indicate that these behaviors are more prevalent than generally or officially recognized, however, the report of those findings remains for a subsequent work. What will be presented here are a set of themes in the psychology of aggression literature that pertain to automobile driving. These long-standing themes are territoriality, frustration, and environmental cues for aggression.

THEMES IN THE PSYCHOLOGY OF AGGRESSION RELATED TO DRIVING

Psychological research on aggressive behavior is voluminous, hence this presentation is only a cursory discussion of some primary topical areas that are related to driving. Roadway conditions that are conducive to aggressive behavior are discussed in light of these psychological themes about which there is considerable consensus among aggression researchers.

Territoriality

The territoriality theme was mentioned earlier in conjunction with the symbolization of the car. Aggression has been linked with territorial defense among numerous species of animals in ethological research. The naturalistic observations of Lorenz (1966) are among the most well-known academic works in this regard, and the writings of Ardrey (1966) are prominent in the popular literature. As noted by Johnson (1972) in his review of scientific literature, territorial conflict is widespread among animal species, but it is not universal -- in fact, most primates do

not defend territories. Ardrey himself notes that baboons, who are highly aggressive, are not territorial. However, observations about territoriality among animal species have been extrapolated into arguments for an aggressive instinct.

While there is little quarrel about the fact that aggression occurs in the defense of space among animals and humans, the assertion of an "instinct" mechanism is another matter, and such claims have been strongly rebutted by so many research scientists that it is no longer an issue. Yet, this idea of a territorial instinct has appeared in the road aggression literature, notably in the monograph by Whitlock (1971) who examined the association between road deaths and general mortality statistics in 26 countries. Whitlock's proposition was that road violence is an aspect of social violence in general, and he explained aggression on the road in terms of instinctive drive and territoriality. He hypothesized that the inclination of young men to be aggressive on the road was due to their lack of real estate ownership and the transfer of aggressive instinct to the automobile. His ideas prompted Richman's (1972) interview study with Manchester traffic wardens concerning "errant motorists," which had disconfirming results for the Whitlock ideas.

There is no need to bind ideas about territorial defense with the notion of aggressive instinct in order to account for aggressive behavior on the road. The automobile surely can be understood as territory, in terms of both property to be defended and as a personal space zone not to be encroached. The automobile is a highly personalized property, and aggression can be elicited by the perceived need to defend it. Marsh and Collett (1986) wrote colorfully about the car as a special territory with personal space zones, the invasion of which provokes anger and aggression. Nearly everyone is irritated to some degree by having another driver riding their bumper. The antagonism experienced may be less a matter of threat to property than of threat to personal security, depending on the speed of travel. In the animal kingdom, aggression is often

a response to the proximity of another animal, and when someone feels jammed, constrained, or trapped in a herd of automobiles, irritability and antagonism are potentiated.

Lastly, the territorial behavior of gangs, exhibited in drive-by shootings, reflects both the economic and the security aspects of the defense of turf. Such shootings also have symbolic causal dimensions. In southern California, drive-by shootings are almost exclusively perpetrated by Latino gangs, although there are many Black and Asian gangs. The prototype was established by predominantly Italian mobsters in New York and Chicago in the 1920s. Such shootings are often acts of retaliation executed on rival turf, hence they are much more than territorial defense, which in this regional context occurs when, for example, someone wearing the wrong "colors" in a particular neighborhood is shot from a passing car. In the past few years, there has been a distinct increase in this form of roadway aggression, and it begs for systematic analysis.

Frustration and Arousal

The relationship between frustration and aggression is the oldest theme in the psychology of aggression. It has its ancestry in the writings of Freud, but it was born as a research topic with the publication of the famous monograph by Dollard, Doob, Miller, Mowrer, and Sears (1939), and it prominently appeared in numerous studies in the 1950s and 1960s. Aggression was viewed as always being a consequence of frustration. The instigation to aggression was held to be a function of a number of aspects of the frustration, including the degree of interference, the importance of the goal, and the number of frustrations. Dollard et al. developed elaborate propositions about the frustration-aggression relationship, including matters concerning displacement, inhibition, and catharsis. The theory received a major reformulation by Berkowitz (1962), who argued that *anger* and *interpretation* were important mediators. Later, aggression theorists, notably Bandura (1973), moved away from the term "frustration," which had become

an omnibus concept, and looked more extensively at varieties of *aversive instigators* and the *arousal states* that they produced which heightened aggressive responding. An interrelated idea is Mandler's (1984) "interruption" concept which pertains to the blocking or delaying of an organized response sequence, the effect of which is to activate arousal and emotion.

Roadways in metropolitan areas are replete with frustrations and interruptions, which are the essence of traffic jams, as well as properties of various traffic control devices. Commuters learn to adapt to these aversive conditions in a variety of ways, cognitively and behaviorally, so indeed the frustrative nature of such conditions is determined by the driver's appraisal of them. Nevertheless, someone who has otherwise adapted to existing levels of travel constraints may, on a particular day, be momentarily sensitized to traffic frustrations or be already agitated by preceeding events (at home or work) such that their capacity to cope is weakened.

Traffic congestion has become a conspicuous and bothersome feature of the urban landscape. In our research on commuting stress mentioned earlier, traffic congestion is understood as a stressor in terms of the concept of *impedance*, a behavioral constraint on movement and goal attainment. The frustrative and arousal-inducing properties of travel constraints are assumed to be stressful. We have operationalized impedance as a physical or objective dimension in terms of the distance and time parameters of commuting and with regard to road exchanges as nodes of congestion. We have also examined impedance as a perceptual or subjective dimension in terms of perceived aspects of travel constraints. Both the physical and the perceived dimensions of impedance have been found to impair personal well-being, job satisfaction, and quality of home life, and we have developed an ecological model for understanding these effects of commuting stress (Novaco et al., in press).

The existing transportation environment in southern California is predisposing to aggressive behavior because of increased impedance conditions. The 1988 Orange County Survey,

a telephone interview sampling of 1000 residents, only 5% of those surveyed reported being satisfied with existing freeway conditions, which is down from 8% in 1987 and 32% in 1982. Nearly 50% of residents consider traffic congestion to be the county's most important problem (Baldassare, 1987; Baldassare & Katz, 1988). Traffic congestion, based on CALTRANS measurements, has increased by a factor of 50 in Orange County and had increased in Los Angeles County by 12-15% per two year interval since 1979. The national picture is also one of increased congestion. A recent report of the General Accounting Office (1989) states that the metropolitan-wide problem of traffic congestion has become more severe, showing major increases in average daily traffic volume for U.S. urban Interstate roads from 1980 to 1987, calculated in terms of volume/capacity ratios. The thwartings associated with increased traffic raise the probability of hostility and aggression on the road.

Frustration and stress due to traffic conditions are by no means automatically generative of aggressive behavior, but they do present predisposing conditions. The research that Stokols and I have conducted with regard to chronic exposure to traffic congestion has found significant increases in baseline blood pressure, lowering of frustration tolerance, increases in negative mood, and aggressive driving habits to be associated with exposure to high impedance commuting. Such conditions present risks for violent behavior, especially when aggression-inhibiting influences are reduced.

Environmental Cues

Field studies on human aggression have often been concerned with stimuli in the environment that elicit aggressive behavior. Berkowitz (1962) used the term "aggressive cues" to refer to these stimuli that enhance the likelihood that someone who is aroused (typically by anger) will attack an available target. He attaches great importance to such cues when

examining impulsive acts of aggression (Berkowitz, 1974, 1983). A person who is aroused or activated to aggress may still be able to restrain himself, but efforts to control this arousal can be short-circuited by aggressive cues in the situation (e.g. insulting words that prompt fighting, the availability of weapons, the presence of other people who reward aggression, or the modeling of aggressive behavior by others).

In the road aggression literature, there is a small set of studies on horn-honking that seemed to have been inspired by a combination of the frustration-aggression research tradition and Berkowitz' work on aggressive cues. These studies began with that of Doob and Gross (1968) and is best exemplified in the field experiments by Turner, Layton, and Simons (1975). These are reviewed in Novaco (in press), along with an analysis of validity issues in social psychology field experiments on road aggression. Although there are difficulties with the use of horn-honking as a criterion measure for aggression, as it has been used, there would be little quarrel with understanding it as a cue for aggression in a context of thwarting or frustration.

Relatively little is known about the prevalence of hostile reactions among drivers. A pioneering study done by Parry (1968) in a London borough found that 15% of the males and 11% of the females stated that "At times, I felt that I could gladly kill another driver." That statement was endorsed by 12% of the males and 18% of the females in a Salt Lake City sample surveyed by Turner et al. (1975) in preparation for their experimental studies. On a more behavioral level, Parry (1968) found that 27% of the males and 12% of the females had given chase to another driver who had annoyed them. The results for Turner et al. (1975) on this item were 12% for men and 4% for women. Marsh and Collett (1986) report that a study in Scotland found that 25% of the drivers in the 17 to 35 years of age group admitted chasing drivers who had offended them. My own surveys with two university student samples and two community samples in southern California have found the percentages to be over 40% for

males in each sample and from 11% to 21% for the female samples. Many other provocative behaviors, such as throwing objects, shouting or yelling, deliberately riding someone's bumper, and obscene gestures, were reported to occur with worrisome frequency. For example, 6% of the university sample and 9% of the community sample report making obscene gestures on a weekly basis.

The carrying of weapons in the automobile presents another cue for aggression. A prospective freeway shooter may be someone who is otherwise law-abiding and has a gun in their car for protection that they then use for attack. Although experimental studies of the "weapons effect" in the aggressive cue literature have often failed to replicate initial findings of Berkowitz and LePage (1967), the ethical limitations of research on human subjects restrict a suitable test of the hypothesis. It is surely plausible that the presence of weapons intensifies ideas of attack, and the prevalence of guns is not on the decline. A Los Angeles Times poll (Clifford, 1989) of 2,032 residents of southern California found that 5% of drivers carry a gun in their car, which is even higher than the 2.9% for my community samples of 412 Orange County drivers on a self-report survey.

To the extent that drivers engage in provoking behavior and carry weapons in their vehicles, there is a troublesome potential for roadway aggression to amplify. Some drivers may be quite inclined to persevere in a quarrel, and an antagonistic exchange between drivers can escalate to harm-doing consequences. Indeed, it is surely a mistake, especially during a community contagion of road shootings, to become ensnared in a road dispute. To do so is to engage in an ego-oriented script that has a very bad ending.

SUMMARY

Aggressive behavior has had a recurrent association with automobile driving, as reflected in our symbolization of cars and trucks, as well as being linked to psychological experiences on congested roadways. Dramatic occurrences of violence, such as the California freeway shooting episode in the summer of 1987, might be thought to be idiosyncratic events. Instead, such occurrences need to be understood in the historical and phenomenological context. Freeway shootings are only one type of aggression occurring on roadways and are in no way unique to California. Overly simplified views of the California summer contagion as being due to "pathological personalities," "copy-cats," and "traffic stress" were shown to be pseudoexplanations.

Although research on human aggression has neglected the roadway context as a field of investigation, there are several major themes in the psychology of aggression literature that offer hypotheses for analysis. The themes of territoriality, frustration, and environmental cues were presented and discussed as they pertain to roadway aggression. A number of surveys and field experiments can be found in the existing literature which are either based on these themes or are convergent with them.

While it would be an exaggeration to say that antagonism and aggression are a routine part of automobile driving, various lines of evidence indicate that such behavior is not uncommon among American and British drivers. The stereotyped form of road aggression known as "drive-by shootings" is much in need of a thorough analysis of its historical, cultural, and sub-cultural underpinnings. Since aggression on roadways exists in many forms and since conditions that are predisposing to such aggression are not diminishing, this topic merits concerted attention.

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