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Targets of Violence and Aggression
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The University of California Transportation Center
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Abstract

Aggression and the automobile have had a long standing association, yet research on aggressive behavior has neglected the roadway context. This chapter reviews existing work which has included archival analysis, field interview studies, personality research, and field experiments. Among the recurrent themes have been the relationship between aggressivity in driving to accident liability and to violence in the larger social context. Validity issues in road aggression research are discussed, and a typology of roadway aggression is presented. The typology maps a range of contemporary forms, most of which have never been investigated scientifically and have received sparse academic attention otherwise, despite having high social and scientific relevance. Disinhibiting influences that heighten the probability of roadway aggression are discussed.

Aggression on Roadways

Virtually all drivers know the experience of provocation behind the wheel, but our sense of risk and destructiveness associated with driving is, for the most part, restricted to the occurrence of accidents. This is, of course, actuarily sound. Yet in the social consciousness of those living in metropolitan areas, there is some inclination to think of automobile driving on congested roadways as resembling what Thomas Hobbes in the 17th century described as the state of nature, a "war of every man against every man." Although this is hyperbole, there are many indications that aggressive behavior on roadways occurs with sufficient prevalence and in various forms to merit attention as a condition of risk for individuals and communities. In this regard, the roadway aggression concept can serve an organizing function as a rubric for otherwise disparate forms of harm-doing behavior that occur in driving situations, all of which have escaped the attention of systematic research.

Studies of human aggression and violence curiously have ignored the roadway context, despite the abundance of research on these general subjects and despite the recurrent association of aggressivity and the automobile. The symbolization of the automobile has commonly incorporated aggressive themes, reflected in car names and marketing images. Both cars and trucks are often used by their drivers as instruments of dominance, and the road serves as an arena for competition and control. Moreover, roadways in metropolitan areas have become contexts where aggressive scripts (mental programming of antagonistic behavior) are activated by driving circumstances. The disposition for aggression, otherwise subdued by the restraining contingencies, palliatives, and gentilities of societal living, becomes engaged behind the wheel, being easily provoked by traffic and the behavior of other drivers. The roadway, whether freeway or surface street, whether urban or rural, is a context where

aggressive behavior is potentiated precisely because of multiple disinhibitory influences[1] which will be discussed in the latter section of this chapter.

Regarding the concept of aggression, let it be clear at the outset that I are referring to harm-doing behavior, intended to be so. This is to distinguish occurrences of aggression from other forms of activated behavior in driving. Various types of ritualized dueling, from hot rod drag racing to frenetic scampers through freeway traffic by hurried drivers jockeying for lane position, might be viewed as preludes to aggression or akin to the stereotyped routines of intra-species animal conflict. However, excitement, acceleration, and the prescribed competition of street cultures do not equate with or automatically convert to assaultive, harm-doing behavior or the threat of such behavior. Aggressivity is not foreign to automobile driving, but predisposing conditions and precursors must be distinguished from behavior intended to cause distress, injury, or damage.

Episodic sprees of freeway shootings in the United States have received extensive media attention, thus there is some tendency to think of roadway aggression primarily in terms of that form of occurrence. However, there are a number of other aggressive behavior forms which occur on the road, and these can be seen to differ in morphological, motivational, and contextual characteristics. In addition to "freeway shootings"[2] or other projectile attacks between drivers, roadway aggression also occurs as assaults with the vehicle as a weapon, roadside confrontations outside of vehicles, sniper/robber attacks by non-drivers, drive-by shootings, and suicide/murder single car crashes. This article provides a typology of these disparate forms and maps them with regard to dimensions of their manifestations so that they may be more clearly differentiated.

Roadway aggression has indeed been a sparse topic in academic literature, yet there has been a pioneering book (Parry, 1968) and a divergence of articles and other books that

form the research background. Lacking in these previous works, however, is an organizing conception and an adequate scope of analysis. In fact, most of the real world forms of road aggression that are delineated here have never been addressed previously. I will review the topical background and then differentiate the various contemporary manifestations and their historical precursors. It will be evident that many present day forms of road violence which have the appearance of novelty in fact have long-standing existences.

RESEARCH BACKGROUND

Early British Studies on Road Aggression

The study of aggression on the road was inaugurated commendably by Parry (1968) who conducted a survey and interview project with samples from a London borough. He was concerned with driving safety and essentially believed that accident-proneness was a function of the driver's personality. Aggression and anxiety were the personality factors that he examined for their relationship to accident liability, as well as for their distribution among his samples.[3] Parry gathered questionnaire data on 382 drivers, 55 of whom he then selected for interviewing. The interview sample consisted of subjects with extreme scores (a low group and a high group) on his aggression/anxiety index. He also conducted interviews with various professionals: eleven police officers, five driving instructors, and an unspecified number of insurance men.

Parry's main questionnaire consisted of 75 forced-choice items (50 aggression and 25 anxiety)[4] that were generated from motorists' responses to open-ended questions in a pilot survey (N = 50) and then pre-tested in a preliminary study with a small sample (N = 25). The questionnaire also obtained the respondents' reports of accidents and their severity.

Generally, he found that aggressive sentiment was relatively prevalent among drivers, as 9% of the males and 1% of the females had been in a fight with another driver; 7% of the males and 2% of the females had deliberately driven at another vehicle in anger; and 15% of the males and 11% of the females stated that "At times, I felt that I could gladly kill another driver." Aggression scores, quite predictably, were highest for males between the ages of 17 and 35. Importantly, high aggression, with or without high levels of anxiety, was related to higher accident liability.

Approximately eleven weeks after completing the questionnaire, 55 selected motorists were interviewed by Parry, whose interview procedure (one to two and a half hours) included a sentence completion form given at the outset (e.g. "For me to be provoked when driving is...;" "If the traffic-lights change to red as I approach them, I usually...") Parry qualitatively judged that subjects responded consistently to the questionnaire and the sentence completion. In his reports of the interview, the subjects give elaborate justifications for their aggressivity. He states:

> Interview after interview with motorists brought forth expressions of justification for aggressive behavior...Not one of the people interviewed in this category (high aggression, high anxiety) admitted that he was, in any way, the guilty party. Not one admitted to having learnt a lesson as a consequence of which he had made a conscious effort towards becoming a better motorist. Almost all agreed that they would again do the same thing in like circumstances" (p. 34).

The relationship between aggression and accident liability that Parry found in his questionnaire and interview data was corroborated in his interviews with the professional

sample. As one police inspector said, "Without any hesitation, I would say that most of the accidents I've witnessed in my capacity as a law officer were caused by young people, men, in some aggressive act or another" (p. 50-51). Parry's report of his interviews with the various professionals is abbreviated and without analytic tabulation. Nonetheless, he concluded from them as well that aggressive personalities, dangerous driving, and accident proneness were integrally related.

Parry's descriptive research made no attempt to account for causal variables and was without theoretical direction, and because it appeared outside of mainstream psychological literature, most aggression researchers missed this rich source of ideas for naturalistic studies. Similarly, another major work that escaped attention was Whitlock's (1971) monograph, which involved an archival analysis of mortality statistics from 26 countries, mapping associations between road deaths and various forms of violence. Whitlock indeed emphasized the personality of the driver as a critical factor in road accidents, thus continuing Parry's theme, although developing his own research from a much larger literature spanning driver characteristics, accident proneness, traffic safety, and aggressive behavior.

Whitlock's research was ambiguously guided by theory, but he extensively used aggression concepts (principally, psychodynamic and ethological) to account for obtained relationships between road deaths and violence indices. His hypothesis that the higher the incidence of intrasocial aggression, the higher the rates for death and injuries on the road received support across numerous correlation analysis; however, his analytical method is flawed by failure to control for co-linearity and spurious effects.[5] Whitlock argued that "road violence is one aspect of social violence" (p. 125), and he explained aggression on the road in terms of instinctive drive and territoriality.[6] Surprisingly, his elaborately developed speculation, given after presenting his findings, was not at all articulated with his elaborate

introductory chapters concerning psychopathology of drivers, accident proneness, and suicidal tendencies.

The territorial defense thesis, prompted by the writings of ethologists such a Lorenz (1966) and Tinbergen (1951), need not be wedded to ideas of aggressive instinct. Aggression is obviously functional in defending territory, and the automobile is unmistakably a chunk of mobile property, often highly personalized. Marsh and Collett (1986) wrote colorfully about the car as a special territory with personal space zones, the encroachment of which provokes anger and aggression. Yet directly stimulated by Whitlock's propositions[7], Richman (1972) conducted a participant observation and unstructured interview study of Manchester traffic wardens[8], investigating whether aggressiveness on the road was primarily a function of the driver being male, young, and of low socio-economic status (indexed by size of car). These factors were treated as operational variables for territoriality -- i.e. conditions under which road aggression as territorial defense would be potentiated. His categorical data on traffic warden's views of "the errant motorist" found little support for these operational variables. However, among the problems in this study are the status of the respondents and their customary field of observation (see note 8). Although the hypothesis of road aggression as territorial defense can be expected to have boundaries in its range of applicability, it nonetheless merits more sophisticated testing.

Personality and Accident Liability

Vehicular homicide is the predominant form of negligent manslaughter, comprising over 90% of the cases (Newman, 1978). In a study of 119 vehicular homicides occurring in Columbus, Ohio, over a three year period, Michalowski (1975) found that a significant proportion of the offenders had a prior history of criminal aggression. His analysis was

guided by Wolfgang and Ferracuti's (1967) concept of violent subcultures. While 19% of the accident victims had criminal records, 41.5% of the perpetrators had prior criminal offenses, and 36.9% had committed some crime against the person. Of the perpetrators who had criminal records, 89% had been arrested at least once for a crime of violence, and 63% had been arrested exclusively for violent crimes. Finding also that nearly all the multiple violent offenders were multiple traffic offenders, Michalowski confirmed his hypothesis that "perceptions favorable to aggressive behavior influence the way an individual drives as well as the way he behaves in face-to-face interactions" (p. 41). He therefore concluded that violence on the road is linked to violent subcultures as much as is routinely recognized violence.

The accident liability theme of the Whitlock (1971) and the Michalowski (1975) studies, whereby aggressive personality characteristics are associated with road safety risk, had in fact been pursued in earlier research in the psychiatric literature (e.g. Conger, Gaskill, Glad, Hassel, Rainey & Sawrey, 1959; Kole & Henderson, 1966; Schuman, Pelz, Ehrlich, & Selzer, 1967; Selzer, Rogers & Kerr, 1968; Tillman & Hobbs, 1949). In this literature, it had been found that accident repeaters had poor control of hostile impulses and have antisocial tendencies. Non-technical works, such as Skillman (1965), often used anecdotal accounts of anger/aggressive dispositions and provocation episodes as accident risk factors. For Skillman, the experience of anger was one type of "vulnerability" for a collision.[9] Impulse expression (anger reactions) in driving situations was found by Schuman et al. (1967) to be related to accident frequency and moving violations among young male drivers, but their criterion data are confounded with number of miles driven. With some exceptions (i.e. Tillman & Hobbs, 1949), this body of psychiatrically oriented research is characterized by weak methodology and rudimentary statistical analyses. Low magnitude correlations without controlling for

confounding variables are the typical findings. Consequently, one must wonder about the empirical versus the mythological basis for the linkage of aggressivity with driving safety.[10]

Among the measures encountered in this literature are projective techniques, and "aggression" was sometimes found to be unrelated to driving outcomes. For example, Panek, Wagner, Barretti & Alexander (1978) found that automobile accidents were not associated with Hand Test aggression scores, and insignificant results were also found in later analyses of moving violations for this female driver sample (Panek & Wagner, 1986). One psychoanalytic report (Hamilton, 1967) of three case histories involving rear-end collisions was based on extensive psychodynamic data, including projectives, and strongly implicated aggressive themes. Hamilton concluded that the rear-end accidents "may be regarded as an attempt to master the passive fear of anal rape by the father via identification with the aggressor in the striking of another car from behind" (p. 198). These cases were clinically evaluated as having poor internalized controls and extreme difficulties in dealing with aggressive impulses (in addition to chaotic sexual identities, castration anxiety, and latent homosexual fears). That analysis would seem to stretch the boundaries of inferential leaps. In something of the same spirit, Kole and Henderson (1966) developed a "Cartoon Reaction Scale" that discriminated (although not well) problem drivers from nonproblem drivers. The problem drivers (New Jersey point system violators) found the cartoons of driving situations less funny. Although these authors developed their scale as a projective test pertinent to aggression, they oddly never stated the expected direction of their results or provided a logic for differential reactions to the cartoons vis-a-vis aggression and driving behavior.

At the front of this literature pertaining to aggression and driving safety is the early study by Tillman and Hobbs (1949), which was admirably done and showed considerable inventiveness. They pursued the idea of "accident-proneness" that had emerged from a study

of British munitions workers after World War I, studies of British bus drivers, and a study of Connecticut drivers which all found that accident liability is not distributed by chance. Tillman and Hobbs, seeking to study the personalities of London, Ontario, bus drivers with high accident records, were thwarted by labor/management problems, so they turned to taxi drivers. However, unlike the bus companies which had extensive records tallied by the authors, taxi firms kept poor records. Nevertheless, Tillman and Hobbs resourcefully used information from insurance firms and interviews with drivers and managers (cross-checked) to isolate groups of high vs. low accident drivers. Extensive field interviews, observations of driving behavior, and information from criminal justice and social agencies found that the high accident drivers had significantly higher childhood aggression, truancy and disciplinary problems, AWOL rates in the Armed Services, family disharmony, sexual promiscuity, bootlegging on the job, and a number of other dysfunctional characteristics. Their driving habits, compared to the low accident group, were characterized by irritability, distraction, horn-honking, competitiveness, and lack of concern with the mechanical limitations of the car. Being mindful of the methodological weaknesses of their procedure, the authors then compared high accident and low accident male drivers from the general population with regard to frequencies of contacts with correctional, public health, and social service agencies. Although there are unaddressed variable contamination problems in Tillman and Hobbs' use of credit bureau difficulties, social service agency contacts, and even venereal disease records as indicators of personality predisposition for high accidents, the significant findings for Juvenile Court and Adult Court (non-traffic) offenses are corroborative of their findings for the taxi drivers.

Inspired by Tillman and Hobbs (1949) and various social deviance theorists, Macmillan (1975) pursued the hypothesis that motoring offenses and accidents are symptomatic of social

maladjustment and deviance. Citing cases of dangerous driving, he argued that these are voluntary acts associated with more generalized risk-taking tendencies. The failure to adjust to society is seen to produce frustrations, And the person's maladjustment carries over to the driver role. He refers to a "temporary accident proneness" that results from emotional stress and the disorganization of skilled functioning. Macmillan's study involved a questionnaire interview with 809 drivers from Croydon, Reading, and Southhampton, which resulted from a random sampling of 1000 license holders in these three towns. The interviews were conducted by Macmillan himself and 27 part-time interviewers. In addition, the records of 12 social agencies were checked for contacts, as did Tillman & Hobbs (1949).

Part of Macmillan's questionnaire concerned driver attitudes. He performed a cluster analysis and identified a set of 15 items that represented a "competitive" approach to driving. It was primarily associated with young males (ages 16-20). Example items are: "I sometimes try to get the better of other drivers;" "It is annoying to be overtaken by an inferior car;" and "I like taking corners as fast as possible." While young male drivers had the highest cluster scores, males across all age groups who were categorized as "competitive" had significantly higher convictions for motoring offenses and higher numbers of accidents. Similarly, his cluster analysis produced a set of 24 items for an "aggressive" attitude toward driving (some overlap with "competitive" items), which also resulted in significant differences for motoring offenses and accidents among males, controlling for driver age. Examples of "aggressive" attitude items are: "It is each man for himself on a roundabout;" "One cannot avoid taking risks on the road today;" "If you are stuck in the wrong lane, you may have to cut across in front of other cars;" "I would rather accelerate than brake to get out of a difficult situation;" and "I would overtake when there are two vehicles in front with no gap in between."

Macmillan's analysis of social maladjustment produced mixed results, as he examined non-motoring convictions, contacts with social agencies, and scores on a social problems index. While there were no effects associated with accidents, there were significant associations for these measures with motoring convictions, and the effects strengthened as the number of convictions increased. Thus, social deviance was not related to accidents, but it was related to motoring offense convictions, which partially supported his social maladjustment hypothesis.

Regarding accident risk, Macmillan primarily found effects related to age and gender; neither education nor occupation were related to accidents. The overall results indicated that it is young males who are fast drivers, competitive, aggressive, and willing to take risks and that these characteristics are associated with accidents and convictions for motoring offenses. He also noted an instability of mood and a tendency to rationalize among drivers; for example, he reports the comments of one driver who said, "What I think is not always what I do...what I do depends on my frame of mind at the time and how 'stable' I feel (p. 138). Like the other British authors who have produced such monographs, Macmillan's work offers a number of suggestions for road aggression research. His interview sampling approach is admirable, and although there were indeed some difficulties with interviewer quality, his questionnaire has many valuable components.

Aggressivity and Drunk Drivers

The themes of driving safety and aggressive personality tendencies certainly converge with regard to drunk drivers, whose histories have been found to be marked by antisocial behavior (McCord, 1984). Public outcry for retribution is indeed strong when drunk driving has lethal consequences for innocent victims. Many people respond to the harm-doing behavior as tantamount to a willful act. Extreme cases, such as that of the intoxicated, wrong

way driver who collided head-on with a school bus in Kentucky (May 14, 1988), killing 24 teenagers and three adults, bring immediate calls for the death penalty. In that case, the defendant was convicted of second-degree manslaughter and several other offenses and was sentenced to 16 years in prison.

While drunk driving is beyond the scope of this paper, the longitudinal study by McCord (1984) focused on the aggressive disposition theme. That study involved a sample of the 466 males from the Cambridge-Somerville Youth Project[11] who were located in 1975 in a follow-up study. Of those men, 36 had been convicted for driving while intoxicated (DWI), although family background data was available on only 18 of them. Discriminant analyses found that those convicted of DWI were more likely to have reported getting into fights and to be more likely to act rather than talk when angry. They also had been "reared in families characterized by conflict, aggression, paternal rejection and paternal alcoholism and criminality" (p. 319). Those convicted of DWI were more likely to have been convicted for serious crimes against property and crimes against persons. McCord concludes, "Their history of antisocial behavior belies a view that these men have inadvertently risked the safety of others during an unaccustomed lapse in self-control" (p. 319).

The personality traits of drunk drivers were cluster analyzed by Donovan and Marlatt (1982) who found an aggressive subtype having a significantly higher risk of accidents. They found that some of Parry's (1968) items, along with measures of competitive speed, sensation seeking, and subscales of the Buss-Durkee hostility inventory (Buss & Durkee, 1957) identified this aggressive subtype of risk-enhancing traits.

From the standpoint of targeted aggression, stern societal reactions to drunk driving, especially when there are death victims, stand in contrast to relatively lenient reactions for *deliberate*, assaultive use of one's vehicle (see later section). This is another version of the

irony in criminal justice between the intentions versus the consequences of aggressive behavior, as is the case when happenstance (e.g., how fast the paramedics arrive) determines whether the charge is murder or assault. Thus, that Kentucky drunk driver was held responsible for the carnage he produced (as indeed he should), but he did not target those school bus passengers. In contrast, drivers who go on rampages with their vehicles, targeting other drivers, cyclists, or pedestrians, receive relatively light sentences when, by the stroke of luck, they do not kill anyone.

Field Experiments

There have been a number of social psychological field experiments on roadway aggression, and these have understandably used analogue measures of the criterion variable. In nearly all of these studies, horn honking has been the surrogate measure, prompted by the procedure of Doob and Gross (1986). One exception was the study by Hauber (1980), who used several aggressive driving indices in a pedestrian crossing situation and also followed-up with a provoking telephone call. These quasi-experimental investigations obviously are a large step removed from the harm-doing behavior that alarms communities, however, they do examine variables that plausibly influence serious aggression.

The Doob and Gross (1968) study pioneered this set of investigations, and their project itself was part of the lineage of the Frustration and Aggression monograph. Their study focused on the status of the frustrator as an inhibitor of horn-honking. Because high status persons have the power to exercise sanctions, fear of retaliation can be thought to generalize from other situations. They experimentally created a frustrating condition by capitalizing on a familiar traffic scenario -- i.e., a car, stopped at a traffic light, which does not move when the signal changes. Status was manipulated by using two categories of automobile for the

stopped vehicle: a new luxury car (a black 1966 Chrysler Imperial) versus an older car (a rusty 1954 Ford station wagon or a grey 1961 Rambler). More honking and shorter latencies of honking occurred in the low status condition. Additionally, as can be expected, male drivers honked more quickly.

The status effect found by Doob and Gross, which also had been obtained in laboratory experiments (e.g., Hokanson & Burgess, 1962), was not replicated by Deaux (1971), although her status manipulation can be faulted for using less than optimal automobiles (an unspecified model Pontiac and a Camaro). Instead, Deaux found effects for the sex of the frustrating driver as more honking and shorter latency of honking occurred when the driver of the stopped car was a female. This was interpreted in terms of "damn female driver" stereotyping. However, neither sex of subject driver nor sex of target driver (here labeled) effects were found in the Chase and Mills (1973) replication effort. These investigators did obtain a status effect, but it was opposite to that of Doob and Gross (1968), although their "high status" car was a 1972 Mercury (model unspecified). Aside from apparent lapses in duplicating the status condition, regional variation in driver attitudes might account for the discrepant findings, since the Doob and Gross study was done in California (Palo Alto), while the other two studies were conducted in Ohio (Dayton and Toledo).

This research methodology was elaborated more fully by Turner, Layton, and Simons (1975), who proficiently incorporated the Doob and Gross procedure, the background of Parry (1968) on aggressive driving reactions, and the aggressive cues concept of Berkowitz (1962; 1973), particularly concerning the debated "weapons effect" (Berkowitz & LePage, 1967). Turner et al., who conducted their three-part study in Salt Lake City, began by administering Parry's driving survey to 93 randomly selected residents in their homes. Finding that there was a sufficient level of anger and aggressive responses in this sample, they then conducted

two field experiments of considerably greater complexity than the previously reviewed studies or those which follow. Turner et al., used a pick-up truck for the stopped vehicle and added aggressive cues by means of a rifle in a gun rack and a bumper sticker that said "vengeance" (versus one that said "friend"). They also manipulated victim visibility by either opening or closing a curtain in the pick-up truck's back window. The highest rate of horn-honking (76.5%) occurred in the condition where the curtain was closed and both the rifle and the bumper sticker were present. The rifle itself and its combination with the "vengeance" bumper sticker added to the horn-honking rate compared to control conditions.

Because the rifle and the vengeance sticker were not independently manipulated (the sticker was not present without the rifle), Turner et al., followed with another study. This time those conditions were orthogonal, and the rear window was closed for all subjects in order to minimize inhibitory influences of victim visibility.[12] In addition, male drivers of older vehicles and female drivers were also used, having been excluded from the previous study because they were expected to inhibit horn-honking. Unfortunately, different (and newer) pick-up trucks were used by the confederate victims. The results of this second field experiment were that the combination of the rifle and the vengeance sticker increased horn-honking for male drivers in newer cars while it was significantly lowered for male drivers in older cars. There were no effects for females or for either the rifle or sticker alone. The vengeance sticker was viewed as heightening the aggressive meaning of the rifle, and Turner et al., explained their findings largely in terms of inhibitory processes: ". . . if male drivers of old vehicles perceived themselves to be of lower status than the confederate, they might have inhibited horn honking as an aggressive response due to fears of retaliation from the high status driver in front of them" (p. 1106).

An attempt to replicate the Turner et al. (1975) results was made by Halderman and Jackson (1979) who found no effects for the presence of a rifle. They conducted their study in Hays, Kansas, using a pick-up truck with its driver obscured from view by a curtain. They had no status or bumper sticker manipulations, but they added a condition in which a rifle was carried by a pedestrian.[13] However, there were no differences in horn honking between the no rifle, rifle in gun rack, and pedestrian with rifle conditions. In fact, only 11% of the subjects honked in the 12 second interval for the green light, which is far below the rates reported by the studies discussed above. The authors interpreted the absence of effects as being due to the lessened cue value of a rifle in a rural community where guns are common.

The Doob and Gross procedure was also used in a more recent study by Kenrick and MacFarlane (1986) who utilized this methodology to investigate another phenomenon from the aggression literature -- i.e., ambient temperature effects. Just as Turner et al., used this field-experimental paradigm to study Berkowitz's aggressive cues ideas and the Berkowitz and LePage (1967) "weapons effect," Kenrick and MacFarlane examined ambient temperature, following the work of Baron and his colleagues (Baron, 1972; Baron & Bell, 1976; Baron & Lawton, 1972). They saw the Doob and Gross procedure as a methodology to balance the control of laboratory studies with the ecological validity of field data. In view of the problems with the Baron and Ransberger (1978) investigation of aggression and heat using archival data (as critiqued by Carlsmith and Anderson, 1979), the field experimental approach was a sensible tact.

Kenrick and MacFarlane (1986) conducted their study in Phoenix and used a 1980 Datsun 200SX with a female driver in the thwarting vehicle. There were no manipulated conditions, as they used a multiple regression design with frequency, latency, and duration of honking as criterion variables regressed on temperature, humidity, and assorted subject vehicle

characteristics as predictors. Ambient temperature was found to be the best predictor of a composite criterion measure, especially for those subjects having their windows open. A temperature and humidity discomfort index produced similar results. Moreover, they found the relationship between horn honking and the environmental variables to be linear,[14] and this was true across all their criterion measures. Striking effects in this regard were graphed for duration of honking across temperature ranges from 86° to 115° Fahrenheit. Because horn honking is instrumental to escape, the linearity effect is to be expected in this procedural context.

Before discussing the criterion validity issue pertaining to horn honking as a dependent measure of aggression, there is one additional study in this field experimental category. Hauber (1980), who conducted his study in some unspecified location in The Netherlands, used several aggressive driving indices in conjunction with an experimentally created pedestrian crossing situation. Stimulated by the work of Parry (1968), MacMillan (1975), and Whitlock (1971), among others, Hauber sought "empirical support for the supposition that there is widespread aggression in road traffic" (1980, p. 462). He selected the pedestrian crossing situation, because pedestrians have legal priority and a driver has responsibility for an accident.

At a predetermined point for an approaching car, an experimental confederate pedestrian entered the crossing. The driver's behavior was dichotomously scored (by an inconspicuous observer) as aggressive or non-aggressive, based on whether they failed to stop, gesticulated/remarked at those in the crossing, or sounded their horn. Hauber does not give the frequency distribution for these response possibilities. After recording the behavior of 966 drivers in this situation, 128 were contacted by telephone for an annoyance-type manipulation (the method for the selection of the subsample is unspecified). In this procedure, an experimenter telephoned the driver twice in succession, persistently asking for a fictitious

person. In addition, these telephoned drivers were then sent a letter recruiting them for a personal interview, and amazingly 124 (97%) volunteered.

In the pedestrian crossing situation, the behavior of 25.4% of the drivers was classified as aggressive. Much of this behavior apparently was fist-shaking, invectives, and horn-blowing. However, Hauber said that occasionally the experimenters had to run for their lives." He found no significant differences for male versus female drivers, but there were effects for age (older or younger than 40) standardly found in aggression/violence studies. Younger men were of course more aggressive than older women, but younger women were more aggressive than were older men. The pedestrian's gender also produced the expected effects, as aggression occurred nearly twice as often when the pedestrian was male. Time of day also was significant, with aggression occurring more frequently in the afternoon than in the morning.[15]

The second part of Hauber's study involved the telephone manipulation. He reports that those drivers who had telephones were less aggressive in the crossing than those without telephones (21.6% vs. 41.2%), which may be a function of socioeconomic status or age. Because in the Netherlands it is customary for someone answering the telephone to give their name, Hauber was able to verify driver identities indirectly. Aggression on the telephone consisted of "becoming abusive," "banging down the telephone receiver," and "strongly marked irritation" (no procedure is given for coding or reliability assessment). Of the 128 drivers contacted, 14 (10.9%) responded aggressively, and aggressive telephone responding was significantly associated with driving aggression.

In the third part of the study, these telephoned-contacted drivers were contacted by letter, requesting a personal interview by the university researchers. The rationale for this interview is unspecified by Hauber (1980), but he reports that 14 persons (11.3%) behaved in

an aggressive manner during the interview, although this was not associated with the two prior measures of aggression. Various items of response content related to aggression in the home and to aspects of driving behavior were found to be related to the pedestrian crossing aggression.

The Hauber study incorporated some inventive methodology, although the lack of specificity in procedural description is a considerable liability. Combined with the methodology of Doob and Gross (1968) and that of Turner et al. (1975), there appear to be fruitful ideas in the literature for an experimental procedure for research on roadway aggression, although present-day regulations regarding the use of human subjects are more restrictive than when those studies were conducted. To be sure, horn honking is easily questioned as an index of aggression, but the use of such surrogate measures and attenuated provocations in doing field experiments is necessitated by ethical considerations. One could forgo experimental manipulation of variables by studying naturally occurring behavior, but aggression on the road is not easily observed and archival data are not without validity problems.

VALIDITY ISSUES IN ROAD AGGRESSION RESEARCH

Conducting research in naturalistic settings does not guarantee external validity any more than one can assume internal validity for a measure like horn honking. Matters of generalizability always require attention to the actors, behaviors, and settings involved, as simply going to the field is not enough (Dipboye & Flanigan, 1979). While aggressive driving may seem to be a prevalent phenomenon, violent actions are relatively low base rate events, hence naturalistic observation of the various forms of roadway aggression is generally not feasible. The Doob and Gross methodology is appealing because its procedural context models

a routine thwarting that does elicit antagonistic behavior and hostility which often are preludes to physical confrontation and violence on roadways; but the criterion validity of the horn-honking measure is the salient issue.

As an index of aggression, horn honking may be questioned on at least two counts: (1) it alternatively may be a behavior intended as a signal, without aggressive qualities (annoyance, castigation, or threat communication); and (2) even if it is performed as an antagonistic behavior, it is certainly mild, is of little consequence, and is only infrequently related to the acts of road aggression that merit community concern. Everyone knows that drivers do blow their horns in annoyance, as a response to frustrations in road travel, but the use of this measure as an experimental variable requires greater clarification.

The signalling function of horn honking clearly weighs against its interpretation as a (mild) aggressive act, and this becomes especially ambiguous in the Kendrick and MacFarlane (1986) ambient temperature study. Turner et al. (1975) acknowledged this problem but only dealt with the criterion validity issue by pointing to variations in responding between their conditions of aggressive stimuli. They do say that "...drivers may become frustrated and angry at other drivers, and this anger or frustration can lead to various hostile reactions such as light flashing, swearing, or hand gestures. Presumably, horn honking might also be perceived as an aggressive response by subjects, especially in the presence of aggressive stimuli" (p. 1106). Such statements, however, justify horn honking as an anger measures more than as an aggression measure and raise the question of whether it is the intention of the honker or the perception of the target that is the issue. Precisely because aggression may remain under inhibitory control, even when anger is aroused to moderate or even strong levels of intensity, the horn honking measure has transparent shortcomings as an aggression index.

Since Turner et al. use inhibition concepts to explain differences in horn honking rates among their status conditions, the anger vs. aggression distinction made here is all the more salient.

Another threat to validity is presented by cultural and regional variations in horn honking, which have not been studied empirically but are quite easy to observe with a modicum of travel. In traffic-congested cities (e.g., New York or Rome), horn honking is quite prevalent yet seems to reflect both the signalling and anger expression functions, rather than be a first step in an escalating aggressive sequence. The driver honks but is primarily interested in moving on, rather than remaining for a protracted confrontation with the offender. Contrastingly, in gentile surroundings (e.g., in certain California cities such as La Jolla or Carmel), horn honking is deviant and looked upon with askance. Aggression and anger are very much inhibited, so the blowing of one's horn is done for signalling and rarely at that. The provocative potential of a honked horn is a function of its meaning in the collective consciousness, as well as the immediate situational context. Considering such contextual differences, it is quickly seen that there is variation in the phenomenology of both the target of the honking and the honker which merit validational assessment.

Despite the signalling function, the argument might still be made that horn honking is oftentimes an antagonistic behavior and that it has a functional relationship to aggressive behavior--i.e., it is activated by aggressive cues, its probability is increased by the arousal of anger, and it can be a prelude to more highly antagonistic behaviors in an escalating provocation sequence. As an action having a distant family relationship to aggression, horn honking is not a behavior that draws community concern about harm-doing, except as a disturbance of the peace in residential neighborhoods or other established behavior settings where tranquility prevails. It's significance, then, hinges on its empirical relationship to higher magnitude aggressive behaviors.

Some data bearing on the relationship between horn honking and other angry or aggressive driving behaviors has been gathered in a questionnaire study that I am conducting, which is still in progress. Here, only a small portion of the data are presented to address the horn-honking validity issue. The subjects are participants in "traffic school," which is a municipal court-approved option for traffic law violators to clear their offense without a fine and without insurance company notification. In Orange County, a driver is eligible for traffic school only once in a two year period, and judges do not grant this option for serious driving offenses (such as reckless driving or multiple violations). Both traffic school administrators and Department of Motor Vehicles officials state that traffic school participants are representative of the normal driving population. While this remains to be substantiated, the background information provided by the questionnaire respondents suggests that although it is a younger population, they do not have an unusually high offense rate.

Four traffic school classes in two municipal courts were involved in the data collection (N=412). The class instructor introduced me as a university professor doing research on aggression and driving behaviors, and then a brief presentation of the research interest was given. Participation was completely voluntary and anonymous. The importance of accuracy and honest responses was emphasized, and after the completed questionnaires were collected, there was a discussion of the research topic and related topics, such as traffic congestion and stress. All indications were that the subjects enjoyed their participation, as there was considerable involvement in the subsequent discussion.

The demographic characteristics of the 412 respondents are that they have an average age of 31.7 years (27.4 yrs. median), were 55.3% male, and 48.1% single (35.4% married). The median length of driving experience was 11 years, and 70.8% drive more than 10,000 miles per year. Their traffic accident history is unremarkable, as 84.6% have had two

accidents or less (zero accidents, 34.5%; one accident, 27.7%; two accidents, 22.1%). Counting the present violation, the median number of traffic tickets in the past five years is 1.3, as 65.3% had received two tickets or less and 82.1% had three tickets or less. One can infer that a primary motivation for attending traffic school is to clear the violation so that the driver's insurance company is not notified of the infraction. This is a common understanding, and it is interesting in this regard that, considering the five year median of 1.3 offenses, 79% of the respondents had one violation in the previous year.

The questionnaire inquired about numerous forms of aggressive behavior in driving, with regard to aggression both experienced as a victim and perpetrated as an actor. A full presentation of results is not attempted here, however, some descriptive data on victimization is easily presented. Of the 412 respondents, 150 (36.4%) have had an object thrown at them while driving, 56 (13.6%) have been bumped or rammed, 18 (4.4%) have been threatened with a gun while driving, 5 (1.2%) report having been shot at while driving, and 181 (43.9%) indicate that they have been chased by another driver. The respondents themselves are not without aggression histories as drivers. Forty-eight (11.7%) have thrown an object at another car, 21 (5.1%) have bumped or rammed someone, 5 (1.2%) say that they have threatened another driver with a gun, 3 (.7%) report that they have shot at someone on the road, and 128 (31.3%) have chased another driver. Other indices of aggression concerned verbal arguments and fights, for which 140 (34%) reported having been in an argument where physical violence was threatened and 32 (7.8%) indicated that they had been in a fight with another driver where physical contact was made. Although the rate of aggression is predictably higher for males, a considerable amount of aggressive behavior is reported by females.

Returning to the horn-honking issue, the participants were asked how often they honked their horns in annoyance at another driver. Responding to a nine-point scale with verbal

anchors at each point ranging from never to daily, the median response was "3 or 4 times per year." A total of 48 respondents (11.9%) gave responses of daily, 2 or 3 times per week, or once per week. The correlation of the horn-honking measure to other items regarding aggression in driving is given in Table 1. Annoyance-motivated horn honking has small but significant ($p < .001$) point-biseral correlations with ever having chased another driver and having been in a verbal argument on the road in which physical violence was threatened. It is not significantly correlated with the other more serious acts of aggression, throwing objects, bumping/ramming, threatening with a gun, shooting, and physical fighting. Horn-honking is, however, significantly correlated with other "low grade" aggressive behaviors that are apt to occur in driving (the "hostile reactions" to which Turner et al. referred). Strong relationships were found with shouting or yelling at other drivers, abruptly cutting off other drivers, flashing high beams, deliberately riding someone's bumper, and giving obscene or provocative gestures. These findings suggest that horn-honking is part of a family of annoyance-expressive behaviors whose link to serious acts of aggression is through their escalation potential.

The questionnaire data presented here to address validity issues in the use of horn-honking as a dependent measure in roadway aggression field experiments obviously must also be scrutinized on matters of validity, given the sample characteristics. However, a Los Angeles Times poll (Clifford, 1989) of 2,032 residents of Southern California had findings comparable to my questionnaire results on two of the three items having similarity. Their poll results indicated that 5% of drivers carry a gun in their car, while my community sample was 2.9%. Having made an obscene gesture to another driver was reported by 38% in the newspaper's poll, while I found 34.2% to report doing this "once a year" or less, 20.4% "hardly ever," and 43.9% "never." Twelve percent of the poll respondents reported having had a fight with another driver in the last year, with 1% saying the fight was physical. My

findings were that 7.8% had ever had a physical fight with another driver and 34% had ever been in a verbal argument that threatened physical aggression. Differences in questionnaire wording made it difficult to directly compare results on fighting history.

A TYPOLOGY OF ROADWAY AGGRESSION

Aggressive behavior occurs in a variety of forms in the roadway context. Classification is often the first step in scientific analysis, and indeed roadway aggression can usefully be categorized morphologically and differentiated on dimensions that pertain to the dynamics of aggression and victimization. Six varieties of roadway aggression can be identified: (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. Each of these forms has contemporary manifestations, and several have had historical precursors predating the automobile.

These various forms of roadway aggression are presented as a typology in Table 2 with regard to six contextual factors: (1) target location, whether inside or outside a motor vehicle; (2) aggressor location, also whether inside or outside a motor vehicle; (3) target identity, which may be anonymous or personal; (4) temporal interval between (provocation) cue and attack, either immediate or delayed; (5) intentional quality, whether premeditated or impulsive; and (6) traffic relevance, pertaining to the potential involvement of traffic circumstances (especially traffic congestion) in the aggressive episode. Since aggressive behavior in driving is sometimes attributed to traffic conditions, this factor is hence categorized as relevant or irrelevant. Each roadway aggression form will be described and then discussed in terms of these contextual factors.

The typology is concerned with acts of physical aggression, and thus excludes verbal threats and symbolic gestures. The focus on physical aggression is done for simplicity and because such behaviors generally have more serious implications. However, it is not assumed that physical aggression necessarily results in greater harm than verbal or symbolic aggression. Someone who shoots a gun at another car may only intend to frighten and thus aim above the car, whereas someone making an obscene gesture may cause a fatal collision, perhaps becoming a victim of their own anger.[16] Verbal and symbolic aggression may be involved in any of the six roadway aggression forms given in the typology which distinguishes physical morphological characteristics.

Descriptive classification rather than explanation is the objective here. These diverse forms of aggression on roadways differ considerably in their motivating and activating circumstances, yet they each occur in the roadway context which, given its centrality to everyday life, merits our attention. This classification will hopefully be useful for future studies of aggression. One step in the direction of explanation, however, is attempted by the account of disinhibitory influences given later.

Roadway Shootings/Throwings

Considerable publicity has been given to freeway shooting episodes, especially the one that occurred in California in the summer of 1987, which received some international as well as extensive national news coverage. As a contagion episode, the publicity hypothetically contributed to the diffusion of the shootings between mid-June and the end of August, when there were between 70 shooting incidents and one serious stabbing on southern California roads reported in newspapers. Over 100 shootings were reported in newspapers throughout the state, and a cursory tabulation was made of them. The incidents were evenly distributed

across days of the week, with no distinct pattern for the time of day, although most of the shootings occurred during the afternoons or in the evenings before midnight. Most of the incidents occurred on freeways, but about 25% took place on surface streets. Although males and females were victimized, the victims were males, predominantly. The assailants were all males, with female companions in a few cases. At times there were groups of three or four assailants.[17] The shots were fired from cars, trucks, and motorcycles, although pick-up trucks were involved disproportionally.

The potential public health consequences of this outbreak of violence on regional freeways led the Los Angeles County Department of Health Services to invite the Center for Disease Control to investigate the problem. Onwuachi-Saunders, Lambert, Marchbanks, O'Carroll, and Mercy (1989) reported the findings of this investigation which concerned firearm assaults on Los Angeles roadways (freeways, highways, and surface streets), excluding gang related incidents and those related to pre-existing domestic quarrels. Their analyses, however, do include brandishing incidents, which represent 54 (39%) of the 137 incidents that they tabulated. They obtained the assault data from regional law enforcement agencies for the summer 1987 episode (June 18 - August 31), comparing this period with 1985 and 1986 data, and also did a simple examination of the association of the 1987 assaults with traffic congestion.

The majority of the firearm assaults occurred on surface streets (63%), with 36% on freeways and 1% on other highways. Of the 137 incidents, seventeen resulted in injuries, two of them fatal. Although the weapon used was not always identified, it was a handgun in the majority of cases (64%), but long guns were also used (15%). From the data available on victim characteristics, the victims were mostly young adult white or Hispanic men. In 38% of the incidents, the victim reported some type of driving confrontation with the suspect (17%

were unsure). Being based on victim's reports, that percentage is likely to be an underestimate. My analysis of newspaper accounts, which also rely on victim reports, found that in the majority of cases, there was some prior dispute about road space or privilege.

The analysis by Onwuachi-Saunders et al. of time trends for the June-August 1987 period compared these findings with those for 1985 and 1986, although no statistical analyses were conducted. They found that firearm assaults increased over these years (32, 91, and 137, respectively), and this was also true for the portion on freeways (4, 15, and 49, respectively). The increase occurred for both brandishings and shootings, and the increase in each category is roughly proportional. No inferential statistics were computed (three data points will not do for a time series), but the authors stray from their purely descriptive format when they try to associate the firearm assaults with traffic congestion. Unfortunately their "congestion" index (vehicle miles traveled) is seriously flawed because they do not consider roadway capacity. The spurious nature of their "positive association" with traffic congestion is reflected in their own findings that 69% of the 1987 incidents occurred during non-peak hours of travel (although what is needed here is a conditional probability).

In discussing their findings from a public health standpoint, Onwuachi-Saunders et al. suggest that given the relatively small number of injuries and deaths, the national and local concern about the roadway assaults incidents was misplaced, since over 1000 homicides and 40,000 aggravated assaults occur in Los Angeles County each year. This is indeed a telling comparison. However, they indicate that the full public health impact has not been assessed, considering that the roadway assaults could have affected drivers emotionally, although it is not clear how one would gauge such impacts. In this regard, the media plays an important role in how the community is affected during the occurrence of a violence contagion episode, which will be discussed later in terms of disinhibition mechanisms.

Sequential outbreaks of roadway shootings have periodically occurred in other metropolitan areas, and aggression on highways, shootings and non-shootings, occur more frequently than is generally or officially recognized. During 1982 in Houston, when there was a large influx of newcomers and very congested freeways, there were 12 traffic-related homicides. Another dozen of such homicides happened over the next four years, and shootings were more numerous. In one newspaper account during the initial period in Houston, the chief of the major assaults division of the Houston Police Department stated that someone is beaten, stabbed, or shot on an average of 16 times per month, and he estimated that "'for every one reported, 40 or 50 go unreported'" (Tempest, 1982). This police division chief also indicated that horn honking was among the most common causes of traffic violence, which he and others viewed in terms of norm variations between newcomers (who honked) and Houstonians (who took umbridge at being honked).

In the past two years there have been other sprees of freeway shootings in St. Louis and in Detroit, which received far less notoriety than the California 1987 summer contagion. Diminished publicity of such events is indeed desirable, however, my speculation is that the reduction in news coverage was not a function of concern about social well-being but rather a matter of "news" appeal. There is considerably more of that for a "California wacko fad"[18] than for precisely the same behavior in two mid-west industrial cities.

The St. Louis episode began on October 22, 1987, with a homicide, and there were 22 confirmed shootings through December.[19] As to be expected with contagion phenomena, the shootings declined the following year, although there were seven others by June 1988. One was a homicide that involved a protracted escalation between drivers. The Detroit shootings were not as numerous, but they extended over a longer period with sporadic sprees. They began on August 17, 1987 (as the California contagion had cooled), when a man driving a

pick-up truck in the left lane was shot by two young men in a Corvette, with whom he had an exchange about passing. Only one other shooting happened that fall (October 21), but then the next year a spree of three shootings and one brandishing occurred during one week in April[20] (including a woman shot in the neck), another took place in August, two happened in two days in November (one was fatal, and the second was a sniping of five cars and one driver), and then two roadway shooting homicides occurred in the following January, 1989. Thus, the wave of shootings on California freeways were not at all unique.

Nor have the incidents of roadway aggression on California freeways abated. Indeed, the number of closely patterned homicides has reduced, and their news worthiness has changed, but the rate of aggressive behavior has not diminished, according to tabulated data obtained from the California Highway Patrol (CHP)[21]. Although the individual incident data must be subjected to detailed analyses, the CHP tabulations of statewide incidents show an upward slope from January 1988, when they began to record "freeway violence" incidents, having then received funds for supplemental personnel from the California legislature. Although the majority of incidents are the brandishing of a weapon or throwing of objects, these forms of aggressive behavior are not inconsequential and the trend is upward. 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. There are indeed regional variations, and the data require scientific scrutiny, but the point here is that this respected police agency in no way considers aggressive behavior on roadways to have been a passing fad.

In the roadway aggression typology given in Table 2, roadway shootings/throwings are arrayed with the six contextual factors. Although shootings readily receive media attention, throwings are more common and not necessarily less dangerous. In 1988, according to

Associated Press reports, there was a "veggie-tossing" gang in London's East End. One man, who was hit by a turnip thrown from a car, was knocked to the ground, received a broken rib and ruptured spleen, and he died from respiratory problems. Scotland Yard did not find the incident amusing at all. To cite an Orange County, California example, on April 16, 1989, two young Vietnamese men in a sports car were trading insults with four Latinos in a station wagon, as they drove down a city street in late evening. The passenger in the sports car, who was a juvenile, threw a lead pipe at the station wagon, smashing its windshield, which caused it to collide with the sports car, which then crashed into a tow truck stopped at a traffic light. The driver of the sports car was killed.

The targets of this category of roadway aggression behaviors are typically inside a vehicle, although the London man above was a pedestrian, and there have been a number of shooting incidents in California where the victim was on the side of the roadway. Even California Highway Patrol officers have been fired upon, and in 1988 a young Garden Grove woman was fatally shot from a passing pick-up truck in an apparently random attack as she sat inside her car on the shoulder of a highway checking a map.

The aggressor is inside (or onboard) a vehicle, and the target's identity is categorized as anonymous, because personal identity is typically not a factor in the decision to attack. The temporal interval between provocation or stimulus cue and attack is more or less immediate, and the intentional quality is impulsive rather than premeditated. Because regional conditions of traffic density can create generalized states of frustration and the base rate for aversive driving experiences can be expected to increase with traffic volume, traffic is relevant to this form of roadway aggression, although a traffic jam is an unlikely place for a shooting.

Assault with a Vehicle

Using the vehicle as a weapon is an unmistakable form of roadway aggression, although it has received little scholarly attention. Incidents of notoriety, however, are sure to receive press coverage. Among the most notable in the Los Angeles area occurred during the 1984 Olympics, when Daniel Lee Young went on a sidewalk rampage, killing one person and injuring 48. He was judged to be sane and was sentenced to 106 years in prison. Periodically, a truck driver will go on a rampage, as did one on California's Hollywood freeway in 1988 smashing his rig into 23 cars sequentially, which was followed several months later by a similar event in Texas. One very dramatic episode in southern California in 1988 involved a man who took a Caterpillar road grader off a construction site, and after knocking cars, trucks, and a motorcyclist off a highway, drove onto the Chino airport chased by a caravan of police cars and a police helicopter. He turned the huge machine (turbo charged) around many times and began to chase the police cars (about 10). He only smashed one airplane, but did smash into the side of a building, driving 30-50 feet into it. Over 25 bullet holes were found in the cab of the bulldozer, although he received only two thigh wounds. He said that he had had an argument with his wife that morning.

Other than Michalowski's (1975) study of vehicular homicide cases in Columbus, Ohio (discussed earlier regarding aggressive personalities), there is virtually no scientific research done on this topic. However, British authors have made contributions that provide some direction here too. Marsh and Collett (1986) give some mention to deliberate lethal driving, and this topic is specifically addressed in a criminal law review by Spencer (1985). Reviewing cases of British drivers who deliberately drove their vehicles at pedestrians and cyclists, Spencer argues that these persons who have used their vehicles as weapons receive very lenient punishment, because they are treated as motoring offenders -- they are prosecuted

for manslaughter rather than murder and typically receive light sentences. However, a cursory review of United States cases heard in various State Supreme Courts and Appellate Courts[22] is at variance with Spencer's contention that those who use their vehicles as weapons do not receive punishment in proportion to the crime.

First, several U.S. courts have maintained that an automobile is a deadly weapon. In several cases, defendants have appealed their convictions of assault with a deadly weapon on the grounds that the automobile is not a "deadly weapon" per se. For example, in Parrish vs. the State of Texas (November 18, 1982), the appellant's arguments were based on Texas Penal Code definitions of deadly weapons. The court found that this contention was without merit and upheld the conviction. Similar rulings occurred in People vs. Claborn (California, January 2, 1964) and in Blalock vs. the State (Georgia, January 31, 1983), where it was held that "An automobile is not per se a deadly weapon, but may become one depending on the manner and means of the vehicle's use" (p. 270).

Secondly, first and second degree murder convictions are not uncommon in U.S. courts. Such judgments have been affirmed on appeal in Jackson vs. the State of Georgia (May 16, 1957), People of the State of Illinois vs. Nathan Brown (September 28, 1962), State of New Mexico vs. Reynaldo Montoya (May 20, 1963), Tom Blackwell vs. the State of Alabama (May 24, 1956), State of North Carolina vs. John C. Ferdinando (December 4, 1979), and Faulcon vs. State of Maryland (October, 1956). The presence of malice aforethought was judged to have been established in these cases, justifying the murder convictions instead of manslaughter. In the Faulcon vs. Maryland case, the appellant argued both that the vehicle was not a deadly weapon per se and that the state penal code only stipulated manslaughter as the crime for causing death by operating a vehicle in a grossly negligent manner. The Maryland Supreme Court ruled against these claims, stating with regard to the vehicle as weapon, "Even though

an automobile may not be a deadly weapon, per se, yet if it is used in such a wilful or calculated manner to produce death, the trial judge may well find that death was intended" (p. 260). Having found premeditation established, the court upheld the first degree murder conviction.

Three dramatic cases occurred recently in Orange County, California. On Labor Day weekend of 1988, a 37 year old woman was run down by an intoxicated 19 year old driver whom she was trying to halt, because he was driving too fast in an alley near her house. The incident, including her two young sons watching in horror, was captured on videotape by a passenger in the car. In May, 1989, the driver was sentenced to 10 years in prison for gross vehicular manslaughter, as the jury had rejected the second degree murder charge. Two months later, another 19 year old was convicted of first degree murder for the 1988 killing of another young man whom he had chased in his car. After knocking down the victim, who was on a motorcycle, the assailant ran over him, then made U-turns to run over him twice again. The U-turns indeed influenced the jury to convict him of murder instead of manslaughter, according to a juror's statement. The third case (February, 1990) involved a ghastly incident in which a jilted suitor parked his car across from the home of his loved one, a young woman who recently announced her engagement to another man. As she entered her car, the spurned lover accelerated at high speed, smashing her car broadside, knocking it over the curb onto a lawn. He then doused her car with charcoal lighter fluid and set it afire with her in it, killing her. Dazed and bloodied, he was caught fleeing the scene on foot.

It is apparent from these various cases of the use of a vehicle (car, truck, and bulldozer) as a deadly weapon, that roadway violence is by no means limited to shooting incidents. This subset of road aggression merits further study, especially since the law review

article by Spencer (1985) concerned British cases, which had different judicial outcomes than many U.S. cases.

In the typology, assault with a vehicle is a form of roadway aggression that targets victims who are both inside and outside other vehicles, while the aggressor is obviously inside the vehicle. While target identities are often anonymous to the aggressor, especially in rampaging cases, in several of the court cases cited above, the vehicle assault was a retaliatory attack against someone in particular. This in turn bears on the temporal interval being either immediate or delayed, but even when the assault is temporally removed from the triggering circumstances, the use of the vehicle as a weapon seems to have an impulsive rather than a premeditated quality in most cases. Because various vehicle smashings occur in conjunction with traffic frustrations, the traffic context is seen as relevant, although when target identity is personalized, traffic is irrelevant.

Sniper/Robber Attacks

This form of roadway aggression refers to attacks on motorists by non-motorists. There are no studies in the literature on such behavior, yet it has a long historical tradition. During the 14th century, robbery on the king's highways was a particular cause of worry, hence the tale of Robin Hood. Bellamy (1985) in his analysis of the Gest of Robyn Hode, calls attention to the statute of Wincester (1285) which states the official concern with sudden attacks from the woods. Then, "in the later 1340s the king and the judges seem to have been eager to invest highway robbery with greater heinousness than it had hitherto possessed; there was even an attempt to have a particular type of that crime rated as treason. Later in the century a not uncommon afforcement of a highway robbery indictment was a statement the

accused was known as a 'common ambusher of roads'" (p. 61). To be sure, most roadway aggressors of this sort, then and now, are not at all of the Robin Hood variety.

Attacks on motorists by non-motorists are common enough, ranging from juveniles throwing stones from freeway overpasses to actual rifle shooting, as occurred in the Detroit contagion discussed earlier, where one man shot at many cars, seriously injuring one driver and hitting five cars. The California Highway Patrol receives several reports every week of someone throwing something from an overpass, but injuries to motorists are rare. However, a 35 year-old man was killed on a Los Angeles freeway (February, 1990) when he was hit by a brick that crashed through his windshield.

In large urban areas, it is not uncommon for motorists who have exited from freeways to surface streets in blighted areas to be set upon by robbers and vandals. Tom Wolfe's recent book Bonfire of the Vanities pivots on an event of this kind. More systematically, however, there was a highway robbery contagion in south Florida in 1985 when over 100 motorists were ambushed and robbed on Interstate 95 between Ft. Lauderdale and Miami. The various attackers, who were called "smash and grab" bandits, would select cars stuck in traffic jams or vehicles deliberately disabled by debris put on the roadway. The robber would first throw a heavy object like a brick through the windshield, then rob the driver of purse, briefcase, or wallet. Heavy police patrols and some improved lighting were activated by considerable public alarm.[23]

Turning to the typology's dimensions, this form of roadway aggression definitely targets drivers or passengers who are inside vehicles and is perpetrated by aggressors who are outside vehicles. The targets are anonymous, the motivating circumstances are temporally distant, hence the delayed interval categorization, and the intentional quality of the act is typically premeditated. However, some instances of throwing objects at cars and even robbery are

likely to be impulsive attacks cued by immediate circumstances. Traffic conditions are categorized as relevant, since stalled, slow-moving, or diverted traffic presents opportunities for sniper/robber attacks.

Drive-By Shootings

This is a form of roadway aggression that has resurfaced in recent years in a highly circumscribed way. In southern California, especially in East Los Angeles and more recently in the Orange County city of Santa Ana, Latino gangs perpetrate homicides from passing vehicles. The behavior is highly related to territoriality and to the subculture's norms of retribution, whereby the drive-by shooting is an act of retaliation. This has become a prototypical aggressive behavior, and during 1988 and 1989 the prevalence has escalated. During 1989, virtually every weekend there was a homicide from a drive-by shooting. Often, the victims are innocent children who are inside the house but are felled by shots aimed at someone on the sidewalk. There were 353 gang violence homicides in Los Angeles County in 1988, and the 1989 total exceeded 400.

The drive-by shooting form seems to have been initiated by New York and Chicago gangsters in the 1920s. In October of 1924, Legs Diamond was gunned down from a car that pulled alongside as he drove down Fifth Avenue. This event is described by Hammer (1975), who also gives an account of a ten-car motorcade with protruding gun barrels that blasted the Capone gang who were in a crowded restaurant in 1926, and this was a retaliation for two drive-by attacks a month earlier. Other accounts of shooting attacks from moving automobiles can be found in Nelli (1976). The famous St. Valentine's Day massacre (New York Times, February 15, 1929), which might be thought to be a drive-by, was actually perpetrated by gunmen on foot, although it did occur in a Chicago garage.

Although the contemporary form of drive-by shooting (which is here synonymous with a gang-related shooting from a vehicle) has become quite prevalent in southern California, there are few reports of similar routine elsewhere. It is very surprising that there are no existing studies of this phenomenon in the literature. The great tragedy of this particular form of roadway aggression is that the victims are often not the targets. The use of semi-automatic weapons and automatic assault rifles by the aggressors has commonly resulted in the shooting of innocent victims inside residential dwellings, sometimes asleep in their beds. The "gang bangers" rack-up new victims every week and are apparently undeterred by the highly publicized tragic deaths of non-targets. A few years ago, drive-by shootings were for the most part restricted to Los Angeles areas, but the phenomenon has moved south and is now prevalent in Orange County.

Regarding the typology dimensions, the targets of drive-by shootings are typically outside of vehicles, often on sidewalks, porches, or inside houses in particular neighborhoods. Some drive-by shootings do target victims in other vehicles, however, as periodically someone is tailed and shot. The targets are typically rival gang members, although there are instances of "random" drive-bys which involve the deliberate shooting of a spontaneously chosen target. In such cases, the victim seems to be someone who was in the wrong place at the wrong time. For example, one man with no gang connections was killed in 1989 in Pacific Palisades as he just happened to be at a cul-de-sac admiring the view, when a car of gang-bangers, well outside of their territory, just happened to be driving by.

Aside from these occasional spontaneous shootings, this form of roadway aggression has a premeditated quality whereby motivating circumstances of retaliation are temporally distant from the situation of enactment. As well, a cruising carload of gang members that "spontaneously" shoots is predisposed to aggress by smoldering turf wars and by recent

grievances. The need to maintain territorial control activates vigilance for provocation cues in particular stimulus categories, so their behavior has less of an impulsive quality. Traffic conditions are irrelevant to this road violence form.

Suicide/Murder Crashes

Another type of roadway aggression about which little is known concerns suicide/murder crashes. The work of Phillips (1974; 1979) on suicide and motor vehicle fatalities is the primary research in this area. In a series of studies, Phillips has found suggestive effects of published suicide stories, first with regard to increases in suicide cases and then with motor vehicle fatalities. The methodology for the aggregate mortality data on suicide and homicide used by Phillips (Bollen & Phillips, 1982; Phillips, 1983) has been criticized by Baron and Reiss (1985) to have produced artifactual results, however, the motor vehicles fatality findings appear to be more robust.

Regarding the motor vehicle research (Phillips, 1979), an exhaustive list of front page suicide stories (1966-73) was obtained from the five newspapers in California with the largest circulation, and Phillips then examined their association with subsequent motor vehicle fatalities. The analyses, which controlled for potentially confounding factors, systematically showed the effects of suggestion. Phillips found that motor vehicle fatalities increase markedly right after publicized suicides (not before); the magnitude of the increase is correlated with the degree of publicity; the increase is geographically localized in association with the published story; single-vehicle crashes are most affected; age of suicide victims and age of driver are linked; and stories about murder and suicide tend to be followed by multiple vehicle crashes involving passenger deaths. This latter discriminant association is relevant to concerns about artifactual findings. Phillips' research indicates that suggestion and modeling influences

affect violent behavior on roadways, but in light of the critique of Baron and Reiss (1985), the hypothesis merits a rigorous time series investigation.

The dynamics of this form of roadway aggression are likely different from that found in the other forms, although this remains a matter for research. Those engaging in this behavior may indeed have aggressive histories, perhaps even aggressive driving histories. On the other hand, this means of suicide may simply be a matter of convenience. A seven-year-old girl in Los Angeles who miraculously survived her mother's suicide/murder crash attempt (July, 1988) reported that her young mother turned to her and said, "I'm sorry I have to do this," then drove off the road at a high rate of speed into Malibu Canyon.

Regarding the typology dimensions, suicide/murder crashes are easily categorized. The targets are inside a vehicle, as even when the suicidal driver intends to kill someone not in his own car, the other person is unlikely to be a pedestrian, since such collisions tend to have insufficient force to kill the driver. The target identity is personal, and the motivating circumstances are temporally removed from the aggressive act, which would seem to be premeditated. Traffic conditions are not relevant to the instigation, although one might suppose that suicidal crashes would not be perpetrated during peak traffic periods.

Roadside Confrontations

Traffic disputes that are extended by the participants outside the vehicle are here called "roadside confrontations." In these events, one of the disputants may have a weapon in their vehicle, which they retrieve only after the conflict escalates and they are not able to terminate the other's aversive behavior by verbal persuasion or threat. Following a dispute about road space or privilege, one driver may force another off the road or may simply be in a position to stop and thereby impede the other's movement, setting the stage for confrontation.

This type of roadway aggression may also occur in conjunction with the sprees of roadway shootings that appear as community contagions. For example, 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 on 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. Similarly, there were two serious injury (one fatal) roadside confrontations that were extensions of traffic disputes which occurred during the Detroit episode in late 1988 and early 1989. 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, the man was forced off the road and was very badly slashed with a knife. Such events suggest that the observed increases in roadway violence during community contagions are more than mere "copy cat" behaviors, since the actions involved are not replications of random shootings on open freeways.

One striking illustration in this roadway aggression category is the case of Arthur Salomon, a Wall Street investment banker and the grandson of Percy Salomon, one of the founders of the 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 with some friction 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 plate of Salomon's Mercedes. Mr. Salomon is reported to have been under strain at the time and was also highly involved with law enforcement hobbies. Although he was

known to be stubborn, he was also well-known for his generosity, and he loved to work in his garden (Stone, 1987). Thus, here is a case of a distinguished citizen becoming ensnared in a road dispute, using a gun that he carried for protection to shoot an unarmed person who was walking away.

In the typology set forth, roadside confrontations have both the aggressor and the target outside of vehicles. The target's identity is anonymous, the temporal interval is immediate, and the intentional quality is impulsive. Traffic conditions are often relevant to the conflict, as restrictions in road space lead to disputes about right-of-way and impedance of movement.

Theoretical Perspective: Disinhibition of Aggression

Roadway aggression can usefully be understood in terms of the disinhibition of aggression concept, which can be traced to the classic *Frustration and Aggression* monograph (Dollard, Doob, Miller, Mowrer, and Sears, 1939), was used by Turner et al. (1975) to explain their horn-honking effects, and is an integral part of the social learning perspective of Bandura (1983). Since Bandura's account of acquisitional mechanisms centrally involves observational and symbolic learning, the combination of those processes with the disinhibition concept allows for the explanation of diffusion or contagion phenomena which hypothetically have occurred for roadway shootings in various communities and have been postulated by Phillips (1979) to have occurred for suicide car crashes.

Community sprees of roadway assaults appear to be a form of violence contagion, bearing similarities to urban rioting in the 60s or to airline hijackings before airport security systems were installed. Violence contagion is a rapid social transmission of aggressive behavior. The spreading of a novel behavior throughout a social system is a diffusion process that is facilitated by communication channels. The diffusion of new ideas or innovations

(kindergarten, modern math, health practices, fashion, etc.) has been studied by communication theorists such as Rogers and Shoemaker (1971) who examined structural and personality factors affecting rates of adoption. Hypothetically, the California summer 1987 episode was a diffusion pattern, and a similar process occurred in the Houston and St. Louis shootings. The cluster of over 100 freeway ambushes in South Florida on Interstate 95 in 1985 when gridlocked or deliberately disabled vehicles were set upon by assaultive robbers was apparently another contagion instance.

The central concept is the disinhibition of aggression - the weakening of restraints against harm-doing. One mechanism for disinhibition is exposure to unpunished aggressive behavior by others, especially if there is some novelty involved. However, our society has many disinhibitors or releasers that override the otherwise inculculated prohibitions against aggression. Cinematic portrayals, alcohol or drug use, violence-prone subcultures, the erosion of community values, etc. can combine with the anonymity of freeways, the likelihood of escape, and carrying firearms in vehicles to lessen inhibitions. The physiological arousal induced by driving a car, per se, as well as by exposure to thwartings in transit, contributes to the override of inhibitory factors in a context that is conducive to aggressive responding. Road violence is a product of weakened social controls and personal controls, which can act in concert with arousal-inducing environmental circumstances, such as traffic congestion, work pressures, or family strain.

The spread of violence as a contagious phenomenon was discussed by LeBon (1895/1960) in his classic work on group behavior. He saw human groups as being in a state of expectant attention, susceptible to suggestion, and as thinking in terms of images, which can evoke destructive impulses. A crowd is influenced by example, and limitation was viewed by LeBon as a natural tendency. For him, contagion was a fundamental and powerful process

by which ideas, sentiments, and emotions spread. However, he gave no account of contagion mechanisms, except to allude to microbial analogy and refer to imitation. Behavioral contagion as a group phenomena was later examined by Redl and his associates (Polansky, Lippitt, & Redl, 1949) as behavior change occurring in social interaction that is linked with impulse expression. In historical writings on emotion, the idea of contagion can be found in Hutcheson's (1742) treatise on "passions."

The contagion concept has been utilized in analyses of increases of criminal violence (Berkowitz & Macaulay, 1971), urban rioting (Mazur, 1972; Midlarsky, 1978), and aircraft hijacking (Bandura, 1983; Holden, 1986). The basic concept in these analyses is the social diffusion of violence. Bandura, following his research on observational learning of aggressive behavior (Bandura, 1973), later approached the contagion effect in terms of symbolic modeling whereby new behavior is spread by a salient example. Observational learning is also the basis for how Berkowitz and Macaulay (1971) account for the sharp increases in violent crime following the Kennedy assassination in 1963, the Speck murder of 8 nurses in Chicago in 1966, and the Whitman shooting of 45 persons from the University of Texas tower in 1966. Various occurrences of copy-cat violence, or what the French sociologist, Tarde, in 1890 called "suggesto-imitative assaults," have often been reported following major crimes and movie theater showings of violent films. Midlarsky's (1978) mathematical analysis of the contagion of urban disorders also conceives of the spread as an observational learning process.

It is not enough to understand contagion in terms of modeling influences. Wheeler (1966) argued that contagion was a social influence process mediated by restraint reduction. He asserted that contagion would not occur unless restraints were reduced - i.e., the lessening of fear, guilt, and regret for engaging in the behavior. Conditions of deindividuation or the feeling of anonymity were also thought by Wheeler to reduce restraints.

Disinhibition of Aggression During Driving: Multiple Influence Channels

As suggested above, roadway violence has many determinants and a roadway violence contagion is a community phenomenon of social transmission and escalation of an aggressive behavior prototype. The diffusion of the "innovation" can be understood in terms of communication processes, norms, and other social system variables as have been delineated by Rogers and Shoemaker (1971) regarding the adoption of other innovative practices. The focus here, though, is not on the social transmission but on the psychological processes entailed in particular aggressive behaviors, with disinhibition as a central concept. Modeling influences through mass communication channels is one disinhibiting influence that affects imitation or adoption of a prototype behavior. However, the modeling effects hypothetically act in conjunction with other converging facilitators, such as the physiological arousal associated with driving, the anonymity of freeways, escape potential, cinematic scripts that have pre-programmed the mind, alcohol or drug abuse, the occurrence of thwartings by "inconsiderate" drivers that "justify" aggression, and the carrying of firearms, which under conditions of arousal and anger can activate aggressive counter-responding. Such factors act as releasers that override the otherwise inculculated prohibitions about aggressive behavior.

Given that aggressive behavior is restrained by social norms and by legal penalties in the general case and that this quite specifically so in driving situations, the delineation of disinhibiting influences is a plausible approach to understanding various forms of aggression on roadways. The following categorization of multiple influence channels is a step in this direction.

Physiological Arousal

The activation of physiological arousal systems increases the probability of impulsive behavior by over-riding restraints and heightens the probability of aggression by constituting a precondition for anger. Although anger is neither necessary nor sufficient for aggression, the role of anger as an activator of aggression has been unmistakably demonstrated in experimental laboratory research, and it is quite clearly a core ingredient of both individual and collective violence (Novaco, 1986). Physiological arousal is a defining property of anger; and as the theory and research of Zillmann (1971; 1983) has shown, arousal which has not been induced by anger provocation can add to that which has been provoked by annoying or irritating circumstances, thereby increasing the probability of aggression. Zillmann has called this process "excitation transfer." Thus, the transfer of excitation or arousal from non-provocation sources enhances or intensifies the experience of anger and the occurrence of aggression in some immediate situation where the person's emotional experience and behavior are guided by environmental stimuli linked with antagonism. Konecni (1975) has shown that cognitive "labeling" or arousal as anger is central to the enhanced aggression effect.[24]

Driving an automobile involves many conditions of arousal activation. Merely driving a car is arousing. Passing, braking, turning, attending to other cars, unexpected occurrences, etc. are even more potent activators of arousal. Extensive research on human factors in automobile driving has demonstrated this quite clearly (cf. Stokols & Novaco, 1981). The research that Stokols and I have conducted with regard to chronic exposure to traffic congestion has found highly significant increases in baseline blood pressure, lowering of frustration tolerance, increases in negative mood, and aggressive driving habits to be associated with traffic exposure in long distance commuting. Moreover, we have found highly significant

stress effects for travel impedance on both a physical or objective dimension and a perceived or subjective dimension. This is described further in the next section.

The Transportation Context of Driving

Very little is known about the prevalence of hostile reactions while driving. Turner et al. (1975) found that 23% of the men and 18% of the women stated that they are easily provoked when driving. Actually chasing an annoying driver was reported by 12% of the men and 4% of the women. A higher prevalence for chasing was found by Marsh (1986), who reported that a study in Scotland found that 25% of drivers in the 17 to 35 age group admitted chasing drivers who had offended them. This is very comparable to the results of my own surveys which for university students found 29.6% reported having chased someone (for males, the rate was 42.9%) and for community drivers, 31.3% had chased someone. From several studies, then, a significant number of drivers report strong negative feelings regarding road situations, and such anger or irritation may lead to actual physical aggression.

Traffic congestion has become a conspicuous and bothersome feature of the urban landscape. As an inevitable constraint on mobility in metropolitan areas, traffic congestion is now a major concern of communities throughout the United States and abroad, although congestion as a hindrance to mobility is not unique to automobile travel, having also occurred with horse-drawn vehicles in ancient Rome and in many 19th century European and American cities (Smerk, 1974). Our research on traffic congestion as a stressor that impacts well-being (Novaco, Stokols, Campbell, & Stokols, 1979; Novaco, Stokols, & Milanesi, in press; Stokols, Novaco, Stokols, & Campbell, 1978; Stokols & Novaco, 1981) has examined transportation experience in the interactive context of personality, residential, and employment variables in addition to travel conditions.

Traffic congestion is viewed as a stressor in terms of the concept of impedance, a behavioral constraint on movement and goal attainment. We have operationalized impedance as a physical or objective dimension in terms of the distance and time parameters of commuting and with regard to exposure to road interchanges as nodes of congestion. We also have examined impedance as a perceptual or subjective dimension in terms of perceived aspects of travel constraints. Both the physical and the perceived and quality of home life, and we have developed an ecological model for understanding these effects (Novaco et al, in press). Our research has shown that the transportation environment is reciprocally linked with characteristics of home and work environments, as well as with personality factors. We have also found that seemingly "low stress" personalities can be strongly affected by high impedance commuting.

Among our research procedures with Irvine industrial area commuters was a questionnaire measure of impatient/antagonistic driving habits. This involved 16 forced-choice items concerning behavioral tendencies in traffic situations (e.g., responses to a yellow light at an intersection, someone cutting in front, someone following too closely, having to yield the right-of-way, someone not moving when a stop light changes, and so on). A summary index of impatient/antagonistic responses to these sampled situations was significantly correlated with a number of stress and anger measures obtained from a variety of methodologies (physiological, performance, and self-report) and at several different points in time. In addition to being significantly associated with diastolic blood pressure, anger, impatience, low frustration tolerance, negative mood on arrival home, and alcohol consumption, the driving habits index was also positively correlated with level of education ($r = .23$, $p < .03$) and socio-economic status ($r = .31$, $p < .004$). Consequently, one should not think of antagonistic driving as a working class, aggressive sub-culture phenomenon. Moreover, our

findings on the driving habits variable reflect environmental influences, because persons who were otherwise not time-urgent, impatient, or hostile[25] had high impatient/antagonistic driving habits scores when they were also high impedance commuters.

The traffic context can shape driving dispositions over the long-term, thereby making aggressive responding more prepotent. Elevations of arousal, negative mood, and impatience work against restraints on aggression, which are further weakened by the anonymity of roadways and the escape potential provided by the automobile. Characteristics of anonymity indeed mark the experiences of urban dwellers (Milgram, 1970), and it has been theorized by Zimbardo (1969) that conditions of anonymity (along with group presence and altered responsibility) can produce a state of deindividuation that raises the probability of impulsive, irrational behavior. Although some laboratory aggression experiments simulating deindividuation conditions have had mixed results (Diener, 1976; Diener, Dineen, Endresen, Beaman, & Fraser, 1975), it seems more than plausible that a driver's lack of social connectedness to targets of aggression, relative concealment of identity, and the ability to escape by speeding away and exiting all lessen the restraining influences of social norms, social controls, and personal controls.

Cognitive Scripts of Aggression

Roadway assaults are in part a product of personal experience and exposure factors that script the individual towards aggression and lower restraints against harm-doing. Elements of the social fabric that have led to a desensitization towards violence and the presence of violence-prone subcultures add to the facilitation equations. Drive-by shootings, for example, are a routine behavior for Southern California gangs. The regular occurrence of such incidents may further establish freeway shootings in the repertoire of other drivers, or the gang behavior

itself might be transposed to freeways and to other targets. The mock war games being conducted in wilderness areas with thousands of sport combat participants (many of whom are white-collar professionals) shooting paint balls at one another certainly does not diminish the concern about disinhibition and the recurrence potential of roadway shooting contagions.

In situations where there are salient cues for aggressive behavior, cognitive scripts of aggression embedded in the experience of the individual can potentiate an aggressive behavior chain. The psychological idea of a script pertains to how social information is cognitively represented and organized (Abelson, 1976; Bower, Black, & Turner, 1979; Higgins, Herman, & Zanna, 1981) and has alternatively been called a "social episode" by Forgas (1979; 1986), referring to cognitive representations of stereotypical interaction sequences. Forgas (1986) has begun to study implicit representations of aggression situations for understanding everyday reactions. The script idea, however, was implied in Toch's (1969) analysis of violent men, for example, when he wrote that violence was habit forming, viewed violent incidents as composed of stages, and asserted that offenders saw themselves as participants in violent games. "Most importantly, they start seeing elements of past violent encounters as they approach fresh situations and begin to respond routinely" (p.186).

The concept of an aggressive script then is that of a mental programming of antagonistic behavior in a particular context whereby situational cues activate various subroutines for an actor's responses. Automobile driving is indeed impregnated with cues linked to aggressive scripts. In addition to the themes of automobile symbolization, traffic context, anger provocation, and personal histories of aggression previously discussed, there have been countless media portrayals of aggression in driving scenarios-- for example, the prototypic chase scenes of Bullitt and The French Connection.

Exposure to scripts which suggest or even legitimize violence have reduced inhibitions as well as programmed the mind with mental images. The modeling effects of media portrayals of violence surely are not irrelevant. I am not saying that someone tails and blasts at other motorists simply or mostly because of watching too many movies with hyped-up chase scenes or avenging angel storylines. Of course, it's more complicated, and to be sure it involves the breakdown of community values and the relative improbability of punishment for violent behavior. Yet we might understand the road assaults as an antisocial dramaturgy played out with tragic consequences. Combines with other disinhibitory influences, cognitive scripts for antagonistic behavior may be particularly potent in driving situations, making aggression difficult to deter.

Criminologists have argued that criminal sanctions are too distant and too improbable to deter offenders and that "punishment" has the least effect on those we want to punish most. With regard to the roadway assaults, the force of their argument depends on who is doing the shooting. If the freeway shooter is someone who is otherwise violent and law-breaking, it cannot be expected that he will be much deterred by new laws or even broadcasts of increased police presence.[26] However, if the prospective shooter is someone who is otherwise law-abiding and has a gun in the car for protection or someone not ordinarily violent but is considering "having some fun," then legislative and law enforcement responses may have a sobering influence. People do not rationally calculate the probability of getting caught or suffering the consequences (an argument used by deterrence opponents against harsher penalties), and a media report of one arrest may deter those whose inhibitions can be activated when there are no tangible rewards to over-ride them. Legislative responses reported in the media may be a visible way to operationalize community concern and disapproval of the deviants' behavior, thereby affirming community norms and leading to internalized personal

control. Some freeway shooters described their actions as only intended to scare the victims--as if the bullets would never hit anyone. Perhaps this is a fiction used to exonerate themselves, but it may be that they did not comprehend that real people were involved who would be harmed. Destructive impulses must be kept in check by convergent inhibitory forces.

On the other hand, expressions of community concern, publicized arrests, and judicial penalties have had little, if any, deterrence effect on drive-by shootings southern California. The "accidental" killing of young children by stray bullets that penetrate the walls of their homes and the deaths of numerous innocent bystanders evidently have not induced sentiments that can compete with violence subculture norms. Even condolence-goers leaving the home of a recently slain person's family were themselves fired-upon and critically wounded. The development and maintenance of these subcultural norms beckons for study, particularly in view of the contemporary ethnic specificity of this aggressive behavior script -- i.e., this is primarily a Latino gang phenomenon. There are many Asian gangs in the region, but they do not do drive-by shootings. And although there are periodic instances of drive-bys done by Caucasians or Blacks, the form of road aggression is today a Latino gang trademark.

Contagion Mechanisms

The diffusion or contagion effects of mass media communication were discussed earlier. Calls for media downplay of violent incidents are commonly heard, and this seems relevant to slowing the social transmission; yet the media have a responsibility to report the news. However, there has been curious variation in the length and positioning of road shooting stories. During the California contagion, stories of freeway shootings gradually moved off the front page, partly by editorial judgment and partly displaced by other news. To illustrate,

on August 26, two months after the shootings began, an arrest of an injury shooting suspect and the death of a victim of another shooting received two small paragraphs of coverage in the Los Angeles Times on an interior page. In contrast, a shattered window incident early in the episode received a full story on a regional front page.

Some acts of road violence may be attempted for publicity, but very few have this calculating quality, being instead of an "impulsive" nature. The stimulational and suggestive influence of the media seems unmistakable, as does the commercial value of sensational stories. However, the effect of media reportage on roadway aggression remains to be demonstrated. One experimental study (Greenberg & Wotring, 1974) of exposure to television violence on driving behavior found no effects, although both the violence exposure and the driving elements were simulations performed with driver education students. In contrast, a naturalistic but correlational study by Smith (1969) found that aberrant drivers tended to watch violent television programs. Although there is obviously a dearth in research on viewers' roadway behavior, a different tact could be taken by focusing instead on media personnel behavior and decision-making.

One way to investigate the hypothesized role of the news media in the social transmission of roadway aggression during a contagion episode would be to study the behavior and decisions of those who construct news stories. In addition to an exacting analysis of all regional newspaper stories and videotapes of television news broadcasts, interviews might be conducted with each of the reporters of road aggression incidents, as well as with editorial decision-makers (e.g., assistant city editor, city editor, news editor, and managing editor). Such interviews could examine how the news item comes to their attention, what makes it "news," how they pursue the story, what factors determine the aspects of the story that are

reported, and how it is reported. Their views on the role of media reporting as a mechanism of contagion could be examined directly in terms of policy decisions.

Summary

Aggressive behavior has had a recurrent association with automobile driving reflected in our symbolization of cars and trucks, as well as being rooted in psychosocial experiences on congested roadways. Dramatic occurrences of violence such as freeway shooting episodes have been thought to be idiosyncratic events but instead need to be understood in their historical and phenomenological context. Freeway shootings are only one type of aggression occurring on roadways and are in no way unique to any regional area.

A typology of six types of roadway aggression was presented, mapping the range of contemporary forms of this behavior with regard to various characteristics of targets, perpetrators, and context. Most of these roadway aggression forms have received sparse academic attention, despite having high social and scientific relevance. A theoretical perspective on the determinants of roadway aggression was also offered.

The concept of disinhibition was central to this analysis of roadway aggression. The disinhibition of aggression was seen to result from multiple influence channels associated with physiological arousal, traffic context, aggressive scripts, and contagion mechanisms linked with the mass media. Modeling and suggestion are thought to have an important role during the diffusion of an aggressive behavior prototype.

Findings from previous research and from an ongoing survey project on road aggression indicate that antagonistic behavior in driving is relatively prevalent and that provocative and self-endangering actions are perpetrated by both male and female drivers. While it would be an exaggeration to say that antagonism and aggression are a routine part of automobile driving,

the findings of the preliminary surveys indicate that such behavior is not uncommon. The topic of aggression on roadways merits continued study independent of shooting contagions. In addition to field experiments and archival data studies, it is suggested that news reporting behavior and decision-making be examined.

Footnotes

[1]Physiological arousal, anger provocation due to travel impedance, anonymity, opportunity for escape, the automobile's symbolization, cognitive scripts for aggression, and community contagion mechanisms convergently operate to lower restraints on aggression.

[2]"Freeway shootings" is being used here as a generic label for the use of firearms from a moving vehicle on a highway where the target is a person in another vehicle or on the side of the road.

[3]Parry obtained three samples in Hornsey: one was produced by stopping the driver of every tenth vehicle at a chosen spot; a second came from registered voters; and a third consisted of motorists who volunteered to complete questionnaires. Very few differences were found between these samples in their questionnaire responses. The subjects were 279 males and 103 females, ranging in age from 17 to 70 years of age.

[4]Only 45 items (30 aggression and 15 anxiety) are used by Parry as relevant for analysis. He is unclear about the status of the items and does not say how the 45 relevant ones were selected.

[5]Whitlock used simple correlation and some multiple regression for his statistical methods. His analytical task, however, calls for time-series methodology.

[6]He gives an elaborate and quite eloquent rationale for the territorial defense thesis, referring to the writings of Lorenz, Andrey, Storr, Wynne-Edwards, and others in building his argument that aggressive drives that are normally devoted to the acquisition and protection of home property are transferred to the automobile. Young men, who typically do not own houses or land, are thereby more likely to be aggressive on the road. Whitlock does acknowledge that frustration-aggression theory is a viable hypothesis, although he discounts it and others in favor of the aggressive drive territoriality thesis.

[7]This refers to Whitlock's thesis that the absence of real estate property produces territorial aggressiveness in conjunction with the automobile, especially for young males of low-socioeconomic status.

[8]These are parking control officers, who in Manchester were a civilian force that encountered friction from both the Police Federation and civil liberties groups. They are males and females; they deal with stationary cars and cannot punish violators beyond a fixed-penalty ticket; and they provoke anger by their assigned duties. Richman's sample of 107 subjects was roughly half male and half female. The problem is that Richman's inferences concern the drivers of automobiles ("errant motorists"), whereas his data are supplied from interviewing these traffic wardens, who are not unbiased or trained observers. Marsh and Collett (1986) also convey that traffic wardens are "regular target(s) for the wrath of drivers" (p. 163) because they challenge the automobile's territory. "British traffic wardens have demanded danger money rather than weapons. At a recent conference in London, their delegation told of how they had been pelted with eggs, spat upon and drenched with water. One warden told how a motorist had driven a car straight at him and three of his colleagues. Not content with this tactic, the driver made a u-turn and scattered them all again" (Marsh & Collett, 1986, p. 164).

[9]Skillman's (1965) book was published by "The Re-Appraisal Society," which is a name that cognitive mediation theorists would find appealing.

[10]Quite unfortunately, Whitlock (1971) misrepresents the findings of other authors in a number of places in his book. Egregious errors occur, for example, in his summarization of Conger et al. (1957) when he states that they found "that accident-repeaters showed poor control of hostility and were more overtly aggressive than the accident-free control group" (p. 34). Conger et al. (1957) found no such thing, as they had no hostility control or overt

aggression measures. Whitlock (1971, p. 35) also distorts the findings of the Conger et al. (1959) study and the Selzer et al. (1968) study by referring to variables not in those studies and to findings as being significant that are not. In another instance (p. 22), he refers to Tillman and Hobbes (1949) as concluding things about "latent tendencies" that they do not say. Other occurrences of inaccuracies also appear in the text, which raise doubts about the rigor of Whitlock's book.

[11]The Cambridge-Sommerville Youth Project, well-known to community psychologists, was begun in 1936 as an attempt to prevent delinquency. Seven hundred boys living in those Massachusetts areas began as participants in the original design, which included both "difficult" and "average" youngsters born between 1925 and 1932. Because of problems with staffing and travel during World War II, the program was reduced to 506 boys (253 matched pairs from 466 families, and ultimately only one boy from each family was used in the evaluation. As a primary prevention project, the intervention produced meager results. The McCord (1984) study used data from the 1975 follow-up project which located 98% of the sample and had a 75% return rate on a mailed questionnaire.

[12]With the curtain closed, a honk is arguably even more likely to be merely a signal given to an inattentive driver, rather than an "aggressive" behavior. However, this argument against the validity of the dependent measure does not account for the differences obtained in the experimental conditions -- i.e. there is no apparent reason to believe that the presence of rifles and "vengeance" bumper stickers raise the probability of courteous signaling. Also, in the Doob and Gross (1968), Deaux (1971), and Kendrick and MacFarlane (1986) studies, significant effects were found for the frequency and latency of horn honking, which argues against interpreting horn honking in the procedural context as merely a signal to the non-proceeding driver.

[13]Halderman and Jackson (1979) refer to Stoltman (1978) as the originator of this procedural nuance.

[14]This linearity effect for ambient temperature on aggression stands in contrast to the curvilinear effect found by Baron and his colleagues in laboratory studies, but it is consonant with other naturalistic data for these variables (Anderson and Anderson, 1984; Carlsmith and Anderson, 1979). Kendrick and MacFarlane acknowledge the instrumentality problem of horn honking in their procedure.

[15]Consistent with this effect for greater aggression in the afternoon, my own research on traffic congestion and stress has found the evening commute to be more aversive than the morning commute and more strongly related to negative mood at home (Novaco, Stokols, & Milanesi, in press).

[16]An example of this latter possibility happened to a 62 year old man on the I-395 freeway near Washington, D.C. in 1988. Frustrated by a slow moving vehicle in front of him, he pulled alongside and made an obscene gesture; but then the vehicles collided, and the gesturing driver's car jumped a median strip, hit a third car, and fatally crashed into a concrete abutment (Jenkins, 1988).

[17]Gang-related incidents, known as "drive-by" shootings are excluded here, as they are separately classified. They, in fact, infrequently occur on freeways, as they are closely tied to matters of territoriality.

[18]Chicago Tribune columnist, Mike Royko (known for his pithy phrases) said as much in characterizing the California 1987 summer shootings (August 4, 1987). Yet the Chicago Tribune gave virtually no attention to the St. Louis shootings in the months that followed.

[19]This information was obtained from St. Louis Post Dispatch news archives and telephone interviews with its reporters. Similarly the Detroit shooting information was obtained from the Detroit Free Press and telephone interviews with reporters.

[20]Curiously, in one Detroit Free Press story (April 19, 1988), a police lieutenant was quoted as saying, "...for years at this time of year, we get groups of teens driving through the subdivisions shooting out windows of parked cars. Maybe they are getting bolder, and now they are shooting at motorists on freeways." His "rite of spring" explanation, however, falters quickly with the August, November, and January shootings.

[21]I thank Commander Susan Cowen-Scott for providing me with these data which will receive a proper detailed analysis in a subsequent paper. I also thank Officer R. Findlay for his tabulations.

[22]John Monahan's assistance in locating these cases is gratefully acknowledged.

[23]Information on this highway robbery contagion was obtained from Miami Herald archives and interviews with Ft. Lauderdale News reporters. I thank Kevin Davis and Renee Krause for their assistance.

[24]Konecni (1975) found that arousal-inducing physical stimulation (aversive auditory tones) heighten aggression when conjoined with psychosocial aversiveness. Conditions of insult provided a "cognitive label" for the combined arousal state (aversive tones and aversive interpersonal interaction), resulting in greater retaliatory aggression than for insult alone or for auditory aversiveness alone (very loud and complex tones).

[25]The personality factor was coronary-proneness Type A/Type B variable, as measured by the Jenkins Activity Survey (cf. Stokols et al., 1978). Type As scored significantly higher than Type Bs on the driving habits index in our low and medium impedance conditions, but the reverse was true for high impedance subjects.

[26]Despite the augmented police patrols, less than 10 arrests were made in more than 100 shootings, which translates to better than a 9 in 10 chance of escaping.

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Table 1

Correlations of Annoyance-Motivated Horn-Honking with Other Aggressive Driving Behaviors

I. Aggressive Driving Behaviors (Ever Performed)	*r*	*p*
Thrown object at another driver	.15	
Bumped or rammed another driver	.12	
Threatened another driver with a gun	.07	
Shot at another driver	.15	
Given chase to another driver	.25	<.001
Argument on road threatening physical violence	.26	<.001
Fight on the road with physical contact	.11	
II. Aggressive Driving Behaviors (Scaled Frequency)		
Abruptly cutting off another driver	.45	<.001
Shouting or yelling at other drivers	.30	<.001
Abruptly stopping in front of another car	.15	
Deliberately riding the bumper of another car	.37	<.001
Flashing your high beams at a car in front	.45	<.001
Obscene or provocative gestures	.50	<.001

Note. The correlations in section I are point-biseral coefficients, as the tabled aggressive behavior measures are dichotomous variables, while the horn-honking measure is a nine-point scale. Those in section II are Pearson coefficients. The section II variables are scaled with the same units as the horn-honking item. For this simple analysis without covariates, only the higher coefficients are noted for significance.

Table 2

Roadway Aggression Typology

	Target Location	Aggressor Location	Target Identity	Temporal Interval	Intentional Quality	Traffic Relevance
Roadway Shooting/ Throwing	inside (typically)	inside	anonymous	immediate	impulsive	yes
Assault with Vehicle	inside or outside	inside	anonymous or personal	immediate or delayed	impulsive	yes or no
"Sniper"/Robber	inside	outside	anonymous	delayed	premeditated	yes
Drive-By Shootings	outside (typically)	inside	personal	delayed (typically)	premeditated	no
Suicides/Murder Crashes	inside	inside	personal	delayed	premeditated	no
Roadside Confrontations	outside	outside	anonymous	immediate	impulsive	yes