EFFECTS OF SOCIAL INFORMATION ON DRIVING COURTESY

by

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DEDICATION

For my parents, Hadi Ferdous Ahmed Chowdhury and Jubaida Khanom Chowdhury; without you I would not be here.

For my wife, MST Zahura Nasrin Shumi, without your support it would not have been possible for me to complete my graduate work within this timeline.

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ABSTRACT

Aggressive driving, defined as a behavior that intentionally endangers other road users psychologically, physically, or both, has been considered the second most serious issue in road safety after driving under the influence (DUI) of alcohol and drugs. Researchers have tried to understand the factors involved in driving aggression, but on the other side of it, there has been little research on driving courtesy, which is defined as a polite and safer action or reaction of drivers to other road users. This research approaches the problem of aggressive driving by focusing on both, factors that provoke driving aggression and factors that encourage driving courtesy. Three such factors were identified through an intensive literature review and three focus groups. These three factors, self-identity (being anonymous or identifiable on the road), recent driving experience (good or bad behavior of other drivers on the road) and group affiliation (social identity of other drivers as in- or out-group) were tested for their significance in driving courtesy and aggression through a vignette survey. The vignette stories were developed using two courtesy-encouraging and two aggression-provoking scenarios which had been identified in the focus groups as common and important in traffic safety. The repeated measure logistic regression model was used to analyze the responses and all three factors were found to be statistically significant predictors of driving behavior. Moreover, it was found that these factors can be used in reducing aggression and also promoting courtesy. Sharing in-group information and being identifiable promote courtesy, and being courteous on the road promotes a better environment in which drivers perceive a good driving experience. Since it was identified that having a recent good driving experience helps to reduce aggression, it was concluded that promoting courtesy can reduce aggression. A feasibility study with video vignette was conducted to explore the idea where drivers could share social identity with other drivers through Connected Vehicle Systems (CVS) or similar technology. The results verified the vignette survey experiment, showing that sharing common group identity does indeed reduce aggression and also promotes courtesy. It should be noted, however, that sharing out-group identity can provoke aggression.

CHAPTER-1

INTRODUCTION

This chapter is designed to provide an overview of the entire research that was planned, revised and conducted in the previous fifteen months. The chapter is organized in the following fashion: 1) background, 2) research questions, 3) research method summary.

Background

It has been estimated by the World Health Organization (WHO) that road injuries are the eighth leading cause of death in the world, and the leading cause of death for people between the ages of 15 to 29 (World Health Organization, 2013). In the Global Status Report on Road Safety (2013), WHO reported that each year approximately 1.24 million people die in road accidents, and another 20 to 50 million people get injured in non-fatal road accidents. Road accidents are also one of the leading causes of death in the US. In 2012 a total of 33,561 people died in the US due to motor vehicle crashes (National Highway Traffic Safety Administration - NHTSA, 2015). If we consider the total estimated population of the US in 2012 which was 313,914,040 (U.S. Census Bureau, Population Division, 2015), the fatal traffic injury rate in 2012 was approximately 10.69 in every 100,000 persons.

A report published by the American Automobile Association (AAA) Foundation (2009) analyzed the fatal crash related data of NHTSA's Fatality Analysis Reporting

System (FARS) database from 2003 through 2007. They found that among the total 192,069 fatal crashes which occurred from 2003 to 2007 in the United States, as many as 56 percent involved one or more unsafe driving behaviors typically associated with aggressive driving. In that report they also defined the term aggressive driving as: "any unsafe driving behavior that is performed deliberately and with ill intention or disregard for safety" (Aggressive Driving: Reasearch Update, 2009, p. 9). Their definition of aggressive driving does not contradict the general concept of aggression, defined as "behaviors that cause psychological or physical harm to another individual" (Gerrig & Zimbardo, 2002). Since it was not possible to ascertain a driver's intentions or motivations, researchers have focused on observable driver behaviors that were reported in police investigations (and hence, found in the FARS database) to estimate the role of aggressive driving in fatal crashes.

The American Automobile Association (AAA) Foundation conducted a survey in 2013 on U.S. residents 16 years of age and older which revealed that, according to the perception of the participants, aggressive driving had become the second most common problem on the road in the previous three years (2013 Traffic Safety Culture Index, 2014). Aggressive driving has been identified as being as serious an issue as driving under the influence (DUI) of alcohol and drugs (Cook, Knight, & Olson, 2005). In order to address this problem and help make the roads safer, much research has been conducted on aggressive driving.

Curiously, although safe roads are the goal, little research has been performed on driving courtesy. As a consequence, no explicit definition of driving courtesy was

identified. So, I took the definition of 'courtesy' from the Oxford dictionary to map 'driving courtesy' as "*a polite and safer action or reaction of a driver towards other road users*". A more detail discussion on driving courtesy is presented in the literature review chapter.

In the research arena of aggressive driving, researchers have indicated the lack of means of communication between drivers as a cause behind the aggression on the road (Ratan & Tsai, 2014; Mitrevska, Castronovo, Mahr, & Müller, 2012; Jenness, 2007; Ellison-Potter, Bell, & Deffenbacher, 2001). To address this, some researchers have discussed upcoming technologies like Connected Vehicle Systems (CVS) through which drivers on the road should be able to conduct real-time communication on the road in the near future (Ratan & Tsai, 2014; Schroeter, Rakotonirainy, & Foth, 2012; Mitrevska, Castronovo, Mahr, & Müller, 2012). This research considered the idea of communication between drivers through new technologies, applying it in not only reducing aggression but also improving courtesy on the road.

Research Objective

The objective of the research was to explore a unique way to address the problem in traffic safety: by not only reducing aggression but also promoting courtesy. This objective involved improving the overall understanding of driving courtesy, determining if it is possible to promote courtesy and reduce aggression by socially connecting drivers on the road through the use of upcoming technologies like CVS.

Research Questions

This thesis considered three main research questions. These three research questions are stated sequentially below:

- **Research Question 1:** What kind of driving situations do people interpret as aggressive or courteous, and what factors are perceived as causing aggressive or courteous driving behavior?
- **Research Question 2:** Which situational factors have significant influence on driving aggression and courtesy?
- **Research Question 3:** Can CVS or similar technologies be used to increase driving courtesy and reduce aggression on the road by providing the opportunity to share social information?

Research Method Summary

Both quantitative and qualitative data were collected to answer the research questions mentioned above. Figure 1 shows the sequence of data collection methods along with the related research questions.

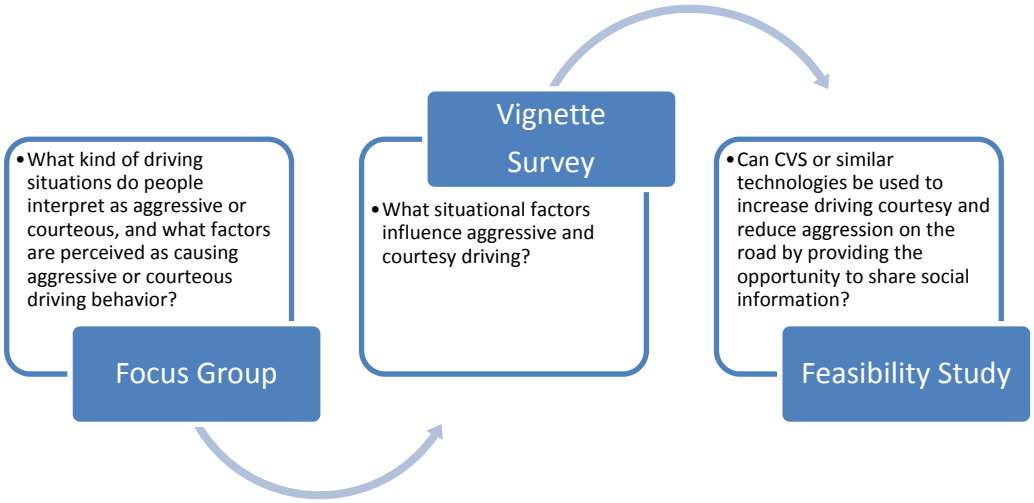

Figure 1: Data collection methods and sequence

Focus Groups

After conducting an extensive literature review, it was identified that although much research has been done on driving aggression, not enough research work has been done to determine how drivers on the road perceive and express courtesy. It was also unknown which factors could potentially play a role in courteous driving behavior. So, to address this, three focus groups were conducted to get answers to the first research question: What kind of driving situations do people interpret as aggressive or courteous, and what kinds of reasons are perceived to make drivers behavior aggressive or courteous? A list of different driving scenarios was attained from the three focus group discussions by compiling the participants' responses when they were asked to share their courtesy and aggression driving experiences. Two scenarios which involved 'active courtesy,' defined as- responding in a helpful manner were selected from this list and

tagged as '*courtesy-encouraging*' scenarios. Two additional scenarios were selected from the same list and tagged as '*aggression-provoking'* scenarios which involved 'active aggression,' defined as- responding in a hurtful manner (Bushman & Huesmann, 2010).

Discussions on the reasons behind aggressive and courteous driving behavior helped to identify factors that might play a role in courteous and aggressive driving.

Vignette Survey

Due to time and budget constraints, it was not possible to test all the situational factors that were identified in the literature review and focus groups. From the literature review, two factors were selected for the experimentation: 1) *group affiliation* (with two dimensions, in- or out- group), and 2) *self-identity* (with two dimensions, anonymous or identifiable).

The first factor, '*group affiliation,*' was selected based on the Similarity Attraction Theory (SAT), Social Identity Theory (SIT) and Self-Categorization Theory (SCT) discussed in detail in the literature review chapter. The significance of this factor on driving aggression was also identified in research done by Mitrevska, Castronovo, Mahr, & Müller (2012) which is also discussed in the literature review chapter.

The second factor '*self-identity*' was selected from a list of situational factors that was made by reviewing the literature on aggressive driving. This factor was chosen above all the other factors of aggressive driving because it was the most common among them. The significance of this factor in both reducing aggression and promoting courtesy was corroborated from the focus group discussions.

Another factor, namely *recent driving experience* (with two dimensions, good or bad recent driving experience), was identified in the focus groups as important in reducing aggression and promoting courtesy and was therefore also included in the second experiment. The three selected factors on driving aggression and courtesy are presented in the table below:

Table 1: Rationale for Study 2 factor selection

Factor	Rationale behind the anticipated significance on Aggression	Rationale behind the anticipated significance on Courtesy	Dimensions of the Factors
Recent driving experience	Focus Group Displaced Aggression Model	Focus Group The norm of social reciprocity	Good experience
			Bad experience
Group affiliation	Mitrevska, Castronovo, Mahr, & Müller, 2012 Social Identity Theory (SIT) Self-Categorization Theory (SCT)	Similarity Attraction Theory (SAT) Social Identity Theory (SIT) Self-Categorization Theory (SCT)	In-group
			Out-group
Self-identity	Mitrevska, Castronovo, Mahr, & Müller, 2012; Jenness, 2007; Ellison-Potter, Bell, & Deffenbacher, 2001; Ellison, Govern, Petri, & Figler,1995 Focus Group	Focus Group Social Reputation	Anonymous
			Identifiable

The objective of the second experiment was determine how these selected factors contribute to driving behavior; namely, to what extent they influence driver tendencies to respond aggressively or courteously.

Vignette stories were used to test these factors. A vignette story is a short description of a hypothetical situation to which research participants respond, thereby revealing their perceptions, values, and attitudes (Hughes, 2001). The vignette stories of

the study were developed using selected driving scenarios identified in the focus group studies. The vignette stories developed from the '*courtesy-encouraging*' scenarios were used to test the significance of the factors in driving courtesy and the vignette stories developed from the '*aggression-provoking'* scenarios were used to test the significance of the factors in driving aggression.

Feasibility Study

Finally, a feasibility study was conducted to answer the final research question: Can CVS or similar technologies be used to increase driving courtesy on the road by providing the opportunity to share social information? As stated before, CVS is an upcoming vehicle communication technology through which drivers on the road would be able to conduct real-time communication on the road in the near future (Ratan & Tsai, 2014; Schroeter, Rakotonirainy, & Foth, 2012; Mitrevska, Castronovo, Mahr, & Müller, 2012). The driving scenarios remained the same in this study as were used for the vignette stories in the second study; however, only *group affiliation* (in- and out- group) data was presented in the fashion of a head-up display (HUD) to create a simulation in which drivers could be socially connected with other drivers as they would be through CVS or similar technologies. HUD is a special type of display that presents data in semi-transparent manner so that users do not have to look away from their usual viewpoints.

Only *group affiliation* was used as an explanatory factor in this study, even though *self-identity* and *recent driving experience* were also identified as significant predictor of behavior in the vignette study, because the magnitude of the effect on driving courtesy and aggression was highest for this factor and also anonymity, which is a

dimension of the factor *self-identity* will also be removed (to some extent) if the drivers on the road get socially connected to each other.

This study was also used to verify the findings of the vignette survey regarding group-affiliation. The four scenarios that were used to create vignettes in the second study were replicated and video recorded on different roads of the town of Bozeman, MT. Only the fans of the local football team, known as 'Bobcat'- were recruited as participants, the identification of other drivers as 'Bobcat' fans was used to present 'in-group social identity'. In contrast, the 'Grizzlies' (University of Montana) are the main rival of the Bobcat team. So, identification as a 'Grizzlies' fan was used as 'out-group social information'. Commercial logos of both teams were presented in the recoded video on top of the car of the other driver in the fashion of HUD as shown in Figure 2:

Figure 2: Presenting in- (left) and out- (right) group information in the fashion of HUD

CHAPTER-2

LITERATURE REVIEW

This research will integrate studies that have been done on the psychology of courtesy and aggression on the road with those done on new technology that is still being developed. As a result, the literature that has been reviewed covers 1) the field of behavioral research on driving aggression and courtesy; 2) literature on factors that influence driving aggression; 3) literature on social behavior and courtesy; and 5) vehicle communication technologies.

Literature on Driving Aggression and Courtesy

Much research has been conducted to discover the psychological factors that play a role in aggressive driving. Ellison-Potter, Bell, & Deffenbacher (2001) describe aggressive driving as a driving behavior that intentionally endangers others psychologically, physically, or both. As examples of aggressive driving behaviors they listed tailgating, horn honking, traffic weaving, excessive speeding, profanity, obscene gestures, headlight flashing, red-light running, and blocking the passing lane. There are generally two forms of aggressive behavior: instrumental or hostile (Baron & Byrne, 1994). According to David Shinar, professor emeritus at Ben-Gurion University of the Negev, Israel (1998):

> Instrumental behavior is basically the behavior that the aggressor assumes will help him/her to overcome the frustrating situation. Typical instrumental behaviors can be honking the horn at drivers blocking the path, weaving in and out of traffic, ‘cutting’ in front of other drivers, and running red lights. On the other hand, hostile behaviors are the kind of

> behaviors that make the aggressive person 'feel better' without really solving the problem (Shinar, 1998, p. 139).

Shinar also concedes, "there is no clear-cut dichotomy between them: honking the horn at somebody may serve both the instrumental and the hostile aspects of aggression" (Shinar, 1998, p. 139).

In 2013, a group of researchers published a content analysis research article showing categories of offensive driving behaviors in the Journal of Transportation Research Part F (Wickens, Roseborough, Hall, & Wiesenthal, 2013). The research was based on daily online diaries which were then coded by the researchers The most common offensive driving behaviors that this research categorized are listed in Table 2.

Table 2 : Common offensive driving behavioral categories

Adapted from "Anger-provoking events in driving diaries: A content analysis" by Wickens, C. M., Roseborough, J. E., Hall, A., & Wiesenthal, D. L. (2013), Transportation Research Part F, p. 110. Copyright 2013 by the Elsevier Ltd. Adapted with permission.

(A) Improper speed	
(i) Speeding/racing	Speed greater than the posted limit or too high for the current road conditions
(ii) Unnecessary slow driving	Such a slow rate of speed as to impede the normal movement of traffic
(iii) Sporadic speeds	Continuously changing or unpredictable speeds
(B) Tailgating	Following a vehicle more closely than is reasonable
(C) Lane usage	
(i) Improper lane usage	Not driving within a single lane, passing another vehicle by driving outside a single lane and onto the shoulder of the roadway, or violating the legally prescribed use of a lane
(ii) Weaving through traffic/cutting off/sideswiping	Moving from one lane to another or entering a lane from a side road without due regard for whether that movement can be made safely
(D) Improperly equipped/unsafe vehicle	
(i) No turn signal	Failing to use a flashing light signal for turn or lane change
(ii) All other forms of improperly equipped/unsafe vehicle	Operating a vehicle that is improperly equipped (e.g., improper display of license plate, lack of headlight/tail light) or in such an unsafe condition as to potentially endanger others (e.g., mechanical error, overloading)

Table 2 Continued

(E) Disobedience of traffic signs/signals	Failing to obey a traffic control sign (e.g., red light, yield sign, pedestrian crossing)
(F) Erratic/improper braking	Sudden and unnecessary braking without due regard for other vehicles
(G) Blocking	Preventing other vehicles from merging or passing
(H) Perceived driver displays of hostility or violence	
(i) Perceived hostile driver displays	E.g., yelling, gesturing, horn honking, flashing high beams
(ii) Perceived violent driver displays	Behavioral displays of discontent that are more intense than verbal commentary or gestures that are not included elsewhere in the coding scheme (e.g., chasing/following, getting out of the vehicle to verbally or physically argue, waving a firearm/blunt instrument/weapon, throwing threatening objects)
(I) Driver inattention	
(i) Cell phone use	Inattention associated with cell phone use
(ii) Other or unspecified distraction	Source of inattention not specified or associated with anything other than a cell phone
(J) Hazardous road conditions not attributable to driver behavior	E.g., people/hitchhikers on the road, disabled/abandoned vehicle, debris on the road
(K) Cannot be classified	Cannot be placed in any of the above categories

In order to identify common aggressive behavior from the above table, it is necessary to understand offensive behavior first. Offensive driving behavior is defined as "behavior which increases the probability of inconvenience, damage, or personal injury being incurred by one or more road-users" (Brown & Copeman, 1975, p. 15). Although in paper, Wickens et al. did not clearly state the relationship between aggressive driving and offensive driving behavior, the relationship can be drawn by comparing with the definition of aggressive driving behavior as behavior that intentionally endangers others psychologically, physically, or both (Ellison-Potter, Bell, & Deffenbacher, 2001). So offensive driving behavior is aggressive when it is done intentionally. So, the above list of offensive behaviors (item number A to I in Table 2) that might be used in aggressive behavior were taken as potential examples of aggressive driving behaviors.

On the other hand, courtesy is defined by the Oxford dictionary as “showing politeness in one’s attitude and behavior toward others”. Taking this definition of courtesy and extending it to the driving arena, we can understand ‘driving courtesy’ as: “a polite and safer action or reaction of a driver to other road users”.

No literature was identified which discusses the relationship between aggressive and courteous driving. In order to understand the relationship between them, the degrees of aggression were considered. Aggression has been divided into active and passive aggression. Bushman & Huesmann (2010) define active aggression as an event in which an aggressor responds in a hurtful manner and ‘passive aggression’ as an event in which an aggressor fails to respond in a helpful manner. Similarly we can classify courtesy into two categories: ‘active courtesy’ being an event in which someone responds in a helpful manner and ‘passive courtesy’ being an event in which someone does not respond in a hurtful manner. Even though ‘active courtesy’ and ‘active aggression’ are totally different concepts, ‘passive aggression’ and ‘passive courtesy’ can be characterized with lack of courtesy and lack of aggression respectively. If we compare the definition of driving aggression and courtesy, it is clearly visible that those definitions refer to active aggression and active courtesy respectively. Therefore, this research only focus on the active aggression and courtesy.

The conceptual model of relation between aggression and courtesy is presented in Figure 3.

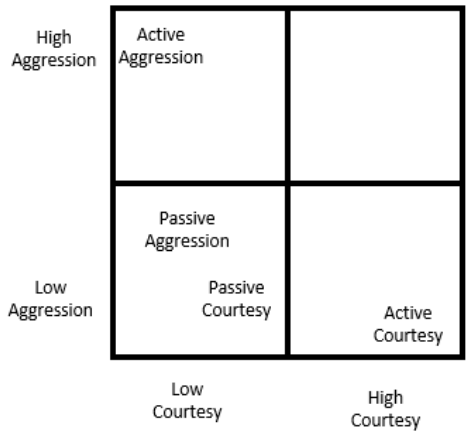

Figure 3: Courtesy - aggression relationship as perceived by the research

Literature on Factors that Influence Driving Aggression

Researchers have discovered several factors contributing to aggressive driving behavior. No research has been done on factors contributing to courtesy on the road, but this would be a worthwhile research to undertake. Salient factors behind aggressive driving which have been considered by researchers are listed in the table below:

Table 3 : Salient factors of aggressive driving

Factor	Factor category	Who found significance on driving aggression	Who did not find significance on driving aggression
Age of Driver (Younger drivers are more aggressive)	Non-situational	(Shinar, 1998; Retting & Williams, 1996;Malfetti, 1993; Hauber, 1980)	
Anonymity (as Self-identity) (The more anonymity, the more aggression)	Situational	(Mitrevska, Castronovo, Mahr, & Müller, 2012; Jenness, 2007; Ellison-Potter, Bell, & Deffenbacher, 2001; Ellison, Govern, Petri, & Figler,1995)	`
Cultural Norms (Disregard for the Law, Disregard for Others)	Non-situational	(Shinar, 1998)	
Gender of Driver (Males are more aggressive)	Non-situational	(Ellison-Potter, Bell, & Deffenbacher, 2001; Shinar, 1998 (On a part of the research); Deaux, 1971; Doob	(Shinar, 1998; Retting, Williams, & Greene, 1996; Hauber, 1980)

Table 3 Continued

		& Gross, 1968)	
Personality (Anger, Habitual or Clinical Behavior, Negligence)	Non-situational	(Wickens, Roseborough, Hall, & Wiesenthal, 2013; Dahlen & Ragan, 2004; Deffenbacher, Lynch, & Richards, 2003)	(Ellison-Potter, Bell, & Deffenbacher, 2001)
Time Urgency / Running Late (The more urgency, the more aggression)	Situational	(Wickens, Roseborough, Hall, & Wiesenthal, 2013; Shinar, 1998)	(Lajunen, Parker, & Summala, 1999)
Traffic Congestion (The more congestion, the more aggression)	Situational	(Shinar, 1998)	(Lajunen, Parker, & Summala, 1999)
Social Identity (as Group-affiliation) (Sharing in-group social information reduce aggression)	Situational	(Mitrevska, Castronovo, Mahr, & Müller, 2012)	

Table 3 includes situational and dispositional factors. Situational factors, defined as external influences on behavior (Glossary of Psychological Terms, 2015), are comparatively easier to change than non-situational factors. In other words, it is comparatively easier to reduce the severity of the effects of situational factors like *Anonymity*, *Time Urgency* and *Traffic Congestion* in order to reduce aggression. On the other hand, dispositional factors, like *Age, Gender, Personality* of driver, as well as other non-situational factors, like *Cultural Norms, ,* are more difficult to change.

Among the situational factors, *Time Urgency* and *Traffic Congestion* were considered by David Shinar (1998) and his associates in terms of the 'frustration-aggression model', which was originally proposed by Dollard, Doob, Mowrer, Miller, and Sears (1939) The frustration-aggression model basically suggests that all aggressive behaviors or acts are initiated by a frustrating circumstance, act, or event. In other words, aggression is always a result of some sort of frustration, which is defined as an emotion

that occurs in situations where a person is blocked from reaching a desired outcome (Berger, 2005).

David Shinar considered traffic delays and congestion as frustrating situations on the road and tested their effects on driving aggression. He considered running red lights and honking the horn as measures of aggressive driving behavior in his two different experiments. He found both factors 1) *Time Urgency* (actual and perceived delays in travel) and 2) *Traffic Congestion* to have significant effect on driving aggression.

In his paper, he considered the effect of *Time Urgency* measured by time and day of travel (assuming weekday rush-hour traffic would be more demanding than weekend driving). By analyzing the time the participants took to honk at a blocking driver, he found a shorter mean honking delay with a short green signal duration and during weekday rush-hours as compared to weekend hours and longer green signal duration.

All of the experiments of Shinar confirmed the applicability of the 'frustration aggression model' in describing driving aggression. However, Shinar's findings regarding 1) *Time Urgency* and 2) *Traffic Congestion* were challenged by three European psychologists, Lajunen, Parker, & Summala, (1999) as they did not find any significance of these factors in aggressive driving when they conducted another similar experiment in Europe.

Anonimity (or *Self-identity*), a situational factor from Table 3 which does not apply to the frustration model, was studied by Ellison-Potter, Bell, and Deffenbacher (2001). They used a computer-based driving simulator to measure the reaction of participating drivers in several potentially frustrating events, such as a jaywalking

pedestrian, a slow vehicle ahead, or a tailgating vehicle. The speed of the drivers, the number of red lights run, and the numbers of collisions and pedestrians killed (in the simulator) were recorded to measure aggressiveness in driving. Researchers asked the participants to imagine themselves driving a convertible with either the top up (hence, anonymous) or the top down (hence, identifiable) while they drove the car in the simulator. Participants were also exposed to either aggressive stimuli (by presenting aggressive text on the simulator screen throughout the simulation in the form of banners, billboards, and signs on buildings) or non-aggressive stimuli (by presenting non-aggressive neutral text). Participants drove more aggressively when they were anonymous and exposed to aggressive stimuli.

Participants were asked to fill out an exit questionnaire on which they self-reported their anger toward a list of general frustrating driving events on a standard 5-point Likert scale known as the Driving Anger Scale (DAS), developed by Deffenbacher, Oetting & Lynch (1994) to assess the driving anger of drivers. Researchers did not find any significant correlation between the observed behavior of the participants in the driving simulator and their self-reported driving anger as assessed by DAS. They described this inconsistency as a consequence of not having presented direct provocation (e.g., tailgating or getting cut off by other drivers) to the participants as a measure of aggression. Researchers supposed that self-reported anger is more applicable in predicting aggressive scenarios with direct provocation.

The use of aggression-stimuli in their research can be interpreted as being similar to having a '*recent bad driving experience*'. Aggressive behaviors from other drivers would act as an aggression-stimuli to drivers on the road.

Monika Mitrevska (2012) with her associates are among the first to have introduced the idea of using social identity (specifically *Group-affiliation*) in order to reduce aggression on the roads by finding and presenting social similarities between drivers. They collected common areas of interest and personal facts from the Facebook® profiles of the participating drivers and presented the information during a stressful situation in a gaming-environment driving simulation. The participants' cars were supposed to reach a selected destination in a given amount of time during there were different stressful scenarios. In those different stressful scenarios, three different types of information were presented: 1) relevant (common in-group information gathered from the participant's Facebook® profile), 2) irrelevant (information which had no connection with the participant's Facebook® profile), and 3) no information about the driver of the blocking car. The participants were given options to express either positive or negative reactions. Every participant encountered all three scenarios, but the order was randomized. Researchers found statistically significant correlation between relevant social information and positive reaction. In other words, they found drivers expressed more positive reaction towards the drivers who have similarities with them.

Many of the researchers (Ratan & Tsai, 2014; Mitrevska, Castronovo, Mahr, & Müller, 2012; Schroeter, Rakotonirainy & Foth, 2012; Jenness, 2007; Renge, 2000) emphasized improving communication between road drivers to reduce *Anonymity*

Besides the factors that provoke aggression, it is also equally important to understand the factors that promote courtesy. To understand human behavior and factors that promote courtesy (i.e. in-group favoritism), we must turn to psychology and sociology.

Literature on Social Behavior and Courtesy

According to world-renowned sociologist William Sumner (1906), humans are a species that join together in groups by their very nature. He also states that humans have an innate tendency to favor their own group. Favoring one's own group or in-group favoritism is described by Aronson, Wilson, & Akert (2010) as an effect where individuals give privileged treatment to others when it is apparent that they are in the same group. In-group favoritism can be expressed in judgment, allocation of resources, and many other ways. Giving favor to another driver on the road in traffic could be one of the ways of expressing in-group favoritism.

To understand the phenomenon of in-group favoritism, we must refer to Social Identity Theory (SIT), Self-Categorization Theory (SCT) and Similarity Attraction Theory (SAT).

A summary of all three theories are presented in table below:

Table 4: Theories of social psychology that explains and supports in-group favoritism

Theory	Proposed by	Brief description of the Theory
Similarity Attraction Theory (SAT)	Byrne (1961)	People like and are attracted to others who are similar, rather than dissimilar, to themselves
Social Identity Theory (SIT)	Tajfel (1974)	The inherent tendency of people to develop self-identity in their mind from perceived membership in a relevant social group. SIT was developed from the idea of the minimal group paradigm.
Self-Categorization Theory (SCT)	Turner (1989)	People categorize themselves on three different levels: as a human being (or human identity), as part of a social group (or social identity) and through person-to-person comparison (personal identity). SCT uses the same fundamentals as SIT.

Psychology and sociology have shown us that similarity is one of the key principles of attraction which contributes to liking. According to the Social Attraction Theory (SAT), people have a tendency to like those who are similar to them. In his classic work on similarity of attitudes and attraction, Donn Byrne (1961) asked college students to fill out an attitude survey. After that the participants were asked to read the same survey supposedly filled out by other unknown students (but actually by the experimenter). Finally, each participant was asked to rate the unknown student on a number of dimensions, based on their survey responses. Participants' responses showed that the unknown students were liked more when he/she agreed more with the participants' own responses. Participants also thought the stranger would be more intelligent, knowledgeable, moral, and better adjusted as the similarity of their attitudes increased.

People feel positive around other people who have similar interests, backgrounds, natures, values and attitudes (Reis & Sprecher, 2009). In a theory-based field study on selection bias in recruiting skilled immigrants in New Zealand, Coates & Carr (2005)

found that perceived similarity even biased recruitment decisions, which carries the Similarity Attraction Theory (SAT) beyond just choosing friends.

British social psychologist Henri Tajfel (1974) was the first to introduce the Social Identity Theory (SIT) which describes the inherent tendency of people to develop self-identity in their mind from perceived membership in a relevant social group. Tafjel and his associates conducted several studies in which participants were assigned into groups arbitrarily without any real connection between them. For example, participants were assigned to the groups 'over-estimator' and 'under-estimator' by their estimation of the number of dots projected on a screen (Tajfel, Billig, Bundy, & Flament, 1971), or by flipping a coin (Billig & Tajfel, 1973), etc. In those studies, participants were assigned to a group which had no past and future association outside the laboratory. Participants were allocated to randomly assigned groups and asked to allocate points to members of their own group as well as to members of the other group. Participants allocated the points to the other participants without knowing the identity of the point receivers, other than their group affiliation. In both cases, participants allocated more reward points to their own group members compared to members of the other group.

According to SIT, in-group favoritism is a motivational process. To understand the motivation behind in-group favoritism, Lemyre and Smith (1985) conducted an experiment with eight concurrent experimental conditions to identify the relation between intergroup discrimination and self-esteem. They found that competitive social comparison and discrimination against an out-group cause an increase in self-esteem. Professor Matthew Hornsey from the University of Queensland, Australia, in his

historical review article on SIT and the later developed Self-Categorization Theory (SCT) published in the Journal of Social and Personality Psychology Compass, stated: "Groups are not islands; they become psychologically real only when defined in comparison to other groups" (Hornsey, 2008, p. 207).

In 1989, John C. Turner published his first book in which he introduced a new and separate theory, the Self-Categorization Theory (Turner, 1989). Though both theories were developed on similar ideological and meta-theoretical viewpoints, the two theories are in-fact different in their foci. The Self-Categorization Theory (SCT) suggests that categorizations take place on three different levels: the category as human being (or human identity), the category of a social group (or social identity) and the personal self-categorization created by person-to-person comparison (personal identity).

Based on the above discussion, therefore, it would be worth testing to see if recognizing group identity on the road through broadcasted social would lead to greater driving courtesy.

In addition to *In-Group Favoritism*, the literature on social behavior yielded important insights on *Anonymity*. Social reputation, defined as the beliefs or opinions that are generally held about someone or something, is a collective phenomenon and a product of social processes. A study focused on what people do about their good reputations, researcher mentioned "People do expect to have to protect their reputations and perceive this is necessary to the degree that their deeds will come to the attention of their family and friends via other sources" (Emler, 1990, p. 185). The results of the study indicated that people tend to put greater effort for protecting their good reputation in

identifiable condition. Showing active courtesy on the road in identifiable condition might be an example of such effort.

Other studies added further insight to courteous or aggressive behavior. Reciprocity norm refers to the phenomenon in which positive actions bring about more positive actions while negative actions bring about more negative actions (American Psychological Association, n.d.), This was referred to as having good or bad recent driving experience in this study. Reciprocal behavior can be observed even when people behave anonymously with unknown partners, ruling out social approval as a potential alternative explanation (Perugini, Gallucci, Presaghi, & Ercolani, 2003). Burger, Horita, Kinoshita, Roberts, & Vera investigated the effect of time on the reciprocity norm (1997). Participants were given an opportunity to return a favor either 5 min or 1 week after receiving a free soft drink from a confederate. The researchers found no significant reciprocity effect in the 1-week condition and concluded that the reciprocity norm is more effective within a reasonable period of time. This study indicates that if drivers on the road have a good recent driving experience, they would likely show courtesy to others on the road in their driving.

With some understanding on the type of information that could be communicated between drivers to promote courtesy and reduce aggression, it is necessary to review the types of technology that could support communication between drivers in traffic.

Literature on Vehicle Communication Technology

Connected Vehicle Systems (CVS) is an emerging technology which is still in the research phase. This technology aims to enable interoperable networked wireless

communication between vehicles, the infrastructure, and passengers' personal electronic gadgets (Connected Vehicle Research, 2014). According to Kirk (2011), CVS could be classified according to the following categories: communication between vehicle-to-vehicle (V2V), vehicle-to-roadside infrastructures (V2I), and vehicle-to-beyond-roadside infrastructures (V2X). In a research paper on the concept of the social car, Rakotonirainy, Schroeter, & Soro, (2014) proposed the use of V2V technology even beyond the existing vehicle-to-vehicle communication focused on exchanging current vehicle kinematics and the whereabouts of hazards between two or more nearby vehicles. They suggested the use of V2V technology in exchanging social information amongst drivers. In their paper, they discussed mentioned the potential of using Augmented Reality (AR) glasses and Head-Up Displays (HUD). They promoted their concepts of sharing social information in 1) reducing aggression, 2) adopting better (e.g. greener) driving practices and 3) reduce risk-taking behavior in young, particularly male, adults via HUDs. Another study on social cars indicates that if the information regarding other vehicles and drivers is presented on car windshield in the fashion of HUD, such additional information does not distract the driver significantly (Rakotonirainy, Feller, & Haworth, 2008).

From the above discussion it could be easily predicted that in the near future, drivers will be able to interact with each other on the road through HUD or AR glasses with the help of CVS or similar technologies.

Literature Review Summary

This literature review has provided a strong foundation for the intended research. There is a scarcity of related research on driving courtesy compared to the abundant research on driving aggression. For this reason, literature on driving aggression was thoroughly examined for influencing factors. '*Anonymity*' was identified as a salient factor behind driving aggression. '*Group affiliation*' as social identity was also found to be an important factor behind aggressive and courteous driving behavior. Related theories and research articles on sociology and social psychology were also explored to get insight into the social behavior of humans and in-group favoritism. The SAT, SIT and SCT give a strong basis for presenting and sharing group information between drivers to reduce aggression and promote courtesy. The general understanding of positive social reputation and reciprocity norm helped to predict the effect of 'self-identity' and 'recent driving experience' on driving courtesy, respectively. Future means of driver communication on the road and the related technology were also presented. CVS was found to be the most prominent technology in driver-to-driver communication which could be used along with HUDs to share social information on the road.

CHAPTER-3

STUDY 1 (FOCUS GROUPS)

What kind of driving situations do people interpret as aggressive or courteous, and what factors are perceived as causing aggressive or courteous driving behavior?

An understanding of common offensive behaviors on the road (as presented in Table 2) was gathered from the literature on driving aggression. Not all common offensive driving behaviors could be considered aggressive; however this list nevertheless helped to predict what kind of driving situations people interpret as aggressive. In addition to aggression, this study sought to understand what kind of driving situations people interpret as courteous. In addition, a list of factors that influence aggression on the road was also identified through the literature review and presented in Table 3. Again, besides knowing the factors that influence aggression, this study sought to determine which factors have an effect on driving courtesy. Therefore Study 1 (Focus Groups) was conducted to fulfill two objectives: 1) to identify what kind of driving situations people interpret as aggressive or courteous, and 2) to determine what reasons are perceived as causing aggressive or courteous driving behavior. Although the literature review had produced a list of factors that influence aggressive driving behavior, finding additional factors that could possibly reduce aggression on the road and also potentially promote courtesy was an important consideration for this study. Thus, this experiment was intended to gather subjective information from the participants.

For such information, questionnaires and focus groups are the most common data collection methods. In this case, focus groups were used because better results can be expected on social issues from the brainstorming of an interactive group than from asking questions individually (Morgan & Krueger, Planning Focus Groups, 1998). Supplemental quantitative information was also collected from the focus group participants.

Focus Group Research Method

Participant Recruitment

Participants were recruited via announcement in two classes of the department of Mechanical & Industrial Engineering, Montana State University, as well as on the internet, through Facebook® groups and Craigslist®, posters hung around campus at Montana State University and also personal communication. Prospective participants had to have a valid US Driver's License and be between 18 to 60 years of age. Mention was also made of the $20 compensation for participation. Participants from the Mechanical & Industrial Engineering department received additional course credit for their participation which was offered as an alternative to an extra credit opportunity assigned in the class.

Participants Sample A total of 17 adult drivers, 7 males and 10 females, with valid driver's licenses and within the age range of 18-31 participated in this experiment. Each of the three sessions had 6 participants except the last session for which only 5 participants showed up. The participants had 5.2 years of driving experience on average (median 4.5 years). The average daily driving experience of the participants was 1.4

hours (median 1.0 hour). All the participants were residents of the town of Bozeman, MT and its surrounding areas.

Procedure

The three focus group sessions took place on three different days at different times. The first and second focus group sessions were held on Wednesday, October 22, 2014 and Thursday, October 23, 2014. The third session was conducted on Saturday, October 25, 2014. Each one and a half hour long session was conducted in a temperature-controlled, standard-illuminated meeting room inside the Renne Library of Montana State University-Bozeman and moderated by the researcher.

Upon reaching the focus group session venue, participants were asked to sit down in the assigned chair and fill-out the IRB approved consent forms (available in Appendix A) followed by a short demographic questionnaire (available in Appendix D). After that, they were asked to put on the name tags that were found inside the file in front of them. Then a brief introduction on the issues to be discussed in the session was given by the moderator. Before starting each session, the moderator asked the participants to introduce themselves. Halfway through the session a short five-minute break was given. Refreshments consisting of beverages, cookies, chips, and drinking water were available during each focus group session.

There was natural variation between focus groups as a result of the dynamics of each group, but consistency between the groups was maintained because the moderator led the discussion in each group, considering the key issues presented in Table 5.

Table 5: Outline of the main topics discussed in the focus groups

Topic #	Topic discussed	Rationale for presenting the topic
1	Experience or example of courteous driving scenarios (Has someone shown courteous behavior towards the participant on the road and / or vice versa?) * +	To identify common and important* courteous driving scenarios
2	Reason/s the participants think the mentioned behavior in section #1 was 'courteous', why the driver showed that behavior and why that behavior is important.	To identify the factors that play a role in driving courtesy
3	What other factors could play a role in courtesy on the road?	This direct question was asked to identify other factors that might promote courtesy on the road
4	Experience or example of aggressive driving scenarios (Has someone shown aggressive behavior towards the participant on the road and / or vice versa?) * +	To identify common and important* aggressive driving scenarios
5	Reason/s they think led the aggressive driver to behave in that way (based on issue #4).	To identify the factors that play role in driving aggression

* All participants were asked to rate each scenario that was discussed for their safety consequence (to measure the importance) and frequency of encountering it in regular driving (to measure how common the scenario is) on a 7-point Likert scale.

+ Participants were asked to share their own experience as well as experiences of other persons known to them.

As indicated in Table 5 (see footnote marked with *), each of the scenarios discussed in the focus group was rated by all participants on a 7-point Likert scale to measure their importance on traffic safety (3 = *extremely important* and -3 = *not at all important*) and commonness or frequency in general traffic (3 = *every time* and -3 = *never*). This rating was collected immediately after a participant described his / her experience or example of aggressive or courteous driving. Participants rated the scenario based on the verbal description of the scenario from the commenter on a form on which they put their rating along with the commenter name or ID. So, each comment which described any courteous or aggressive driving scenarios (no comma) had its own rating from each participant.

Data Analysis of Focus Group Study

There are several methods to conduct qualitative data analysis of focus groups. Pilot and Beck (2008), in their book for nursing research, mentioned three steps for qualitative data analysis: 1) organize, 2) provide structure, and 3) find the meaning from the data that has been collected. The data analysis of this focus group study was done in two steps: first organizing the data and then structuring the data. Results of the analysis have been interpreted in the result section.

Organizing Data

After conducting each session, all recorded audios were transcribed with the help of a transcriptionist. The transcribed data was again checked by the researcher (who was also the moderator of all three sessions) for any missing information; none was identified. While transcribing the audio recordings, all non-essential words were ignored. Recorded video was used to identify each commenter as sometimes it is hard to recognize who is who just from the voice on the recorded audio. Then each comment was coded with the serial number of the comment for the focus group discussion, focus group session number, and commenter color code. For example, '10_2BLU' was the tenth comment of the second focus group and the comment was given by the participant who was coded with the color blue. Each comment that described an aggressive or courteous driving scenarios had its own importance and commonness ratings from the present participants of the focus group. The other types of comments which did not have any rating (i.e. comments indicating the factors of driving aggression or courtesy) were listed separately.

Data Structuring

The identified courteous and aggressive scenarios were further classified into the following categories:

- CID = Courtesy to an Individual Driver
- CGR = Courtesy to General Road-users
- AID = Aggressiveness to an Individual Driver
- AGR = Aggressiveness to General Road-users

After that, the listed scenarios were ranked according to the average rating given by the participants for their consequences and frequencies. The identified, categorized and raked scenarios were listed in three different tables for three focus groups which could be found in Appendix F.

During the focus group sessions, the moderator asked the participants to discuss what kinds of reasons they perceived as causing aggressive or courteous driving behavior in the scenarios they discussed. Factors associated with driving courtesy and aggression were identified from those discussions (topic numbers 2 and 5 of Table 5) by the participants. In addition to the responses to topic numbers 2 and 5, every comment was meticulously inspected for any clue about additional factors that could play a role in either driving aggression or courtesy. Three lists of identified factors were created from the three different focus group sessions. Furthermore, the identified factors in the three lists were classified into the following categories:

- SF = Situational Factor
- NSF = Non-situational Factor (other factors which is not situational e.g., dispositional factor, environmental factor)

Three lists of identified factors can be found in Appendix G and the summary is presented in the result section.

Results of Focus Group Study

The outcome of each focus group session was a list of courteous driving scenarios, driving situations participants interpreted as courteous, and a list of aggressive driving scenarios, driving situations participants interpreted as aggressive. A list of factors that might influence drivers' behavior (to aggression or courtesy) was also obtained as a result of these three focus group sessions. The driving scenarios are the events or the driving situations that are defined by the actions of traffic, drivers and other related infrastructures. Driving scenarios can be used to explain how drivers perceive and show aggression and courtesy. On the other hand, the list of potential factors indicate the causes behind aggressive or courteous driving. The results regarding identified scenarios and potential factors are discussed separately as below:

Identified Driving Scenarios

As stated, identified driving scenarios from the three focus groups were listed in three different tables and were classified into four categories (i.e., CID, CGR, AID and AGR). All the courtesy scenarios (CID and CGR) from the three focus groups are listed in Table 6 and all the aggression scenarios (AID and AGR) from the three focus groups are listed in Table 7. Each scenario was given a mean frequency rating (which indicated

the commonness of the scenario) and a mean consequence rating (which indicated the importance of the scenario), obtained from the ratings of all 6 (5 for FG-3) participants in each focus group. In cases where multiple focus groups identified the same scenario, the highest average rating score was selected. As the scenarios were rated on a numbered scale to measure their importance on traffic safety (3 = *extremely important* and -3 = *not at all important*) and commonness (3 = *every time* and -3 = *never*), a few scenarios had negative average rating scores. Those scenarios were not included in the list.

Driving scenarios were described by different participants when they were asked to share an experience or example of driving courtesy and aggression. After each participant completed describing his/ her experience or example, the moderator asked all the participants to rate that scenario. Some participants used examples from personal experience; others described the scenarios in a general tone. Therefore, the ratings of the participants were not only influenced by the descriptions of the scenarios but also by the commenter's presentation capability and style of presentation. The intention for collecting the ratings from the participants about the different driving scenarios was not to make a comparison among them. The sole intention of taking the ratings was to pick up four driving scenarios quickly for the vignette stories that would be used in Study 2. While selecting the scenarios to use for the next study, the feasibility of presenting those scenarios with a video vignette for Study 3 was also considered, along with the importance and commonness of the scenarios. When selecting the courteous driving scenarios (CID & CGR) to present in Table 6 and aggressive driving scenarios (AID & AGR) in Table 7, scenarios those have 95% CI upper bound of sum of scores below the

95% CI lower bound of mean sum of scores (M = 2.079, [2.586 , 1.572]) which is 1.572 were not considered.

Table 6: Identified courteous driving scenarios

Scenario	**Category***	**Mean Frequency Rating**	**Mean Consequence Rating**	**Sum of Rating Scores** (Mean, 95% CI)
Allowing a driver in close proximity to change lanes after seeing his/ her turn signal** **[*selected*] +**	CID	2.00	2.17	4.17, 95% CI [3.38, 4.96]
Slowing down or stopping for a driver who is attempting to pull out from on-street parking** **[*selected*]**	CID	1.67	2.17	3.83, 95% CI [3.04, 4.62]
On the highway or freeway, letting someone else get off the ramp or merge lanes by shifting to the left lane (without speeding up or blocking them)**	CID	2.20	1.40	3.6, 95% CI [2.49, 4.71]
Dimming headlights when another driver indicates that your bright is on**	CID	2.00	1.33	3.33, 95% CI [2.06, 4.6]
Pulling over to help when someone visibly needs help on the roadside**	CID	0.33	2.17	2.5, 95% CI [1.62, 3.38]
Allowing big trucks / vehicles room to make wide turns easily**	CID	0.50	1.83	2.33, 95% CI [0.75, 3.91]
Driving at the same speed as the general flow of traffic even when speed is higher than the regulated speed limit.	CGR	2.50	2.00	4.5, 95% CI [3.05, 5.95]
Keeping a safe distance between other drivers**	CGR	2.20	2.20	4.4, 95% CI [3.29, 5.51]
Taking enough time to brake, considering the cars behind you (who might not be prepared to stop as quickly)**	CGR	1.60	1.80	3.4, 95% CI [1.73, 5.07]
Not using the shoulder to make a right turn when there is a long line of cars at a red light	CGR	-0.50	2.83	2.33, 95% CI [1.48, 3.19]
Staying in a chosen lane on a crowded highway instead of weaving through traffic to travel faster	CGR	0.83	1.33	2.17, 95% CI [0.62, 3.71]
Staying in the right lane if driving at the speed limit or under	CGR	1.50	0.67	2.17, 95% CI [1.13, 3.2]
Not blocking entrances or exits of stores / other public places while sitting in stagnant traffic	CGR	1.5	0.5	2, 95% CI [0.12, 3.88]
Moving over to the left lane for officers, accidents or other road hazards**	CGR	0.2	1.2	1.4, 95% CI [-0.48, 3.28]

*****Scenario category codes: CID = Courtesy to Individual Driver | CGR = Courtesy to General Road-users
**Active courtesy scenario +Scenarios that were identified in multiple focus groups

Table 7: Identified aggressive driving scenarios

Scenario	Category*	Mean Frequency Rating	Mean Consequence Rating	Sum of Rating Scores (Mean, 95% CI)
Driving with high beam on, even though it causes visibility problems for other drivers	AID	1.40	1.60	3, 95% CI [0.68, 5.32]
At busy roundabouts after a long wait, trying to push into traffic and rush out**	AID	1.17	1.83	3, 95% CI [1.85, 4.15]
Tailgating a driver who is in the left lane at the regulated speed limit in order to intimidate that driver to move into the right lane** **[*selected*]**	AID	0.80	1.80	2.6, 95% CI [1.18, 4.02]
Taking revenge by overtaking because the other driver cut you off previously**	AID	0.83	1.50	2.33, 95% CI [1.25, 3.42]
When someone is driving slower than permitted limit, trying to push him / her to speed up by honking the horn** **[*selected*]**	AID	0.50	1.33	1.83, 95% CI [0.8, 2.87]
Pulling into a parking spot when someone is already attempting to park there**	AID	1.6	-0.8	0.8, 95% CI [-0.82, 2.42]
Revving the engine and speeding around another car at a red light on a 2-lane street that will merge into one lane**	AID	N/A^	N/A^	N/A^
Speeding around a car that is attempting to back up out of a parking spot**	AID	N/A^	N/A^	N/A^
Texting or using cell phone while waiting for a red light to turn green	AGR	2.00	2.33	4.33, 95% CI [2.62, 6.05]
Weaving through traffic and frequently changing lanes**	AGR	1.50	2.17	3.67, 95% CI [2.23, 5.1]
Driving 10-15 miles above the speed limit, changing lanes without signaling	AGR	0.83	1.33	2.17, 95% CI [0.36, 3.97]
Passing in the left lane when another driver in the right lane is either slowing down or completely stopped without considering the reason why the right lane driver is slowing / stopped**	AGR	0.00	2.00	2, 95% CI [0.67, 3.33]
Slamming on the brakes at high speed for a yellow light instead of passing through**	AGR	0.33	1.50	1.83, 95% CI [0.61, 3.06]
When there are cars backed up and waiting for a long period of time, trying to go on the shoulder and cut ahead of the traffic**	AGR	0.83	0.17	1, 95% CI [0.06, 1.94]
Waiting to cut into another lane at the last minute when the current lane ends	AGR	1	-0.4	0.6, 95% CI [-0.51, 1.71]
Parking in an unsafe location or manner i.e. – at the end of an intersection effectively blocking the view of other drivers on the road	AGR	0.5	-0.17	0.33, 95% CI [-0.94, 1.6]

*****Scenario category codes: AID = Aggression to Individual Driver | AGR = Aggression to General Road-users, **Active aggression scenario, ^Scenarios that were not rated by participants

While analyzing the different courtesy and aggression driving scenarios, it was found that participants defined and perceived courtesy and aggression on the road with both types of scenarios: 1) scenarios where drivers show courtesy or aggression directly to the other driver, and 2) scenarios where drivers show courtesy or aggression generally to other road users. While defining aggression with driving scenarios, participants referred to both passive and active aggression. This was also applicable for driving courtesy. For these reasons, the tables show the CID/CGR and the AID/AGR categorization and also indicate active courtesy or aggression scenarios.

Driving Scenarios Selection for Vignette Study For the next study, where the contribution of different factors in driving courtesy and aggression will be quantified through a vignette survey, two types of scenarios were necessary to create the vignette stories: 1) active aggression and 2) active courtesy driving. Only active type of aggression and courtesy were selected because most of the participants referred to the active type when they discussed their real-life examples of courtesy and aggression. In addition, only aggression to an individual driver (AID) and courtesy to an individual driver (CID) type scenarios were considered. There were two reasons behind only selecting CID and AID type scenarios: 1) The vignette study was conducted to create the foundation for the final feasibility study which would assess the benefit of driver-to-driver communication (between individual drivers, not general road users) through CVS technology; and 2) The literature review indicated that it is better to present direct provocation to the participants as a measure of aggression when self-reported data are used to quantify the aggression (Ellison-Potter, Bell, & Deffenbacher, 2001).

For the two CID-type scenarios, the most common and important scenarios as measured by the cumulative rating scores in Table 6 were selected to be used as vignette stories in the vignette-survey study in which participants would have the chance to show active courtesy or passive aggression on the road.

However, among the AID-type driving scenarios, the third and fifth ranked scenarios (measured by the average rating scores in Table 7) were selected to use in the vignette-survey study in which participants would be exposed to a situation which could potentially elicit active aggression or passive courtesy. The other AID situations among the top 5 were not selected due to the complexity that would arise in producing the video vignette for the third study. It was important to assess the feasibility of presenting the scenarios through video vignette, because the plan was to use the same vignette stories in both the second and third studies. The selected driving scenarios are listed in Table 8 below:

Table 8: Selected driving scenarios for use in the next studies

Scenarios	Scenario Category
Allowing a driver in close proximity to change lanes after seeing his/ her turn signal	Active courtesy to individual driver
Slowing down or stopping for a driver who is attempting to pull out from on-street parking	Active courtesy to individual driver
When someone is driving slower than the permitted limit, trying to push him / her to speed up	Active aggression to individual driver
Tailgating a driver who is in the left lane at the regulated speed limit in order to intimidate that driver to move into the right lane	Active aggression to individual driver

Identified Factors

While analyzing the factors that influence driving behavior (courtesy, or aggression, or both), the factors were classified into two categories, situational and non-situational. Since the focus of the research was the situational factors, the identified non-

situational factors were not considered while aggregating the results from the three different focus groups regarding factors of aggressive and courteous driving behavior. The list of situational factors that could affect driving behavior (courtesy, or aggression, or both) is presented in Table 9 below:

Table 9: Situational factors that could affect driving behavior

Factor	Description	Supporting Comments from Participants (not exactly quoted, unnecessary words removed)
Behavior of other drivers / previous experience +++	Behavior of other drivers on the road influences one's own driving behavior. Aggressive behavior from other drivers leads drivers to aggression. On the other hand, if someone gets respect and courteous behavior from others, it helps the person to be courteous.	• *If you are being constantly respected by other drivers and people are nice to each other, it helps you to be courteous** • *I think they are being aggressive and I am being passive aggressive* - (describing the reaction about the drivers who wave between lanes frequently*)*^ • *Because I've been in their position where I had to change lanes in traffic and I want to pay them same respect that I got from someone.** • *I will say like, when someone lets you in or something like that, I always get so happy like, "Oh! Thank you so much" and I just want to spread the joy out to the world!** • *When I see someone is using a cell phone, I get really pissed.*^ • *If I have to get there in a limited amount of time, and nobody is letting me through, then I think I would be a more aggressive driver in that moment.*^ • *I think it also depends on what the other people on the road are doing. If somebody lets you in, you're more likely to let someone else in. But if somebody cuts you off, then it's like everyone is for themselves.*^*
Identity of other driver and their needs	According to the participants, if they know the exact need (and urgency) and the identity of other drivers, their reaction to those drivers may change.	• *If it's an emergency and they let me know that, then yeah! But if they're being rude and just don't want to wait in line…no!* ^*– (When explaining in what situation they allow others merge into the compact lane). • *I feel like if it was that situation where everyone is waiting their turn in line, and there was a guy saying "My wife's in labor!" I would just say go.**
Passengers in car	Passengers can also influence driving behavior.	• *So like if you're driving by yourself and just chilling to music, if everything else is good, you're probably going to be courteous and let people merge. If like you have friends in the car and you're talking and laughing and you're not always looking forward…** • *It's the opposite too, if you have a baby in the car. Small children, screaming or fighting… it can be very stressful.*^
Sense of urgency and	A sense of urgency and rushing leads people from being	• *You are in hurry. You want to get home when you are done with work* - (describing the cause behind aggressive behavior).^

Table 9 Continued

rushing+++	courteous to being aggressive.	• *Apart from frustration, people not feeling rushed. So probably time, time is an issue-* (asked to assume the cause behind being courteous).^ • *I move back and let them in because I'm not in hurry –* (describing own courteousness to other drivers on the road).*
Time of day++	Aggressiveness depends on the time of the day. People are more aggressive in the evening when they are returning home after work.	• *It was like 5:25 PM, I was coming back from work… –* (describing a situation where the commenter was being tailgated by another driver who honked at him and he did not change speed or let the other driver pass due to frustration).^ • *And a lot of people are coming from the (oil) field and they are tired. And they are not really paying any attention.*^
Traffic congestion +++	People tend to be aggressive when there is traffic congestion on the road and courteous when not.	• *I think that traffic plays a really big role in courtesy driving.** • *When there were cars backed up and waiting for a long period of time-* (describing an aggressive driving scenario).^ • *I was waiting there (in a roundabout) for a long time, and at some point, I pushed into traffic.*^

*Comments from participants which indicates the factor that could have an effect on driving courtesy
^Comments from participants which indicates the factor that could have an effect on driving aggression
++Factors identified in two focus groups +++ Factors identified in three focus groups

Participants indicated that all the situational factors listed above except *Time of day* could have an effect on both driving courtesy and aggression. *Sense of urgency and rushing* and *Traffic congestion* were also identified in the literature as factors of aggressive driving, but in the focus groups, participants indicated their effect on courteous driving as well. The factor *Identity of other driver and their needs* strongly suggests the importance of communication between drivers on the road. *Passengers in car* was also identified as a factor that could play a role in driving behavior. The most common factor, which was mentioned by many participants of all three focus groups was *Behavior of other drivers / recent driving experience*. Participants indicated that this factor could have an effect on both courteous driving as well as aggressive driving.

Factor Selection for Vignette Study For the next study, where the contribution of different factors in driving courtesy and aggression would be quantified, Self-identity (with two dimensions: anonymous and identifiable) and Group affiliation (with two dimensions: in- and out-group) were selected. These two factors were selected because they were identified in the literature review as the factors which could potentially have the most effect on both courteous and aggressive driving (more discussion on selecting those factors can be found in 'Introduction to Vignette Survey' section). Besides these two factors, a search for additional situational factors that could have an effect on driving behavior was conducted in the focus group study. As a result of this search, a list of situational factors (presented in Table 9) was created. Among the all factors, the most common factor that was identified in all three focus group sessions was Behavior of other drivers / recent driving experience. The effect of this factor on driving courtesy could be explained by the norm of social reciprocity. This social norm directs the individual to return the favors, goods, and services that they receive from others (Smith & Mackie, 2007). The effect of the same factor on driving aggression could be explained by the displaced aggression model which describes the phenomenon in which people express their aggression to some other person or object because they could not take out their aggression on the source (Dollard, Miller, Doob, Mowrer, & Sears, 1939). Since many participants talked about their mood change due to recent driving experiences with other drivers on the road, recent driving experience was taken from the focus group study to test its effect on driving courtesy and aggression through the vignette survey.

Result Summary

The focus groups were designed and conducted with two objectives in mind. The first one was to identify some common and important (in terms of their consequences in traffic safety) scenarios in which drivers show courtesy on the road in order to get a common understanding of how drivers perceive driving courtesy. Though many drivers indicated active courtesy as their example of courtesy driving, some also indicated passive courtesy. A common understanding of driving aggression was also achieved in a similar way. Participants indicated both active and passive aggression while describing driving aggression scenarios. The second objective was to identify any additional situational factors that influence the behavior (aggressive, or courteous, or both) of drivers on the road. Self-identity and Group affiliation had already been identified and selected from the literature review. Recent driving experience was identified as the most prominent factor among the other factors identified in the focus groups and was selected to be used in Study 2 (Vignette Study).

CHAPTER-4

STUDY 2 (VIGNETTE SURVEYS)

Which situational factors have significant influence on driving aggression and courtesy?

Study 2 (Vignette Surveys) was conducted to answer the second research question: Which situational factors have significant influence on driving aggression and courtesy? This study examined the significance of three potential factors which could affect the courteous and aggressive behavior of drivers on the road.

The most common factor discovered through the extensive literature review on driving aggression was *self-identity* (Jenness, 2007; Ellison-Potter, Bell, & Deffenbacher, 2001) which is also referred to in literature as anonymity. However, no one has tested the significance of this factor in driving courtesy.

The literature on social psychology indicated that *group affiliation* plays a role in courtesy and could therefore be studied with regards to the behavior of drivers. Research also identified the effect of common group information in reducing aggression (Mitrevska, Castronovo, Mahr, & Müller, 2012) which is comparable to the factor *group affiliation.*

The last situational factor was identified in the focus groups. Participants of all three focus group indicated that their driving behavior is highly influenced by their *recent driving experience,* specifically their experience interacting with the behavior of other drivers on the road.

Therefore, this experiment considered three factors, each factor having two dimensions: 1) *self-identity* (anonymous or identifiable), 2) *group affiliation* (in-group favoritism or out-group derogation) and 3) *recent driving experience* (good or bad driving experience).

The significance of each factor was examined in two types of scenarios which had been identified in the focus group study: 1) The first was labeled as 'courtesy-encouraging' where the participant received an indication from another driver which required a helping action of the participants and hence, participants would potentially show active courtesy to the other driver, and 2) The second was labeled as 'aggression-provoking' where participants received aggressive stimuli or experienced a frustrating event and hence, would potentially show active aggression to the other driver.

'Courtesy-encouraging' scenarios examined the significance of the three identified factors on active courtesy and 'aggression-provoking' scenarios were used to examine the effect of those factors in active aggression. Two different driving situations were used to represent each type of scenario. For example, to examine the significance of the three identified factors in a situation where drivers could potentially show active aggression to the other driver, two different stories were used: 1) the driver encounters a car in front of him / her which is driving at half the permitted speed limit of that road, and 2) the driver is tailgated by another car.

Vignette Survey Study Research Method

Participant Recruitment

As in the first experiment, all prospective participants for this experiment had to have a valid US driver's license and be between 18 to 60 years of age to be allowed to participate. Participants were recruited by making announcements in two classes of the department of Mechanical & Industrial Engineering, Montana State University, as well as on the internet, through Facebook® groups and Craigslist®, and also by personal communication. There was $5 compensation for the participants. Persons who had participated in the previous experiment were not allowed to participate in this study.

Participants Sample A total of 35 adult drivers, 24 males and 11 females with valid driver's licenses and within the age range of 18-38, participated in this experiment. The majority (94.3%) of the participants were within the age range of 18-31 years. The participants had 6.12 years of driving experience on average (median 5.0 years). The average daily driving experience of the participants was 0.99 hour (median 1.0 hour). All the participants were residents of the town of Bozeman, Montana, and its surrounding areas.

Vignette Design

The vignette surveys were designed to collect data on the behavioral responses of participants. In addition, the survey also collected data on their emotional responses to the vignettes. The following four stories were used to create two types of scenarios:

1. Courtesy-encouraging:

Scenarios identified in Study 1 in which the driver will potentially show active courtesy to the other driver

a. Signaling car from on-street parking

Suppose you are driving your car on a busy two-lane roadway with double solid yellow lines (where passing is prohibited). As you drive, you see a car in front of you which is attempting to pull out from on-street parking.

b. Signaling car from a nearby lane

Suppose you are driving your car on a busy, multi-lane roadway. As you drive, you see that a car in close proximity to your car is signaling and trying to get into your lane.

2. Aggression-provoking:

Scenarios identified in Study 1 in which the driver will potentially show active aggression to the other driver

a. Tailgating car

Suppose you are driving your car on a busy, multi-lane roadway. You are going at the regulated speed limit, but through the rear view mirror of your car, you notice that a car is tailgating you.

b. Slow car

Suppose you are driving your car on a two-lane roadway with double solid yellow lines (where passing is prohibited). As you drive, you encounter a car in front of you which is driving at half the permitted speed limit of that road.

As mentioned before, courtesy-encouraging scenarios were used in identifying the effect of the selected explanatory factors in driving courtesy, and aggression-provoking scenarios were used to identify the effects of the factors in driving aggression. All four scenarios were followed by a set of (2×2×2) conditions in which the dimensions of the

vignette were varied. The explanatory factors and the associated dimensions are described in Table 10.

Table 10: Factors and dimensions of the vignette survey

Factor	Dimension	Text used in the vignette as an example of the dimension
Recent driving experience	Good experience	*Just a few minutes ago… another driver slowed down for you to switch lanes*
	Bad experience	*Just a few minutes ago… another driver honked at you for no good reason*
Group affiliation	In-group	*…the car… has a bumper sticker of your favorite football team*
	Out-group	*…the car… has a bumper of the main rival of your favorite football team*
Self-identity	Anonymous	*Your car has tinted windows and you are driving in a new town, so you know you are anonymous on the road.*
	Identifiable	*Your car has clear windows and you are driving in your own town, so you know you can be easily identified*

An example of a first courtesy-encouraging scenario (signaling car from on-street parking) is presented in Figure 4, with the underlined sections indicating dimensions that were varied. Arrows indicate other dimensions that were used to vary the vignette conditions.

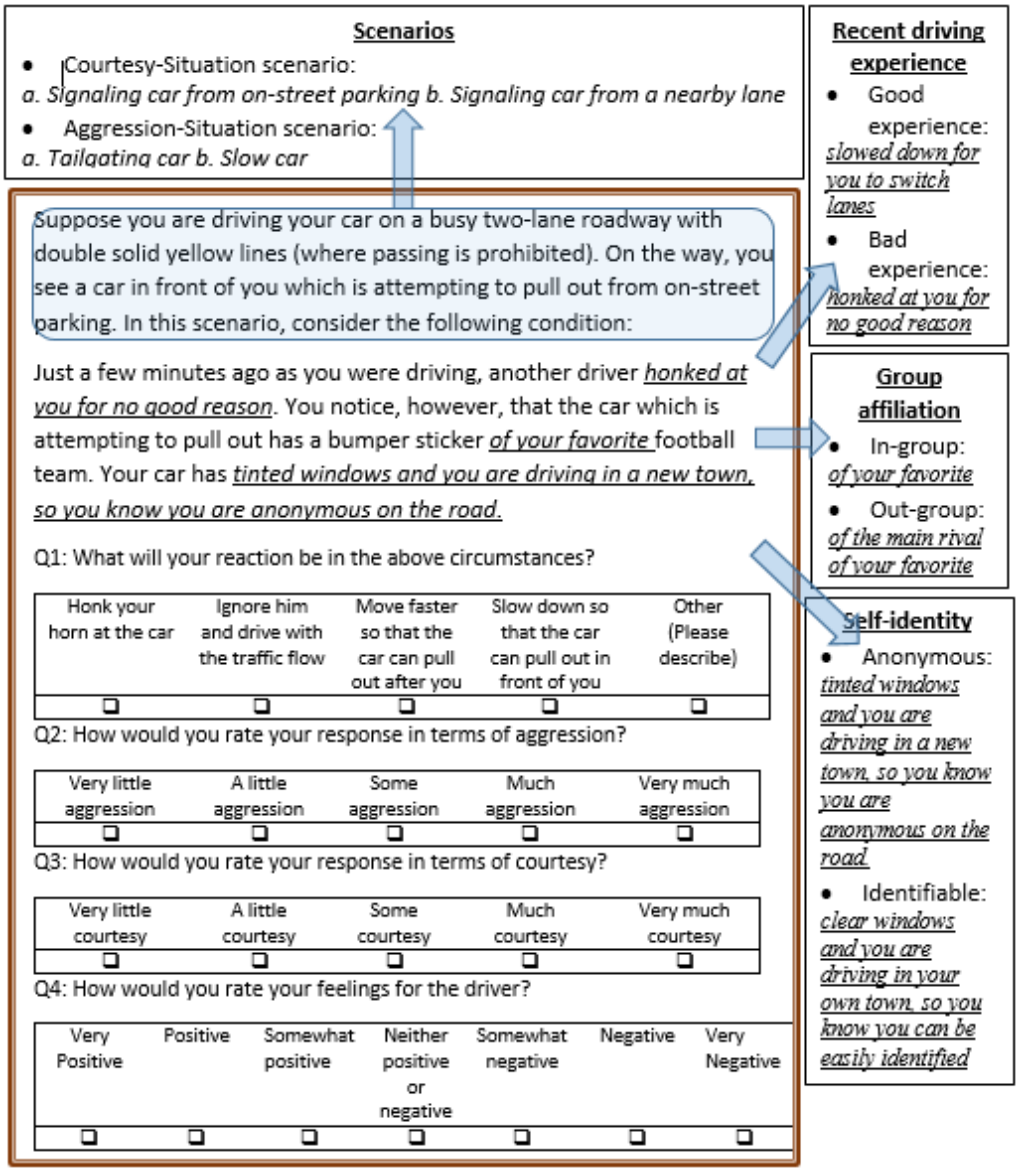

Figure 4: Vignette example with all dimensions of the three explanatory factors

Figure 4 also shows all four questions that were asked in each vignette condition. The first question in the vignette addressed the behavioral response to the vignette. There were four answer options to answer the first question along with an additional open-ended option, as seen below.

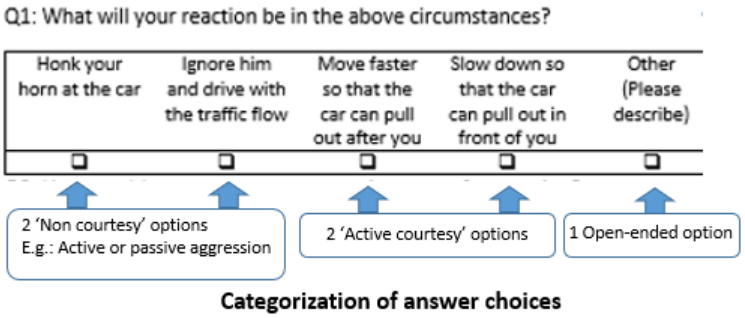

Figure 5: Example of answer choices of first question with categorization

As shown in Figure 5 above, for the courtesy-encouraging scenario there are two options that represent active courtesy response and other two options which represent non- courtesy. The categorization was done by the researcher and not presented in the survey form provided to the participants. Similarly, in aggression-provoking scenarios, two active aggression options and two non-aggression options were provided. An open-ended option is provided in both types of scenarios for answering the first question if the participant has a response which does not fall under the available choices. In that case, the researcher selected the category based on the response. That means, though participants had a total of five options, responses were put in two categories, either 'active courtesy' or 'non-courtesy' in courtesy-encouraging scenarios and either 'active aggression' or 'non-aggression' in aggression-provoking scenarios.

The second and third questions in the survey are presented to collect a self-evaluation from the participants in order to confirm the researcher's interpretation of the behavior. Answer choices for these two questions are identical for all four scenarios. The second question asked the participants: "*How would you rate your response in terms of aggression?*" The answer choices were on a 5-point Likert aggression scale: *1) very little*

aggression, 2) a little aggression, 3) some aggression, 4) much aggression, and 5) very much aggression. The third question similarly addressed courtesy: "*How would you rate your response in terms of courtesy?*" The answer choices were presented on a courtesy scale: *1) very little courtesy, 2) a little courtesy, 3) some courtesy, 4) much courtesy, and 5) very much courtesy.*

The last question for each vignette was presented to learn about the emotional response to the other driver. This additional question asked the participants: "*How would you rate your feelings for the driver?"* In order to allow the participants more variation in their emotional responses, a 7-point Likert scale was used: *1) very positive, 2) positive, 3) somewhat positive, 4) neither positive nor negative, 5) somewhat negative, 6) negative, 7) very negative*.

The entire survey instrument was developed in three stages. The survey questionnaire was pilot-tested and revised for clarity and a range of responses. The final version of the vignette survey questionnaire is presented in Appendix E.

Procedure

First, an IRB-approved consent form (Appendix B) was used to inform the participants about the purpose of the research and any risks or discomforts as well as benefits related to participation. Participants were informed about the privacy policy, that no individual characteristics would be identified and reported. A clause stating that their participation was voluntary and participation or non-participation would not affect them in any way was also included. Next, demographic data was collected using a standard demographic questionnaire (Appendix D) which was used for the other experiments as

well. Finally, the paper-based vignette survey was given to the participants to collect their responses. The experiment was conducted on the campus of Montana State University-Bozeman. There was not one fixed time for conducting the experiment; each participant and the researcher mutually set up a convenient meeting time to conduct the survey.

Results of Vignette Survey Study

Data Analysis

Logistic regression is commonly used to model the relationship between a categorical response variable and one or more explanatory (a.k.a. independent) variable/s (Stokes, Davis, & Koch, 1995). The response variable may be dichotomous (binary type response, e.g. yes or no) or polytomous (more than two response levels). As stated earlier the responses to the first question were dichotomized into two categories, active courtesy or non-courtesy in courtesy-encouraging scenarios and active aggression or non-aggression in aggression-provoking scenarios. So the repeated measure binomial logistic regression model was used to analyze the data from the responses of the first question. All other questions of the survey had polytomous (a.k.a. multinomial) response variables, so the ordinal multinomial logistic regression model was used for all other questions. Both of the logistic regression models (binomial and ordinal multinomial) assume that the dependent variables are independent of each other.

In the data analysis no interactions of explanatory variables were considered. Data analysis was done by SAS® Studio, the cloud-based, free, online version of the SAS statistical software. Table 11 summarizes the response variables for all questions asked in each of the vignettes.

Table 11: List of response variables for all vignette questions

Question Number	Response / Dependent Variables	Response / Dependent Variable Type
1	Active (aggression / courtesy)* Non- (aggression / courtesy)*	Binary (2-level) dichotomous
2	Very little aggression A little aggression Some aggression Much aggression Very much aggression	Ordinal (5-level) polytomous
3	Very little courtesy A little courtesy Some courtesy Much courtesy Very much courtesy	Ordinal (5-level) polytomous
4	Very positive Positive Somewhat positive Neither positive or negative Somewhat negative Negative Very negative	Ordinal (7-level) polytomous

* Active aggression or non-aggression in aggression-provoking scenarios, and active courtesy or non-courtesy in courtesy-encouraging scenarios

Behavioral Response of the Participants

As the effect of three potential factors in courtesy and aggression were examined in courtesy-encouraging and aggression-provoking scenarios respectively, the results are presented separately one by one as below:

Behavioral Response in Courtesy-encouraging Scenarios The binomial logistic regression was used to predict the effect of three explanatory factors on active courtesy in behavioral response through two courtesy-encouraging scenarios. Results of the data analysis are presented in the table below:

Table 12: Predicting active courtesy in behavioral response

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group						
	In-group	2.0057	0.3196	1.3793	2.6321	6.28	<.0001
Recent driving experience	Bad-experience						
	Good-experience	1.7331	0.2923	1.1603	2.3059	5.93	<.0001
Self-identity	Anonymous						
	Identifiable	1.108	0.2439	0.6299	1.586	4.54	<.0001
Courtesy-encouraging Scenario	On-street parking						
	Nearby lane	0.6616	0.2282	0.2144	1.1088	2.9	0.0037
Modeling the probability that response = active courtesy							

From the above table, it can be stated that, at a significance level of alpha $\alpha = 0.05$, *group affiliation* ($p<0.0001$), *recent driving experience* ($p<0.0001$) and *self-identity* ($p<0.0001$) are statistically significant predictors of behavioral response to other drivers on the road. That means with the information of *group affiliation, recent driving experience, and self-identity* it is possible to predict the change in behavioral reactions as measured with different levels of it (here, either active courtesy or non-courtesy). We can estimate that the odds of behaving 'active courteously' increase by a factor of $e^{2.0057} = 7.43$ (95% confidence interval range: 3.97 to 13.90) from *out-group* to *in-group,* $e^{1.7331} = 5.66$ (95% confidence interval range: 3.19 to 10.03) from a *recent bad driving experience* to a *recent good driving experience,* and $e^{1.108} = 3.03$ (95% confidence interval range: 1.88 to 4.88) from an *anonymous* to *identifiable* condition. In other words, if the condition changes from an *out-group* to *in-group* situation, the probability of behaving with active courtesy increases. Now, in order to understand a multiplicative change in odds, we consider an example. Suppose there is a scenario where it is expected that subjects act active courteously 30% of the time. In other words, for every 100 events, we expect about

30 active courteous actions and 70 non-courteous actions. Thus, we would say the odds of behaving active courteously are 30/70 = 0.428. Now, if we change the scenario from out-group to in-group, we expect the odds to increase by a multiplicative factor of 5.66. This means we now expect the odds of acting courteous to be 0.428*5.66 = 2.426 which corresponds to a probability of 2.426 / (1 + 2.426) = 0.708 or 70.8%. The results regarding other factors can be interpreted in similar way.

In addition to that, we see that type of scenario (courtesy-encouraging) was also a significant predictor (p= 0.0037) of active courtesy behavioral response to the other driver.

Behavioral Response in Aggression-provoking Scenarios Similar to active courtesy, the binomial logistic regression was also used to predict the effect of three explanatory factors on active aggression in behavioral response through two aggression-provoking scenarios. Results of the data analysis is presented in the table below:

Table 13: Predicting active aggression in behavioral response

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group	1.8765	0.3158	1.2576	2.4954	5.94	<.0001
	In-group						
Recent driving experience	Bad-experience	1.4692	0.2977	0.8856	2.0527	4.93	<.0001
	Good-experience						
Self-identity	Anonymous	0.9649	0.22	0.5337	1.396	4.39	<.0001
	Identifiable						
Aggression-provoking Scenario	Slow car	0.2746	0.3692	-0.4489	0.9981	0.74	0.457
	Tailgating car						
Modeling the probability that response = active aggression							

From the above table, it can be stated that, at a significance level of alpha $\alpha = 0.05$, *group affiliation* ($p<0.0001$), *recent driving experience* ($p<0.0001$) and *self-identity* ($p<0.0001$) are statistically significant predictors of behavioral response to other drivers on the road. We also estimate that the odds of behaving 'active aggressively' increase by a factor of $e^{1.8765} = 6.53$ (95% confidence interval range: 3.51 to 12.12) from *in-group* to *out-group*, $e^{1.4692} = 4.35$ (95% confidence interval range: 2.42 to 7.79) from a *recent good* to a *recent bad driving experience*, and $e^{0.9649} = 2.62$ (95% confidence interval range: 1.71 to 4.04) from *identifiable* to *anonymous* condition.

Unlike the courtesy-encouraging scenario, aggression-provoking scenario type was not a significant predictor ($p = 0.457$) of active aggression type behavioral response to the other driver.

Next we looked at the emotional response of the participants to the other driver.

Emotional Response of the Participants

After the first question, the fourth question was the second most important since it asked the participants about their feelings toward the other driver. The ordinal multinomial logistic regression analysis was conducted to predict the emotional response using *group affiliation*, *recent driving experience* and *self-identity* as predictors. *Scenario type* was also included in the model. First we looked at the emotional response in courtesy-encouraging scenarios.

Emotional Response in Courtesy-encouraging Scenarios Results regarding the emotional responses to the other driver in courtesy-encouraging scenarios are presented in the table below:

Table 14: Predicting positive emotional response in courtesy-encouraging scenarios

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group						
	In-group	1.992	0.3364	1.3326	2.6514	5.92	<.0001
Recent driving experience	Bad-experience						
	Good-experience	0.949	0.1835	0.5894	1.3086	5.17	<.0001
Self-identity	Anonymous						
	Identifiable	0.1583	0.1163	-0.0697	0.3863	1.36	0.1736
Courtesy-encouraging Scenario	Nearby lane						
	On-street parking	0.1594	0.1280	-0.0915	0.4104	1.25	0.2131
Modeling the probability of emotional response towards 'very positive'							

From the above table, it can be stated that, at a significance level of alpha $\alpha = 0.05$, *group affiliation* ($p<0.0001$) and *recent driving experience* ($p<0.0001$) are statistically significant predictors of emotional response to other drivers on the road. We can estimate that the odds of feeling 'very positively' increase by a factor of $e^{1.992} = 7.33$ (95% confidence interval range: 3.97 to 14.17) from *out-group* to *in-group* and $e^{0.949} = 2.58$ (95% confidence interval range: 1.8 to 3.7) from a *recent bad driving experience* to a *recent good driving experience.*

Self-identity ($p= 0.173$) was not identified as a significant predictor of emotional response to other drivers on the road. *Type of scenario* (courtesy-encouraging) was also not a significant predictor ($p= 0.2131$) of emotional response.

Emotional Response in Aggression-provoking Scenarios Results regarding the emotional responses to the other driver in aggression-provoking scenarios are presented in the table below:

Table 15: Predicting negative emotional response in aggression-provoking scenarios

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group	1.8325	0.2746	1.2942	2.3707	6.67	<.0001
	In-group						
Recent driving experience	Bad-experience	0.8115	0.1514	0.5149	1.1082	5.36	<.0001
	Good-experience						
Self-identity	Anonymous	0.1453	0.0768	-0.0052	0.2958	1.89	0.0584
	Identifiable						
Aggression-provoking Scenario	Slow car	-0.2047	0.2068	-0.6101	0.2006	-0.99	0.3222
	Tailgating car						
Modeling the probability of emotional response towards 'very negative'							

From the above table, it can be stated that at a significance level of alpha $\alpha = 0.05$, *group affiliation* ($p<0.0001$) and *recent driving experience* ($p<0.0001$) are statistically significant predictors of emotional response to other drivers on the road. We can estimate that the odds of feeling 'very negatively' increase by a factor of $e^{1.8325} = 6.25$ (95% confidence interval range: 3.65 to 10.71) from *in-group* to *out-group,* and $e^{0.8115} = 2.25$ (95% confidence interval range: 1.67 to 3.03) from a *recent good* to a *recent bad driving experience*.

Similar to courtesy-encouraging scenarios, *self-identity* ($p= 0.0584$) was not identified as a significant predictor of emotional response to other drivers on the road. Type of scenario (aggression-provoking) was also not a significant predictor ($p= 0.3222$) of emotional response.

Self-evaluation of Behavior by the Participants

As mentioned before, self-evaluation of behavior was taken from the participants on two different scales of aggression and courtesy. These two additional questions were presented to see how they interpreted their own reported behavior on two different scales.

Results indicated that in both courtesy-encouraging and aggression-provoking scenarios participants did not interpret their own reported behavior exactly similar on two different scales. The correlation between the responses on the scales of aggression and courtesy were identified as "-0.70" and "-0.67" in courtesy-encouraging and aggression-provoking scenarios respectively.

As the self-evaluation of their own behavior was taken on a 5-point Likert aggression scale with the options 1) *very little aggression*, 2) *a little aggression*, 3) *some aggression*, 4) *much aggression*, and 5) *very much aggression*, while analyzing the data a score from 1 to 5 was given to each options sequentially. So, *very little aggression* was given score 1 and *a little aggression* was given the score 2 and so on. Similarly, on the courtesy scale *very little courtesy* was given the score 1, *a little courtesy* was given 2 and so on. The correlations among the two scales were calculated with those scores based on the response from the participants. The descriptive statistics based on that score for both scales are presented in the table below:

Table 16: Mean scores of aggressive and curtesy scales

Parameter		Aggression Scale Mean Score *M*, 95% CI	Courtesy Scale Mean Score *M*, (95% CI)
Group affiliation	Out-group	2.23, 95% CI [2.13, 2.33]	2.37, 95% CI [2.26, 2.47]
	In-group	1.54, 95% CI [1.46, 1.61]	3.12, 95% CI [3.02, 3.21]
Recent driving experience	Bad-experience	2.19, 95% CI [2.09, 2.29]	2.39, 95% CI [2.28, 2.49]
	Good-experience	1.58, 95% CI [1.5, 1.65]	3.1, 95% CI [3, 3.2]
Self-identity	Anonymous	2.02, 95% CI [1.93, 2.11]	2.55, 95% CI [2.44, 2.66]
	Identifiable	1.75, 95% CI [1.66, 1.84]	2.94, 95% CI [2.83, 3.04]
Scenario Type	Aggression-provoking	2.00, 95% CI [1.91, 2.1]	2.76, 95% CI [2.65, 2.87]
	Courtesy-encouraging	1.77, 95% CI [1.68, 1.85]	2.73, 95% CI [2.63, 2.83]

Result Summary

All three factors (*group affiliation*, *recent driving experience* and *self-identity*) were identified as significant predictor of active aggression and courtesy. Therefore, it can be inferred that the positive dimensions of the factors (i.e. in-group, being identifiable, good driving experience) can be used both in reducing aggression and promoting courtesy. However, it was found that all three factors had a greater effect in promoting courtesy than reducing aggression. Although *self-identity* had a significant effect on the behavioral response to other drivers, it did not have a significant effect on the feelings of the participants towards other drivers on the road. This result indicates that the behavioral change due to the effect of *self-identity* is not caused by any change of feelings for the other driver. The motivation behind behavioral change is not the driver's feeling about the other driver but something else. Though the study did not attempt to identify the potential cause behind the behavioral change, it was anticipated that one's own reputation motivates him/her to behave with active courtesy or aggression when he/she is identifiable or anonymous on the road.

CHAPTER-5

STUDY 3 (FEASIBILITY STUDY)

Can CVS or similar technologies be used to increase driving courtesy and reduce aggression on the road by providing the opportunity to share social information?

The literature review and focus group study showed anonymity to be a very significant factor in aggression. The focus group study also suggested that being identifiable might have an effect in promoting courtesy as well. The vignette study showed group affiliation to be the most dominant factor in reducing aggression and promoting courtesy. So the third study predicted that sharing social information with other drivers on the road by using CVS or similar technologies would reduce anonymity and allow in-group affiliation to be revealed, and thereby reduce aggression and promote courtesy on the road.

The results of the second study indicate that the factor *group affiliation* has a significant effect on both active aggression and active courtesy, even larger than the magnitude of the effect of *self-identity*. Therefore, presenting out-group information in identifiable conditions might dispel the effect of *self-identity.* On the other hand, presenting in-group information in identifiable conditions should escalate the effect. Therefore, the third study was designed to identify the effect of *group affiliation* in identifiable conditions which will answer the question: "Can CVS or similar technology be used to increase driving courtesy and reduce aggression on the road by providing the opportunity to share social information?"

Feasibility Study Research Method

Study 3 utilized the same four driving scenarios from the second study, but used only in- and out-group factors as independent variables. The scenarios were created by the researcher and his associates on the roads of the town of Bozeman, MT and recorded with a camera to create video vignettes. The entire method followed to attain the desired objectives is described in the following sections:

Participant Recruitment

Like the first and second studies, all prospective participants of this experiment had to have a valid US driver's license, be between 18 to 60 years of age and identify themselves as 'Bobcat' (Montana State University) football fans to be allowed to participate. Participants were recruited by making announcements in several classes of the department of Mechanical & Industrial Engineering at Montana State University, as well as on the internet, through Facebook® groups and Craigslist®, and also through personal communication. Participants were offered $10 compensation. Persons who had participated in either of the previous experiments were not allowed to participate in this study. Participants were recruited from the city of Bozeman and its nearby areas.

Participant Sample A total of 20 adult drivers, 16 males and 4 females with valid driver's licenses and within the age range of 18-31, participated in this experiment. Among the 20 participants, 13 were within the age range of 18-24 years. The remaining 7 participants were between 25-31 years of age. The participants had 6.9 years of driving experience on average (median 6.0 years). The average daily driving experience of the participants was 1.1 hour (median 1.0 hour). All the participants were residents of the town of Bozeman, MT and its surrounding areas. Only fans of the Bobcat football team were recruited for this study. To measure how the participants identify their fellow Bobcat fans and how much they see themselves belonging to the Bobcat group, two questions were asked along with a 7-point Likert scale response as presented in Table 17 below:

Table 17: Group affiliation assessment question and answer options

Q1: How much do you identify your fellows at MSU Bobcat Football Team?						
Not Very Much			Neutral			Very Much
1 ❑	2 ❑	3 ❑	4 ❑	5 ❑	6 ❑	7 ❑
Q2: How much do you see yourself belonging to the group – MSU Bobcat Football Team?						
Not Very Much			Neutral			Very Much
1 ❑	2 ❑	3 ❑	4 ❑	5 ❑	6 ❑	7 ❑

The average score of all 20 participants for identifying fellow Bobcats was 5.4 (*median* 5), and for a sense of belonging, the average was 6.1 (*median* 6). These results can be generalized with the statement that participants do identify with fellow Bobcat fans on the road, and they do have the perception of belonging to the group, the 'Bobcats'.

Feasibility Study Design

The four scenarios that were used to create vignettes in the second study were replicated and video recorded on different roads of the town of Bozeman, MT. As all of the participants were residents of the area, it was expected that they would be familiar with the traffic and the type of roads used in the video vignette. The reason behind using participants from the same area as that used for the video vignettes is, the familiar roads and traffic conditions would help the participants to imagine themselves in those situations easily since they use such roads in their regular, natural driving.

As only fans of the 'Bobcat' football team were recruited as participants, the identification of other drivers as 'Bobcat' fans was used to present 'in-group social identity'. In contrast, the 'Grizzlies' (University of Montana) are the main rival of the Bobcat team. So, identification as a 'Grizzlies' fan was used as 'out-group social identity'. Commercial logos of both teams were presented in the recorded video on top of the car of the other driver in the fashion of Head-up Display (HUD) as showed Figure 6:

* The full video can be found at: https://www.youtube.com/watch?v=JE0MVfsOh9k

Figure 6: Presenting of group affiliation information in the fashion of HUD

The survey instrument of this study was identical to the previous study. The only change was in the method of scenario presentation and the factors used as independent variables. Scenarios were presented with a video instead of a written vignette, and only '*in-group*' and '*out-group*' denotations were considered explanatory variables. Similar to the second study, there were a total of four stories with two types of scenarios, namely 'courtesy-encouraging' and 'aggressive-situations,' and participants had to answer four questions for each scenario. The factors and dimensions of this experiment are presented in Table 17:

Table 18: Factors and dimensions of the feasibility study

Factor	Dimension	Expression of dimension used in the video vignette of semi-naturalistic study
Group affiliation	In-group	Bobcat logo shown on top of the other car in HUD
	Out-group	Grizzlies logo shown on top of the other car in HUD

Procedure

Participants gave their consent through an IRB-approved consent form (Appendix C) prior to starting the experiment. Risks or discomforts, as well as benefits related to participation, and compensation for the participants were described on the consent form, along with a brief statement of the purpose of the research. Participants were informed about the privacy policy, that no individual characteristics would be identified and reported. A clause stating that their participation was voluntary and participation or non-participation would not affect them in any way was also included.

Participants were introduced to the HUD and CVS technology in a simple, non-technical, descriptive manner soon after signing the IRB-approved consent form and filling out a demographic questionnaire. The introduction to the technology and the instructions were given in the video with the following words:

> *Imagine you are driving your car which is equipped with a new type of communication technology. This technology lets you see and share social information, such as is found on Facebook, with other drivers. This technology presents the social information about other drivers on top of their cars and uses a special display embedded in your windshield. Now, please consider yourself in the following scenarios and answer the questions carefully.*

After the introduction video, a brief description of the scenarios to be shown was presented on the video. For example, the first courtesy-encouraging scenario was introduced with the following sentence: "*Suppose you are driving your car and on the way, you see a car in front of you which is attempting to pullout from on-street parking"*. The scenarios were then presented one by one in random order. Soon after completing each scenario, the video was paused and participants answered the questions regarding the scenario on a printed questionnaire similar to the four questions presented in Figure 4.

As mentioned earlier, in this experiment only *group affiliation* factors (*in-* or *out-group*) were used. For the four stories, there were a total of 4×2 = 8 scenarios for each participant. The order of presenting *in-* and *out-group* information was randomly assigned.

The experiment was conducted on the campus of Montana State University-Bozeman. There was not one fixed time for conducting the experiment; each participant and the researcher mutually set up a convenient meeting time to conduct the survey.

Results of the Feasibility Study

Data Analysis

Similar to the second study, data was analyzed with the repeated measure logistic regression model. Responses to the first question were analyzed using the binomial logistic regression model and all others with the multinomial ordinal logistic regression model.

Behavioral Response of the Participants

Similar to the second study, the effect of *group-affiliation* in courtesy and aggression were examined in courtesy-encouraging and aggression-provoking scenarios respectively.

Behavioral Response in Courtesy-encouraging Scenarios The binomial logistic regression was used to predict the effect of group-affiliation on active courtesy in behavioral response through two courtesy-encouraging scenarios. Results of the data analysis are presented in the table below:

Table 19: Predicting active courtesy in behavioral response in Study-3

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group						
	In-group	1.9424	0.5202	0.9228	2.9620	3.73	0.0002
Courtesy-encouraging Scenario	On-street parking						
	Nearby lane	0.2673	0.4686	-0.6511	1.1856	0.57	0.5684
Modeling the probability that response = active courtesy							

From the above table, it can be stated that, at a significance level of alpha α = 0.05, *group affiliation* (p=0.0002), is a statistically significant predictor of behavioral response to other drivers on the road. We can estimate that the odds of behaving 'active courteously' increase by a factor of $e^{1.9424} = 6.98$ (95% confidence interval range: 2.51 to 19.34) from *out-group* to *in-group* conditions.

Type of scenario (courtesy-encouraging) was not a significant predictor (p= 0.5684) of active courtesy behavioral response towards the other driver.

Behavioral Response in Aggression-provoking Scenarios Similar to active courtesy, the binomial logistic regression was also used to predict the effect of group affiliation on active aggression in behavioral response through two aggression-provoking scenarios presented through video vignettes. Results of the data analysis is presented in the table below:

Table 20: Predicting active aggression in behavioral response in Study-3

Parameter		**Estimate**	**Standard Error**	**95% Confidence Limit**		**Z**	**Pr > |Z|**
Group affiliation	Out-group	3.3380	0.6042	2.1539	4.5222	5.52	<.0001
	In-group						
Aggression -provoking Scenario	Slow car	0.1859	0.7208	-1.2268	1.5987	0.26	0.7965
	Tailgating car						
Modeling the probability that response = active aggression							

From the above table, it can be stated that, at a significance level of alpha α = 0.05, *group affiliation* (p<0.0001) is a statistically significant predictor of behavioral response to other drivers on the road. We also estimate that the odds of behaving with

'active aggression' increase by a factor of $e^{3.338}$= 28.16 (95% confidence interval range: 8.62 to 92.04) from *in-group* to *out-group* condition.

Aggression-provoking scenario type was not a significant predictor (p= 0.7965) of active aggression type behavioral response to the other driver.

Next we looked at the emotional response of the participants to the other driver identified in the feasibility study.

Emotional Response of the Participants

The fourth question asked the participants about their feelings toward the other driver. The ordinal multinomial logistic regression analysis was conducted to predict the emotional response using *group affiliation* as predictors. *Scenario type* was also included in the model. First we looked at the emotional response in courtesy-encouraging scenarios.

Emotional Response in Courtesy-encouraging Scenarios Feasibility study results regarding the emotional responses to the other driver in courtesy-encouraging scenarios are presented in the table below:

Table 21: Predicting positive emotional response in Study-3

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group						
	In-group	2.4065	0.4662	1.4926	3.3203	5.16	<.0001
Courtesy-encouraging Scenario	Nearby lane						
	On-street parking	-0.3895	0.4735	-1.3175	0.5386	-0.82	0.4108
Modeling the probability of emotional response towards 'very positive'							

From the above table, it can be stated that, at a significance level of alpha α = 0.05, *group affiliation* ($p<0.0001$) is a statistically significant predictors of emotional response to other drivers on the road. We can estimate that the odds of feeling 'very positively' increase by a factor of $e^{2.4065} = 11.09$ (95% confidence interval range: 4.45 to 27.66) from *out-group* to *in-group* condition.

Type of scenario (courtesy-encouraging) was also not a significant predictor ($p= 0.4108$) of emotional response.

Emotional Response in Aggression-provoking Scenarios Feasibility study results regarding the emotional responses to the other driver in aggression-provoking scenarios are presented in the table below:

Table 22: Predicting negative emotional response in Study-3

Parameter		Estimate	Standard Error	95% Confidence Limit		Z	Pr > |Z|
Group affiliation	Out-group	2.8448	0.5089	1.8473	3.8423	5.59	<.0001
	In-group						
Aggression -provoking Scenario	Slow car	0.6221	0.3931	-0.1483	1.3925	1.58	0.1135
	Tailgating car						
Modeling the probability of emotional response towards 'very negative'							

From the above table, it can be stated that at a significance level of alpha α = 0.05, *group affiliation* ($p<0.0001$) is a statistically significant predictor of emotional response to other drivers on the road. We can estimate that the odds of feeling 'very negatively' increase by a factor of $e^{2.8448} = 17.19$ (95% confidence interval range: 6.34 to 46.63) from *in-group* to *out-group* condition.

Type of scenario (aggression-provoking) was also not a significant predictor (p= 0.1135) of emotional response.

Self-evaluation of Behavior by the Participants

Similar to Study-2, results regarding self-evaluation of behavior indicated that in both courtesy-encouraging and aggression-provoking scenarios participants did not interpret their own reported behavior exactly similar on two different scales. The correlation between the responses on the scales of aggression and courtesy were identified as "-0.56" and "-0.39" in courtesy-encouraging and aggression-provoking scenarios respectively.

The descriptive statistics based on the score (collected similar to the scoring process of Study-2) for both scales are presented in the table below:

Table 23: Mean score of aggressive and curtesy scales in Study-3

Parameter		**Aggression Scale Mean Score *M*, 95% CI**	**Courtesy Scale Mean Score *M*, 95% CI**
Group affiliation	Out-group	2.25, 95% CI [1.95, 2.55]	1.74, 95% CI [1.53, 1.95]
	In-group	1.18, 95% CI [1.05, 1.3]	2.9, 95% CI [2.65, 3.15]
Scenario Type	Aggression-provoking	1.9, 95% CI [1.61, 2.19]	2.43, 95% CI [2.13, 2.72]
	Courtesy-encouraging	1.53, 95% CI [1.31, 1.74]	2.21, 95% CI [1.98, 2.44]

Result Summary

The results of the data analysis show significant effects for *group affiliation* (*in-group* vs. *out-group*) as presented with a pretend CVS technology. This result was consistent regardless of the two types of situations (aggression-provoking and courtesy-encouraging) that were presented to the participants. So, it can be inferred that *in-group*

social information can be used both in reducing aggression and promoting courtesy. On the other hand, sharing social information with out-group drivers could deteriorate situations. So, the results of this experiment suggest that only sharing common social group identities, instead of indiscriminately sharing social identities with all drivers on the road, will help to reduce aggression and increase courtesy on the road.

In comparing the results from the vignettes with the semi-naturalistic approach, it was found that both studies provided similar results. Though the magnitude of the effect of explanatory factors varied and the results of the semi-naturalistic study were much amplified, both experiments provided results in the same direction. The results of the semi-naturalistic experiments were somewhat more sensitive to the explanatory factors, as was expected, and were not unusual because of using real group affiliation information instead of a general notion. Therefore, it can be concluded that the results of the experiments do not contradict, and in-fact, show similar results.

CHAPTER-6

DISCUSSION AND CONCLUSION

Discussion

As stated before, driving aggression has been identified as the second most common and important issue (after DUIs) in the research arena of road and traffic safety. Most of the researchers who have focused on traffic safety have put their efforts towards understanding road aggression since this is directly related to traffic safety. This research considered exploring problem with a new approach, reducing safety risks on the road not only by reducing aggression but also by promoting courtesy on the road. As the main intention of the research was to get answers to the questions that were asked at beginning of the study, the discussion starts with restating the research questions.

1. What kind of driving situations do people interpret as aggressive or courteous, and what factors are perceived as causing aggressive or courteous driving behavior?
2. Which situational factors have significant influence on driving aggression and courtesy?
3. Can CVS or similar technologies be used to increase driving courtesy and reduce aggression on the road by providing the opportunity to share social information?

Each of the research question was answered separately in three different studies. Therefore, the discussion is presented in the order of those studies as below:

Discussion on the First Study

The first study found that there are many ways in which drivers show courtesy (and also aggression) on the road. By analyzing the scenarios described by the participants of the study, it was determined that drivers mainly express courtesy and aggression in two ways: 1) an expression of aggression or courtesy towards an individual driver, or 2) an expression of aggression or courtesy towards road users in general, which is not directed at an individual. In their real-life examples, participants indicated both active and passive types of courtesy and aggression. However the majority of the participants indicated active types of courtesy, as well as active types of aggression in their examples. So two active types of aggression and two active type of courtesy scenarios were selected from the first study to test the significance of three potential factors in aggression and courtesy respectively.

A second goal of the first study was to look further for additional potential factors beyond those already identified in the literature which have an effect on driving aggression and courtesy. Several situational and non-situational factors were mentioned by the participants. Many factors (e.g., *recent driving experience*, *identity of driver, passengers in car*) were mentioned by the participants that could potentially have an effect on both, driving aggression and courtesy.

The identification of the factor 'recent driving experience' was the second main contribution of this study. '*Recent driving experience*' influences driving mood and hence courtesy and aggression while driving on the road. This factor is important because of its reciprocal nature. For example, with courtesy, receiving courtesy from others results in a good driving experience, and having a good driving experience results in courtesy

towards others. Having a good driving experience also causes drivers to avoid behaving aggressively in their driving. This phenomenon could be explained by the norm of social reciprocity which states that people respond to a positive action with another positive or kind action (Fehr & Gächter, 2000). Participants indicated that this reciprocal nature is also applicable for aggression.

Another point to mention here is that the factor '*recent driving experience*' was identified in all three focus group sessions and was directly and indirectly mentioned by the participants as a cause behind both aggressive and courteous types of driving behaviors. This factor was therefore chosen to be included in the second study.

Discussion on the Second Study

The second study measured the significance of identified the three identified potential situational factors that may have an effect on driver-to-driver courtesy and aggression. Three prominent factors, two that had been identified in the literature review and one from the focus groups, were selected: 1) *group affiliation*, 2) *self-identity*, and 3) *recent driving experience*. The results showed that being identifiable on the road, having a good recent driving experience and identifying the other driver as an in-group member, as opposite opposed to being anonymous, having a bad recent driving experience and identifying the other driver as an out-group member, helped to predict less active aggression as tested in aggression-provoking scenarios and more much active courtesy as tested in courtesy-encouraging scenarios.

Among the all three factors, *group affiliation* was identified as the most dominant factor in reducing aggression and promoting courtesy. The results regarding the effect of

group affiliation on in aggression-provoking scenarios was also in the same direction as consistent with the results of Mitrevska et al. (2012) in which common Facebook® group identity was used to present in-group social information. On the other hand, it was not possible to compare the results regarding *group affiliation* in active courtesy because no other study could be found addressing this. Nevertheless, the findings of this study concerning the role of group affiliation on courtesy was also supported by several social psychology theories (e.g., SIT, SCT and SAT).

It should be noted that the results regarding *group affiliation* might not be applicable in all types of social groups. In this study, social identity as being fans of a football team was used to speculate the effect of the factor *group affiliation* and participants of the study were relatively young. The data collection period was January 18, 2015 to February 20, 2015 and one of the most popular football tournaments, Super Bowl XLIX, was held within that period. Since it can be anticipated that the participants of the study were stimulated with the spirit of football at that time, there is a chance that the results regarding the effect of this factor show an overestimated value.

Recent driving experience was also identified as a significant factor in both active aggression and courtesy. The results regarding exposure to aggression stimuli in the research by Ellison-Potter et al. (2001) support the results of this study in which a bad recent driving experience (comparable to exposure to aggression stimuli in the Ellison-Potter study) was identified as a significant predictor of aggression. Again, although no research was identified that directly supports the effects of a *good recent driving experience* on active courtesy, the norm of social reciprocity discussed in the literature

on social behavior supports this finding. Though many experiments related to the norm of social reciprocity refer to the situation in which an individual returns the favor to the person from whom he/she received it, this is also applicable for anonymous situations (Perugini, Gallucci, Presaghi, & Ercolani, 2003). Therefore according to this norm, receiving courtesy from an unknown driver would motivate individuals to be courteous to other unknown drivers.

Anonymity, one of the two dimensions of the factor *self-identity* in this study was identified as having significant influence on aggression in several experiments (Mitrevska, Castronovo, Mahr, & Müller, 2012; Jenness, 2007; Ellison-Potter, Bell, & Deffenbacher, 2001; Ellison, Govern, Petri, & Figler, 1995). The results of this current study also indicate significant effect of self-identity in active aggression. In addition, the reverse was also true. Thus, this factor was also identified as a significant predictor of active courtesy as tested in courtesy-encouraging scenarios. This result could be explained by the concept of reputation in which people try to protect their positive reputations by showing good behavior when they are identifiable.

Additionally, this study identified that the behavioral change caused by the factor *self-identity* was not due to their changes in emotion to the other driver. The motivation behind *self-identity* and its effect on driving courtesy has not been addressed in this study, however, social reputation can explain the motivation behind it. In fact, the explanation of the effect of *self-identity* on active courtesy by social reputation is supported by this result of emotional response. Since, according to the result of the study there is no

emotional motivation for the other driver behind the effect of *self-identity* in behavioral response, social reputation became dominant potential explanation behind it.

This study also suggested that though there is a strong negative correlation between them, but people do not perceive courtesy and aggression in the exact opposite manner.

Discussion on the Third Study

From the results of the vignette study, it was predicted that if drivers on the road can share their social identity on the road through the help of CVS or similar technologies it will help to increase driving courtesy and reduce aggression on the road. Because CVS technology is not fully developed or easily available, a feasibility study was conducted using video vignettes with simulated HUD displays. The idea of using HUD display was gained from the research paper of Soro, Wollstädter, & Rakotonirainy, (2014) in which they compared different design alternatives of In-Vehicle Information Systems (IVIS) which can communicate and connect with nearby vehicles to reduce aggression on the road by using HUD.

The results of the feasibility showed that the prediction was correct for the situation where drivers share the in-group social information. The results also suggest that it is not wise to share social identity with all road users because the revelation that the other driver belongs to the 'out-group' increases the occurrence of aggressive reactions. Comparing the effect of the factor *group affiliation* in the vignette and the feasibility studies, a greater change in probability of behaving non-aggressively and feeling positively for the other driver (in both active aggression and active courtesy

situations) were identified due to change in situation from out- to in-group. This change in the results of the two different studies can be explained by the following facts: 1) sharing social identity through connected vehicles helps to reduce anonymity (Mitrevska, Castronovo, Mahr, & Müller, 2012) and Study-2 identified that being identifiable (as oppose to anonymous) might reduce aggression and promote courtesy 2) the use of real group affiliation (as opposed to theoretical) information in the feasibility study might play a role in more acute in-group favoritism as well as out-group aggression 3) the use of the video vignettes were recorded in the same town as the hometown of the 'Bobcat' team, so participants who declared themselves as Bobcat fans might get more aggressive seeing fans of their opponent team (out-group) in their own hometown. However, the effect *group affiliation* on behavioral responses identified in active courtesy situations was not escalated in feasibility study as expected, although the results of both studies were very close.

Another issue that must be discussed, applicable to both the third study and the second study, is not using 'neutral' information while assessing the *group affiliation* factor. Under the factor *group affiliation,* each of participants received either 'in-group' or 'out-group' information and were asked to show their behavioral and emotional reactions. A third option, 'neutral' or 'no group affiliation' (which is comparable to the 'control group' in quantitative scientific experiments) was not given. Without this, the effect of *group affiliation* might show somewhat inflated results. In other words, it is only by comparing with 'neutral' information that the true effect of 'in-group' or 'out-group' can be measured. In this study this was not considered for use in order to keep the survey

simple and short for the participants as they were marginally paid ($5 along with extra course credit and $10 for study 2 and 3 respectively) for their participation in 45~55 minute-long study. Adding another dimension to the factor *group affiliation* was avoided because it was anticipated this would make the study lengthier and hence unattractive for the participants for that study compensation.

Limitation of the Research

The overall applicability of the findings of this research is bound by a few limitations.

First, the study was limited to the drivers of Bozeman, MT and its surrounding areas who fall between the ages of 18 to 60 years. The majority of the participants were comparatively young (below 31 years of age) and university students. Thus, the findings of this study may not reflect general driving behavior within the United States.

Second, all testing was conducted based on self-reported data. Even though Study 3 supported some of the results of Study 1 & 2, and Study 2 supported some of the findings of Study 1, all three studies were based on self-reported data. In the arena of behavioral research there is a great deal of evidence supporting significantly different results from self-reported behaviors as compared to actual behaviors (Junco, 2013).

Third, the sample size used in Studies 2 and 3 were small for making a general conclusion. On the other hand, planning to use 40 and 20 participants for the third and fourth study respectively was justified because of the limited time and resource of the research. The primary goal was the development of a common understanding of driving courtesy and aggression, not necessarily generalization of specific results. As exploratory

research, the focus was on measuring the main effects of explanatory variables with limited resources and time. Due to this limitation, the interaction effects in the second study were overlooked.

All of the limitations discussed above were unavoidable due to the time and financial limitations of the research. However, as a preliminary research, it provides good direction and guidance for further research and experimentation. To the very best of my knowledge, this research is the first window into exploring and validating the effects of social information on driving courtesy.

Future Work and Recommendation

Beyond eliminating the above mentioned limitations of this research, there are a few other recommendations for future work.

First, although this research utilized a feasibility study to test the application of CVS technology for the purpose of socially connecting drivers on the road, a naturalistic experiment would nevertheless provide a truer result of actual (not self-reported) driving behavior. Therefore, we recommend testing the significance of sharing social information with a naturalistic experiment.

Second, the potential problem of distracted driving due to sharing and receiving social information was out of the scope of this research. The reality of this issue is recognized, however, and it would be worthwhile to conduct research on the distraction (and its risks) that might be caused by socially connecting drivers on the road.

Third, all four scenarios that were used in Study 3 took place on local urban streets which were very familiar to the participants. It would be worthwhile to test the explanatory factors on unfamiliar roads.

Fourth, no interaction effects of explanatory factors were identified in the second study due to the small amount of data. The result of the interaction effects would definitely help to understand the factors more elaborately and extensively. Measuring and testing the effects of the other situational factors that were identified in the focus group study is also recommended.

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APPENDICES

APPENDIX A

IRB APPROVED CONSENT FORM (STUDY-1)

Montana State University
Research Participant Information and Consent Form

Title of the Study: Courteous and Aggressive Driving Behaviors on the Road.

Principal Investigator: Nazi Faisal A. Chowdhury, Graduate Student (phone: 406539-7079, email: nazifaisal.chowdhury@msu.montana.edu),

DESCRIPTION OF THE RESEARCH

You are invited to participate in a group discussion to identify and measure how do drivers define, perceive and express courtesy on the road. You have been asked to participate because you have a valid US driver's license.

This study will include both male and female licensed drivers from the local area aged 18 to 60 years.

The research will take place in the city of Bozeman.

As a participant of this research, you will be asked to discuss your perception, thoughts and experience of courteous as well as aggressive driving behaviors on the road in a group. Expressing opinion on the comments from other participants are welcomed in this group discussion. A list of possible courteous driving behaviors or reactions on the road will be the outcome of the discussion session which is also known as the focus group.

WHAT WILL MY PARTICIPATION INVOLVE?

Participation is voluntary and there is no cost to you to participate. If you decide to participate in this research you will be asked to attend a focus group sessions lasting approximately one and half hours in total. You will discuss your own perceptions, thoughts as well as (your own or your known person's) experience of aggressive and courteous driving. The whole session may be audio and video recorded for further analysis.

Participation is voluntary and participation or non-participation will not affect you by any way.

WILL I BE COMPENSATED FOR PARTICIPATION

You will be compensated by cash $20 for your participation.

In addition, if you are from the classes of EIND-101 or EIND-364, you will get extra course credit for participating this research which is offered as an alternative to extra credit homework given to your class.

ARE THERE ANY RISKS TO ME?

We are not aware of any social, psychological, legal, or economic risks associated with your participation in this study.

ARE THERE ANY BENEFITS TO ME?

There are no direct benefits to you for participating in this study other than your own interest in participating in research. However, the results of this study will be utilized in a broad research project, where a particular benefit of new car technology will be assessed.

HOW WILL MY CONFIDENTIALITY BE PROTECTED?

While there may be publications or conference presentations as a result of this study, your name and participation in this study will not be identified. Only group characteristics will be reported. Recorded audio and video will only be used for data extraction and analysis. They will not be shared with any other external person / media.

WHOM SHOULD I CONTACT IF I HAVE QUESTIONS?

You may ask any questions about the research at any time. If you have questions about the research after you leave today you should contact the investigator, Graduate Student Nazi Faisal A. Chowdhury at (406) 539-7079.If you are not satisfied with the response of the research team, have more questions, or want to talk with someone about your rights as a research participant, you should contact the MSU IRB Office: Chair, Mark Quinn 994-4707, ***mquinn@montana.edu***

Your participation is completely voluntary. If you decide not to participate or to withdraw from the study it will have no effect on any relationship you may have with the university or with Western Transportation Institute.

I understand that my participation is completely voluntary. I have read the above and understand the discomforts, inconvenience and risk of this study.

Name of Participant (please print):_____

Signature of Participant
_____ Date _____

Signature of Researcher
_____ Date _____

Your signature indicates that you have read this consent form, had an opportunity to ask any questions about your participation in this research and voluntarily consent to participate. You will receive a copy of this form for your records.

APPENDIX B

IRB APPROVED CONSENT FORM (STUDY-2)

Montana State University
Research Participant Information and Consent Form

Title of the Study: Leading Factors that Influence the Courteous Driving Behaviors on the Road

Principal Investigator: Nazi Faisal A. Chowdhury, Graduate Student (phone: 4065397079, email: nazifaisal.chowdhury@msu.montana.edu),

DESCRIPTION OF THE RESEARCH

You are invited to participate in a research study to identify the leading factors that influence courteous driving behaviors on the road. You have been asked to participate because you have a valid US driver's license.

This study will include both male and female licensed drivers from the local area aged 18 to 60 years.

The research will take place in the city of Bozeman.

As a participant of this research you will be asked to fill out a questionnaire consisting of some stories / scenarios related to driving courtesy and aggression. You have to read those scenarios / stories and answer the questions using your judgment and intuition. This type of survey is called a vignette questionnaire survey. This vignette questionnaire survey will look for the main factors that influence drivers' courteous or non-aggressive driving behaviors on the road.

WHAT WILL MY PARTICIPATION INVOLVE?

If you decide to participate in this research you will be asked to fill out the printed vignette questionnaire survey along with a short demographic questionnaire. The short demographic questionnaire will ask for your gender, age group (not your exact age) and some other questions related to your driving experience. You are expected to be honest and trustworthy in using your judgment on answering the questions.

WILL I BE COMPENSATED FOR PARTICIPATION

You will be compensated by cash $5 for your participation.

In addition, if you are from the classes of EIND-101 or EIND-364, you will get extra course credit for participating this research which is offered as an alternative to extra credit homework given to your class.

ARE THERE ANY RISKS TO ME?

We are not aware of any social, psychological, legal, or economic risks associated with your participation in this study.

ARE THERE ANY BENEFITS TO ME?

There are no direct benefits to you for participating in this study other than your own interest in participating in research. However, the results of this study will be utilized in a broad research project, where a particular benefit of new car technology will be assessed.

HOW WILL MY CONFIDENTIALITY BE PROTECTED?

While there may be publications or conference presentations as a result of this study, your name and participation in this study will not be identified. Only group characteristics will be reported.

WHOM SHOULD I CONTACT IF I HAVE QUESTIONS?

You may ask any questions about the research at any time. If you have questions about the research after you leave today you should contact the Investigator Graduate Student Nazi Faisal A. Chowdhury at (406) 539-7079.If you are not satisfied with the response of the research team, have more questions, or want to talk with someone about your rights as a research participant, you should contact the MSU IRB Office: Chair, Mark Quinn 994-4707, ***mquinn@montana.edu***

Your participation is completely voluntary. If you decide not to participate or to withdraw from the study it will have no effect on any relationship you may have with the university or with Western Transportation Institute.

I understand that my participation is completely voluntary. I have read the above and understand the discomforts, inconvenience and risk of this study.

Name of Participant (please print):_____

Signature of Participant
_____ Date _____

Signature of Researcher
_____ Date _____

Your signature indicates that you have read this consent form, had an opportunity to ask any questions about your participation in this research and voluntarily consent to participate. You will receive a copy of this form for your records.

APPENDIX C

IRB APPROVED CONSENT FORM (STUDY-3)

Montana State University
Research Participant Information and Consent Form

Title of the Study: Leading Factors that Influence the Courteous Driving Behaviors on the Road – A Semi-naturalistic Approach.

Principal Investigator: Nazi Faisal A. Chowdhury, Graduate Student (phone: 406 539 7079, email: nazifaisal.chowdhury@msu.montana.edu),

DESCRIPTION OF THE RESEARCH

You are invited to participate in a research study to identify the leading factors that influence courteous driving behaviors on the road. You have been asked to participate because you have a valid US driver's license. And also you are a fan of MSU Bobcat football team.

This study will include both male and female licensed drivers from the local area aged 18 to 60 years.

The research will take place in the city of Bozeman.

As a participant of this research you will be asked to watch some videos consisting of some stories / scenarios related to driving courtesy and aggression and fill out a questionnaire regarding your response and feelings on those scenarios. You will be asked to see those scenarios / stories and answer the questions using your judgment and intuition. This type of survey is called semi-naturalistic video vignette questionnaire survey. This semi-naturalistic video vignette questionnaire survey will look for the main factors that influence drivers' courteous or non-aggressive driving behaviors on the road.

WHAT WILL MY PARTICIPATION INVOLVE?

If you decide to participate in this research you will be asked to fill out the printed vignette questionnaire survey along with a short demographic questionnaire. The short demographic questionnaire will ask for your gender, age group (not your exact age) and some other questions related to your driving experience and association with MSU Bobcat football team. You are expected to be honest and trustworthy in using your judgment on answering the questions.

WILL I BE COMPENSATED FOR PARTICIPATION

You will be compensated by cash $10 for your participation.

ARE THERE ANY RISKS TO ME?

We are not aware of any social, psychological, legal, or economic risks associated with your participation in this study.

ARE THERE ANY BENEFITS TO ME?

There are no direct benefits to you for participating in this study other than your own interest in participating in research. However, the results of this study will be utilized in a broad research project, where a particular benefit of new car technology will be assessed.

HOW WILL MY CONFIDENTIALITY BE PROTECTED?

While there may be publications or conference presentations as a result of this study, your name and participation in this study will not be identified. Only group characteristics will be reported.

WHOM SHOULD I CONTACT IF I HAVE QUESTIONS?

You may ask any questions about the research at any time. If you have questions about the research after you leave today you should contact the Investigator Graduate Student Nazi Faisal A. Chowdhury at (406) 539-7079. If you are not satisfied with the response of the research team, have more questions, or want to talk with someone about your rights as a research participant, you should contact the MSU IRB Office: Chair, Mark Quinn 994-4707, ***mquinn@montana.edu***

Your participation is completely voluntary. If you decide not to participate or to withdraw from the study it will have no effect on any relationship you may have with the university.

I understand that my participation is completely voluntary. I have read the above and understand the discomforts, inconvenience and risk of this study.

Name of Participant (please print):_____

Signature of Participant
_____ Date _____

Signature of Researcher
_____ Date _____

Your signature indicates that you have read this consent form, had an opportunity to ask any questions about your participation in this research and voluntarily consent to participate. You will receive a copy of this form for your records.

APPENDIX D

DEMOGRAPHIC DATA COLLECTION FORM

<table>
<tr><th colspan="4">DEMOGRAPHIC QUESTION</th></tr>
<tr><td>Participant Name</td><td colspan="3"></td></tr>
<tr><th>Question</th><th colspan="3">Answer</th></tr>
<tr><td>Do you have a valid US driving license?</td><td colspan="2">❑Yes</td><td>❑No</td></tr>
<tr><td>What is your average number of driving hours per day?</td><td colspan="3">_____hours / day*
(*Put approximate value if you are not sure)</td></tr>
<tr><td>How long have you been driving (driving age)?</td><td colspan="3">I have been driving for_____ years*.
(*Put approximate rounded value if you are not sure)</td></tr>
<tr><td>Your gender:</td><td>❑
Male</td><td>❑
Female</td><td>❑
Not listed / Prefer not to answer</td></tr>
<tr><td rowspan="3">Your age falls between: (in years)</td><td>❑ 18-24</td><td>❑ 25-31</td><td>❑ 32-38</td></tr>
<tr><td>❑ 39-45</td><td>❑ 46-52</td><td>❑ 53-59</td></tr>
<tr><td>❑ 60</td><td colspan="2"></td></tr>
<tr><td colspan="4">I hereby verify that the above information is true and correct to the best of my knowledge and belief.
Signature:_____ Date:_____</td></tr>
</table>

APPENDIX E

QUESTIONNAIRE OF STUDY-2

Story 1 [For all scenarios]:

Suppose you are driving your car on a busy two-lane roadway with double solid yellow lines (where passing is prohibited). On the way, you see a car in front of you which is attempting to pullout from on-street parking.

In this situation, consider the following scenarios:

Story-1, Scenario-01:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to pullout has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-1, Scenario-02:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to pullout has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 1 [For all scenarios]:

Suppose you are driving your car on a busy two-lane roadway with double solid yellow lines (where passing is prohibited). On the way, you see a car in front of you which is attempting to pullout from on-street parking.

In this situation, consider the following scenarios:

Story-1, Scenario-03:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to pullout has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-1, Scenario-04:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to pullout has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 1 [For all scenarios]:

Suppose you are driving your car on a busy two-lane roadway with double solid yellow lines (where passing is prohibited). On the way, you see a car in front of you which is attempting to pullout from on-street parking.

In this situation, consider the following scenarios:

Story-1, Scenario-05:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to pullout has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-1, Scenario-06:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to pullout has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 1 [For all scenarios]:

Suppose you are driving your car on a busy two-lane roadway with double solid yellow lines (where passing is prohibited). On the way, you see a car in front of you which is attempting to pullout from on-street parking.

In this situation, consider the following scenarios:

Story-1, Scenario-07:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to pullout has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-1, Scenario-08:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to pullout has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore him and drive with the traffic flow	Move faster so that the car can pull out after you	Slow down so that the car can pull out in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 2 [For all scenarios]:

Suppose you are driving your car on a busy, 2-lane roadway. On the way, you see that a car in close proximity to your car is signaling and trying to get into your lane.

In this situation, consider the following scenarios:

Story-2, Scenario-01:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-2, Scenario-02:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 2 [For all scenarios]:

Suppose you are driving your car on a busy, 2-lane roadway. On the way, you see that a car in close proximity to your car is signaling and trying to get into your lane.

In this situation, consider the following scenarios:

Story-2, Scenario-03:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-2, Scenario-04:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 2 [For all scenarios]:

Suppose you are driving your car on a busy, 2-lane roadway. On the way, you see that a car in close proximity to your car is signaling and trying to get into your lane.

In this situation, consider the following scenarios:

Story-2, Scenario-05:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-2, Scenario-06:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 2 [For all scenarios]:

Suppose you are driving your car on a busy, 2-lane roadway. On the way, you see that a car in close proximity to your car is signaling and trying to get into your lane.

In this situation, consider the following scenarios:

Story-2, Scenario-07:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-2, Scenario-08:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is attempting to switch the lane has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Ignore his signal	Speed up a little bit to allow him to merge behind you	Slow down and let him merge in front of you	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 3 [For all scenarios]:

Suppose you are driving your car on a busy, multi-lane roadway. You are going at the regulated speed limit, but through the rear view mirror of your car, you noticed that a car is tailgating you.

In this situation, consider the following scenarios:

Story-3, Scenario-01:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is tailgating you has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-3, Scenario-02:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is tailgating you has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 3 [For all scenarios]:

Suppose you are driving your car on a busy, multi-lane roadway. You are going at the regulated speed limit, but through the rear view mirror of your car, you noticed that a car is tailgating you.

In this situation, consider the following scenarios:

Story-3, Scenario-03:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is tailgating you has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-3, Scenario-04:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is tailgating you has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 3 [For all scenarios]:

Suppose you are driving your car on a busy, multi-lane roadway. You are going at the regulated speed limit, but through the rear view mirror of your car, you noticed that a car is tailgating you.

In this situation, consider the following scenarios:

Story-3, Scenario-05:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is tailgating you has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-3, Scenario-06:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is tailgating you has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 3 [For all scenarios]:

Suppose you are driving your car on a busy, multi-lane roadway. You are going at the regulated speed limit, but through the rear view mirror of your car, you noticed that a car is tailgating you.

In this situation, consider the following scenarios:

Story-3, Scenario-07:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is tailgating you has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-3, Scenario-08:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is tailgating you has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Slow down and don't let him pass	Ignore him and drive normally	Speed up a little bit	Shift to the right lane	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 4 [For all scenarios]:

Suppose you are driving your car on a two-lane roadway with double solid yellow lines (where passing is prohibited). As you are driving, you encounter a car in front of you which is driving at half the permitted speed limit of that road.

In this situation, consider the following scenarios:

Story-4, Scenario-01:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is going at slower speed has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-4, Scenario-02:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is going at slower speed has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 4 [For all scenarios]:

Suppose you are driving your car on a two-lane roadway with double solid yellow lines (where passing is prohibited). As you are driving, you encounter a car in front of you which is driving at half the permitted speed limit of that road.

In this situation, consider the following scenarios:

Story-4, Scenario-03:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is going at slower speed has a bumper sticker of the **main rival** of your favorite football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-4, Scenario-04:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is going at slower speed has a bumper sticker of the **main rival** of your favorite football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 4 [For all scenarios]:

Suppose you are driving your car on a two-lane roadway with double solid yellow lines (where passing is prohibited). As you are driving, you encounter a car in front of you which is driving at half the permitted speed limit of that road.

In this situation, consider the following scenarios:

Story-4, Scenario-05:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is going at slower speed has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-4, Scenario-06:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is going at slower speed has a bumper sticker of your **favorite** football team. Your car has clear windows and you are driving in your own town, so you know you can be **easily identified**.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story 4 [For all scenarios]:

Suppose you are driving your car on a two-lane roadway with double solid yellow lines (where passing is prohibited). As you are driving, you encounter a car in front of you which is driving at half the permitted speed limit of that road.

In this situation, consider the following scenarios:

Story-4, Scenario-07:

Just a few minutes ago as you were driving, another driver **slowed down** for you to switch lanes. You notice, however, that the car which is going at slower speed has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

Story-4, Scenario-08:

Just a few minutes ago as you were driving, another driver **honked** at you for no good reason. You notice, however, that the car which is going at slower speed has a bumper sticker of your **favorite** football team. Your car has tinted windows and you are driving in a new town, so you know you are **anonymous** on the road.

What will your reaction be in the above circumstances?

Honk your horn at the car	Tailgate the car	Drive patiently behind the car	Search for an alternate route	Other (Please describe)
❑	❑	❑	❑	❑

How would you rate your response in terms of aggression?

Very little aggression	A little aggression	Some aggression	Much aggression	Very much aggression
❑	❑	❑	❑	❑

How would you rate your response in terms of courtesy?

Very little courtesy	A little courtesy	Some courtesy	Much courtesy	Very much courtesy
❑	❑	❑	❑	❑

How would you rate your feelings for the driver?

Very Positive	Positive	Somewhat positive	Neither positive or negative	Somewhat negative	Negative	Very Negative
❑	❑	❑	❑	❑	❑	❑

APPENDIX F

IDENTIFIED COURTESY AND AGGRESSIVE DRIVING SCENARIOS

Scenario	Scenario Category*	Mean Frequency Rating	Mean Consequence Rating	Mean of Sum Scores (Mean, 95% CI)
Slowing down or stopping for a driver who is attempting to pull out from on-street parking	CID	1.67	2.17	3.83, 95% CI [3.04, 4.62]
Allowing a driver in close proximity to change lanes after seeing his/ her turn signal	CID	0.33	2.17	3.17, 95% CI [1.62, 4.71]
Pulling over to help when someone visibly needs help on the roadside	CID	0.83	1.33	2.5, 95% CI [1.62, 3.38]
Allowing big trucks / vehicles room to make wide turns easily	CID	0.50	1.83	2.33, 95% CI [0.75, 3.91]
Staying in a chosen lane on a crowded highway instead of weaving through traffic to travel faster	CGR	0.83	1.33	2.17, 95% CI [0.62, 3.71]
Not blocking entrances or exits of stores / other public places while sitting in stagnant traffic	CGR	1.50	0.50	2, 95% CI [0.12, 3.88]
At busy roundabouts after a long wait, trying to push into traffic and rush out	AID	1.17	1.83	3, 95% CI [1.85, 4.15]
Taking revenge by overtaking because the other driver cut you off previously	AID	0.83	1.50	2.33, 95% CI [1.25, 3.42]
When someone is driving slower than permitted limit, trying to push him / her to speed up by honking the horn	AID	0.50	1.33	1.83, 95% CI [0.8, 2.87]
Weaving through traffic and frequently changing lanes	AGR	1.50	2.17	3.67, 95% CI [2.23, 5.1]
When there are cars backed up and waiting for a long period of time, trying to go on the shoulder and cut ahead of the traffic	AGR	0.83	0.17	1, 95% CI [0.06, 1.94]

Identified Scenarios at Focus Group-1

***Scenario category codes:** CID = Courtesy to Individual Driver | CGR = Courtesy to General Road-users | AID = Aggressiveness to Individual Driver | AGR = Aggressiveness to General Road-users

Identified Scenarios at Focus Group-2

Scenario	Scenario Category*	Mean Frequency Rating	Mean Consequence Rating	Mean of Sum Scores (Mean, 95% CI)
Allowing a driver in close proximity to change lanes after seeing his/ her turn signal	CID	2.00	2.17	4.17, 95% CI [3.38, 4.96]
Dimming headlights when another driver indicates that your bright is on	CID	2.00	1.33	3.33, 95% CI [2.06, 4.6]
Slowing down in order to enable another driver to pull out of a turn-around when there are no traffic lights***	CID	0.50	-0.17	0.33, 95% CI [-0.52, 1.19]
Driving at the same speed as the general flow of traffic even when speed is higher than the regulated speed limit.	CGR	2.50	2.00	4.5, 95% CI [3.05, 5.95]
Not using the shoulder to make a right turn when there is a long line of cars at a red light	CGR	-0.50	2.83	2.33, 95% CI [1.48, 3.19]
Staying in the right lane if driving at the speed limit or under	CGR	1.50	0.67	2.17, 95% CI [1.13, 3.2]
Texting or using cell phone while waiting for a red light to turn green	AGR	2.00	2.33	4.33, 95% CI [2.62, 6.05]
Driving 10-15 miles above the speed limit, changing lanes without signaling	AGR	0.83	1.33	2.17, 95% CI [0.36, 3.97]
Passing in the left lane when another driver in the right lane is either slowing down or completely stopped without considering the reason why the right lane driver is slowing / stopped	AGR	0.00	2.00	2, 95% CI [0.67, 3.33]
Parking in an unsafe location or manner i.e. – at the end of an intersection effectively blocking the view of other drivers on the road	AGR	0.50	-0.17	0.33, 95% CI [-0.94, 1.6]
Slamming on the brakes at high speed for a yellow light instead of passing through	AGR	0.33	1.50	1.83, 95% CI [0.61, 3.06]

*** Scenario category codes:** CID = Courtesy to Individual Driver | CGR = Courtesy to General Road-users | AGR = Aggressiveness to General Road-users *****Not considered** (due to the 95% CI upper bound of sum of scores of the scenario falls below the 95% CI lower bound of mean sum of scores which is 1.572)

Identified Scenarios at Focus Group-3

Scenario	Scenario Category*	Mean Frequency Rating	Mean Consequence Rating	Mean of Sum Scores (Mean, 95% CI)
On the highway or freeway, letting someone else get off the ramp or merge lanes by shifting to the left lane (without speeding up or blocking them)	CID	2.2	1.4	3.6, 95% CI [2.49, 4.71]
Allowing another driver to make a left hand turn off a 2 way street, even if you have the right of way***	CID	1	-0.6	0.4, 95% CI [-0.71, 1.51]
The mutual merge when people put blinkers on at the same time and then they switch lanes***	CID	-1.4	-0.2	-1.6, 95% CI [-3.48, 0.28]
Keeping a safe distance between other drivers	CGR	2.2	2.2	4.4, 95% CI [3.29, 5.51]
Taking enough time to brake, considering the cars behind you (who might not be prepared to stop as quickly)	CGR	1.6	1.8	3.4, 95% CI [1.73, 5.07]
Moving over to the left lane for officers, accidents or other road hazards	CGR	0.2	1.2	1.4, 95% CI [-0.48, 3.28]
Not blocking entrance or exit to stores / other public places while sitting in stagnant traffic	CGR	0.4	-0.6	-0.2, 95% CI [-2.24, 1.84]
Driving with high beam on, even though it causes visibility problems for other drivers	AID	1.4	1.6	3, 95% CI [0.68, 5.32]
Tailgating a driver who is in the left lane at the regulated speed limit in order to intimidate that driver to move into the right lane	AID	0.8	1.8	2.6, 95% CI [1.18, 4.02]
Speeding up and tailgating a car that has made a right on red and is now in front of you travelling at the regulated speed limit***	AID	0	-0.2	-0.2, 95% CI [-1.56, 1.16]
Pulling into a parking spot when someone is already attempting to park there	AID	1.6	-0.8	0.8, 95% CI [-0.82, 2.42]
Revving the engine and speeding around another car at a red light on a 2-lane street that will merge into one lane	AID	N/A**	N/A**	N/A**
Speeding around a car that is attempting to back up out of a parking spot	AID	N/A**	N/A**	N/A**
Waiting to cut into another lane at the last minute when the current lane ends	AGR	1	-0.4	0.6, 95% CI [-0.51, 1.71]

*** Scenario category codes:** CID = Courtesy to Individual Driver | CGR = Courtesy to General Road-users | AID = Aggressiveness to Individual Driver | AGR = Aggressiveness to General Road-users

**** Not rated by the participants ***Not considered** (due to the 95% CI upper bound of sum of scores of the scenario falls below the 95% CI lower bound of mean sum of scores which is 1.572)

APPENDIX G

IDENTIFIED FACTORS OF COURTESY AND AGGRESSION DRIVING

Identified Driving Courtesy or Aggression Factors in Focus Group Session-1

Factor	Factor Category*	Description of Factor	Supporting Comments from Participants**
Behavior of other drivers / previous experience	SF	Behavior of other drivers on the road influences one's own driving behavior. Aggressive behavior from other drivers leads drivers to passive aggression. On the other hand, if someone gets respect and courteous behavior from others, it helps the person to be courteous.	• *If you are being constantly respected by other drivers and people are nice to each other, it helps you to be courteous.* • *I think they are being aggressive and I am being passive aggressive* - (describing the reaction about the drivers who wave between lanes frequently*).* • *Yea, it was like revenge on me, because I cut them off.* • *Because I've been in their position where I had to change lanes in traffic and I want to pay them same respect that I got from someone.*
Driver's background	NSF	Drivers from rural area / smaller towns are generally courteous. Drivers from larger cities are prone to aggressive behaviors on the road. [Anonymity could be one latent cause behind it.]	• *Small town drivers are courteous.* • *I think where you are from is a big factor. People from small cities might have a hard time driving in bigger areas.*
Driver's gender	NSF	Males are more aggressive in driving.	• *Do you think it's because he was a guy? I know guys are very emotionally attached to their vehicles.*
Frustration	SF!	People are more aggressive when they are frustrated. [! This factor is, in fact, a consequence of other factors: traffic congestion, behavior from other driver, weather condition etc.]	• *Having patience is important.* • *People driving ahead of you are slow and then you get frustrated...*
Other driver's age	NSF	When a nearby driver on the road drives awkwardly, people assume that the driver is either too old or too young. In such cases, they look for the face of the other driver and try to check their age; if the person is old, then they feel sympathy, but in other case they get frustrated.	• *...but eventually you realized that the person is old. Then you'll feel sorry for them.*
Poor road / parking design	NSF	Sometimes the road / parking exit design forces its users to go in a different direction than the user's intended direction. This leads the	• *Like, at the library (Bozeman Public Library), you want to go back towards 19th and the exit is pushing you towards Livingstone,*

		user to frustration and to perhaps violating traffic rules.	*completely the opposite way…. you'll become upset*
Sense of urgency and rushing	SF	A sense of urgency and rushing leads people from being courteous to being aggressive.	• *You are in hurry. You want to get home when you are done with work* - (describing the cause behind aggressive behavior). • *Apart from frustration, people not feeling rushed. So probably time, time is an issue*- (asked to assume the cause behind being courteous). • *I move back and let them in because I'm not in hurry* – (describing own courteousness to other drivers on the road).
Time of day	SF	Aggressiveness depends on the time of the day. People are more aggressive in the evening when they are returning home after work.	• *It was like 5:25 PM, I was coming back from work...* – (describing a situation where the commenter was being tailgated by another driver who honked at him and he did not change speed or let the other driver pass due to frustration).
Traffic congestion	SF	People tend to be aggressive when there is traffic congestion on the road.	• *I think that traffic plays a really big role in courtesy driving.* • *When there were cars backed up and waiting for a long period of time*- (describing an aggressive driving scenario). • *I was waiting there (in a roundabout) for a long time, and at some point, I pushed into traffic.*
Weather condition and limited visibility	NSF	Poor lighting and weather conditions cause additional stress in driving, which therefore leads the driver to aggressiveness	• *You are under more stress when you are driving in bad weather.* • *Poor lighting, ice or rain that can make your journey more stressful.*

*** Factor category codes:** SF = Situational Factor | NSF = Non-Situational Factor

**** Comments are not quoted exactly**

Identified Driving Courtesy or Aggression Factors in Focus Group Session-2

Factor	Factor Category*	Description of Factor	Supporting Comments from Participants**
Behavior of other drivers / previous experience	SF	Behavior of other drivers on the road influences one's own driving behavior. Aggressive or inappropriate driving behavior from other drivers leads drivers to passive aggression. On the other hand, if someone gets respect and courteous behavior from others, it helps the person to be courteous.	• *I will say like, when someone lets you in or something like that, I always get so happy like, "Oh! Thank you so much" and I just want to spread the joy out to the world!* • *When I see someone is using a cell phone, I get really pissed.* • *When people pass on slick roads or pass when it's raining heavily, like you can't see anything 5 feet from you, it makes me upset sometimes.*
Driver's background	NSF	Drivers from rural area / smaller towns are generally courteous. Drivers from larger cities are prone to aggressive behaviors on the road. [Anonymity could be one latent cause behind it.]	• *I came from a bigger, busier city and my mindset was to not give the room. But after coming here to Montana, I saw people do that, and eventually I started doing that.* • *Sometimes I make mistakes, like I want to go left and I'm in the middle lane. So I turn my signal on and people behind me stop and they give me room to get in. That doesn't happen in big cities.* • *I think it is the mindset of people in bigger cities people - in bigger cities people have less time for others.*
Other driver's age	NSF	When a nearby driver on the road drives awkwardly, people assume that the driver is either too old or too young. In such cases, they look for the face of the other driver and try to check their age; if the person is old, then they feel sympathy, but in other case they get frustrated.	A comment supporting this factor is: • *When someone is driving slowly like, under the speed limit, we assume that the person is less experienced or old. So when we pass by and see the person is old, then we say "Okay, that is understandable!"* But there was one counter example for this factor: • *But my grandma is the craziest driver I've ever met. It scares me when I get in her car.*
Population density	SF	People are usually more aggressive in densely populated areas. [This factor is comparable with driver's background and	• *I guess population density is another factor. – (*When asked why driving behavior of smaller and bigger cities differ

		traffic congestion]	significantly).
Sense of urgency and rushing	SF	Sense of urgency and rushing lead people from being courteous to being aggressive.	• *If I'm in hurry, like going to work, I'll probably not give that room. But when I'm on my way back home, I'll show that courtesy.*
Time of day	SF	Aggressiveness depends on the time of the day. People are more aggressive in the evening when they are returning home after work.	• *And a lot of people are coming from the (oil) field and they are tired. And they are not really paying any attention.*
Traffic congestion	SF	People tend to be aggressive when there is traffic congestion on the road.	• *Yea, 'cause you have less flexibility in such cases* – (When asked whether they think traffic congestion plays a role in being courteous or not being courteous to others.

*** Factor category codes:** SF = Situational Factor | NSF= Non- Non-Situational Factor
**** Comments are not quoted exactly**

Identified Driving Courtesy or Aggression Factors in Focus Group Session-3

Factor	Factor Category*	Description of Factor	Supporting Comments from Participants**
Behavior of other drivers / previous experience	SF	Behavior of other drivers on the road influences one's own driving behavior. Aggressive or inappropriate driving behavior from other drivers leads drivers to passive aggression. On the other hand, if someone gets respect and courteous behavior from others, it helps the person to be courteous	• *If I have to get there in a limited amount of time, and nobody is letting me through, then I think I would be a more aggressive driver in that moment.* • *I think it also depends on what the other people on the road are doing. If somebody lets you in, you're more likely to let someone else in. But if somebody cuts you off, then it's like everyone is for themselves.*
Identity of other driver and their needs	SF	According to the participants, if they know the exact need (and urgency) and the identity of other drivers, their reaction to those drivers may change.	• *If it's an emergency and they let me know that, then yeah! But if they're being rude and just don't want to wait in line…no!* – (When explaining in what situation they allow others merge into the compact lane). • *I feel like if it was that situation where everyone is waiting their turn in line, and there was a guy saying "My wife's in labor!" I would just say go.*
Other driver's age	NSF	When a nearby driver on the road drives awkwardly, people assume that the driver is either too old or too young. In such cases, they look for the face of the other driver and try to check their age; if the person is old, then they feel sympathy, but in other case they get frustrated.	• *The other thing I notice, if they are driving really slow, they're old people. And then I feel bad for judging them.* • *If it causes me any anger or annoyance or anxiety, I always check out who is driving. And it's almost always a teenager who is texting or an old person. And if they're young and texting, then I'm more annoyed than if it's an old person!*
Passengers in car	SF	Passengers can also influence driving behavior.	• *So like if you're driving by yourself and just chilling to music, if everything else is good, you're probably going to be courteous and let people merge. If like you have friends in the car and you're talking and laughing and you're not always looking forward…* • *It's the opposite too, if you have a baby in the car. Small children,*

			screaming or fighting… it can be very stressful.
Sense of urgency and rushing	SF	Sense of urgency and rushing lead people from being courteous to being aggressive.	• *Generally, it's when I'm not in a rush to get somewhere…*- (When asked about the factors that make them courteous). • *If I'm running late, I need to get somewhere, jumping the speed limit… then I'm the one that is swerving around the slow cars…*
Traffic congestion	SF	People tend to be aggressive when there is traffic congestion on the road.	• *I will never let someone merge in front of me. It's like, I've been waiting in this line forever, you're not just going to get in front of me.* • *When there's really a lot of traffic especially, I hate it when people go all the way to the last minute where the lane ends, and then cut in.*
Weather condition and limited visibility	NSF	Limited visibility and weather conditions cause additional stress in driving, which therefore leads the driver to aggressiveness.	• *I hate driving in the rain; it makes me tense up. If it's raining and there's a big truck next to me, it's like, I don't care, I can't do it…it terrifies me.* • *I definitely drive slower if it's raining or snowing or there's ice or visibility is limited.*
Vehicle type	NSF	Some participants mentioned that when they see any unusual driving behavior, the type of the vehicle also influences them to judge the other driver and affects their 'mental model' of the other driver.	• *People who drive big old jacked-up trucks tend to be not as good drivers. They're like really aggressive, weaving in and out, and they're like semis, they don't care very much.* • *Race cars, always speeding around…*

*** Factor category codes:** SF = Situational Factor | NSF= Non-Situational Factor
**** Comments are not quoted exactly**