Self-Determination Theory as a Framework for Understanding Road Rage[1]

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The present study examined relations between motivational orientations, driving anger, and aggressive driving behaviors. It was hypothesized that the tendency to regulate behavior according to contingencies and pressures (controlled orientation), as opposed to interest and choice (autonomy orientation), would be associated with experiencing more driving anger and in turn driving more aggressively. Data from 109 college students were examined. As hypothesized, (a) controlled orientation was associated with feeling more driving anger as a result of other drivers' actions; (b) controlled orientation was associated with more aggressive driving behaviors and more traffic citations; (c) the relation between controlled orientation and aggressive driving was mediated by driving anger; and (d) self-esteem and social anxiety did not account for the results of motivational orientations.

According to a recent survey conducted by the American Automobile Association (AAA, 1996), driving anger is on the rise. These estimates are consistent with the public's perception that they find themselves more frequently as both victims and perpetrators of aggressive driving. However, the extent to which public perceptions eventuate from observable increases in "road rage" rather than media campaigns is unclear (Fumento, 1998). Still, driving anger does not seem to be limited to United States roadways.

In 1995, the Automobile Association surveyed 526 British motorists and discovered that nearly 90% had experienced driving-anger incidents in the past 12 months. According to the survey, common aggressive driving behaviors resulting from driving anger were aggressive tailgating (62%), headlight flashing (59%), obscene gestures (48%), deliberately obstructing other vehicles (21%), and verbal abuse (16%). Despite considerable attention from politicians, media, and various government agencies, driving anger and aggressive driving behavior have received relatively little attention from social psychologists.

[1]Portions of this research were presented at the annual meeting of Social Psychologists in Texas at Austin, Texas, January 1999. Christopher M. Black, Shannon L. Black, Heather A. Patrick, Suzanne C. Kieffer, and Aruni Nanayakkara provided helpful comments at various stages of this research.

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Journal of Applied Social Psychology, 2001, **31**, 5, pp. 889-904.

A profile of the angry driver has remained largely elusive (AAA, 1996). Much of the previous work on driving anger and aggressive driving has focused on either situational factors (Turner, Layton, & Simons, 1975); high-risk groups of drivers categorized according to their dangerous driving experiences (Donovan, Queisser, Salzberg, & Umlauf, 1985); or attributes that are conceptually similar to anger itself, like irritability and hostility (for a review, see Beirness, 1993). We reasoned that self-determination theory, with its emphasis on emotional regulation in interpersonal contexts, would afford a better understanding of the underlying process of driving anger and aggressive driving behavior.

Motivational orientations have been linked already to how individuals regulate self-esteem in other potentially threatening contexts and social interactions (Hodgins, Koestner, & Duncan, 1996; Hodgins, Liebeskind, & Schwartz, 1996; Knee & Zuckerman, 1996, 1998). Further, Deci and Ryan (1991) stated that when self-regulation proceeds according to an unintegrated aspect of the person, as with ego involvement or controlled behavior, the experienced emotion will be less flexible, more pressured, and more subject to defensive reactions that less fully express one's integrated self. Given that motivational orientations influence reactions within social contexts, we were interested also in whether relations with driving anger depended on who else was in the car. Anecdotal evidence suggests that driving anger may be more likely when one is alone than when others are in the car.

Self-determination theory (Deci & Ryan, 1985b, 1987, 1991) has furthered our understanding of behaviors and outcomes in several important domains, including education and achievement (Grolnick & Ryan, 1989; Grolnick, Ryan, & Deci, 1991; Ryan & Connell, 1989), romantic relationships and marriages (Blais, Sabourin, Boucher, & Vallerand, 1990; Hodgins, Koestner et al., 1996), and medical training and health outcomes (Ryan, Plant, & O'Malley, 1995; Williams & Deci, 1996; Williams, Grow, Freedman, Ryan, & Deci, 1996). With its emphasis on self-regulation and emotional integration, self-determination theory also provides a theoretical context for why some individuals might be more prone to experiencing driving anger and more likely to retaliate with aggressive driving behaviors.

Self-Determination Theory

Investigators have operationalized self-determination in various ways, including the aspirations that individuals endorse (Kasser & Ryan, 1993, 1996), coercive elements of the social context (Deci, Spiegel, Ryan, Koestner, & Kauffmann, 1982; Ryan, Mims, & Koestner, 1983), self-reported reasons for engaging in various behaviors (Vallerand & Bissonette, 1992; Vallerand, Blais, Briere, & Pelletier, 1989), and individual differences in motivational orientations (Deci & Ryan, 1985a; Hodgins, Liebeskind, et al., 1996; Knee & Zuckerman, 1996, 1998). This latter work on motivational orientations evolved from the assumption that people differ in the extent to which they regulate their behavior

based on autonomy and choice, or based on pressures to perform (either real or imagined; Deci & Ryan, 1985a). Accordingly, Deci and Ryan developed a general measure of causality orientations that assesses the degree to which an individual's behavior is autonomous or controlled.

Autonomy orientation is positively correlated with ego development, self-esteem, and self-actualization, and is negatively correlated with self-derogation and hostility (Deci & Ryan, 1985a). Controlled orientation is correlated positively with the Type-A coronary-prone behavior pattern, public self-consciousness, and is associated with the adoption of a pressured, ego-involved stance toward achievement tasks (Deci & Ryan, 1985b; Ryan, Koestner, & Deci, 1991). More recent research has linked motivational orientations to emotional regulation and esteem-maintenance strategies (Knee & Zuckerman, 1996, 1998). In that work, it was reasoned that a tendency to regulate behavior according to pressures and controls (controlled orientation), as opposed to choice and interest (autonomy orientation), would be associated with strategies that can serve to defend or enhance self-esteem. For example, in examining self-serving attributions, Knee and Zuckerman (1996) assessed autonomy and controlled orientations and then manipulated success and failure on a maze-solving task. The self-serving bias was evident in that participants who experienced success took more responsibility for their performance than did participants who experienced failure. However, as expected, this self-serving attributional tendency was not evident among self-determined individuals (those higher in autonomy orientation and lower in controlled orientation). These individuals engaged in fewer self-enhancing attributions after success as well as fewer defensive attributions after failure, compared to all other participants.

The moderating effects of motivational orientations on emotional regulation strategies are not limited to the self-serving bias. Knee and Zuckerman (1998) examined whether autonomy and controlled orientations moderated other forms of esteem-maintenance behavior, including tendencies toward self-handicapping and defensive coping strategies in response to stressful events. Consistent with previous findings, individuals who were higher in autonomy orientation and lower in controlled orientation engaged in less defensive coping strategies (e.g., denial) over time, and exhibited less self-handicapping, compared to all other participants.

Finally, motivational orientations have been linked to defensive interpersonal behavior as well. For example, when providing explanations for hypothetical social predicaments (e.g., turning in another person's term paper late), controlled orientation was associated with providing less mitigating and complex accounts, telling more lies, and defending one's own "face," rather than the victim's (Hodgins, Liebeskind, et al., 1996). Further, when naturally occurring social interaction was examined, autonomy orientation was associated with open, honest, and positive interaction, whereas controlled orientation was associated with more defensive interpersonal functioning (Hodgins, Koestner, et al., 1996).

These findings collectively suggest that some esteem-maintenance behaviors are partly a function of regulating one's behavior according to contingencies and pressures, as opposed to interest and choice. Whether making attributions for performance, dealing with stressful life events, or interacting spontaneously with others, orienting oneself toward controls and pressures is associated with more defensive behavior, whereas orienting oneself toward interest and choice is associated with less defensive behavior.

According to Deci and Ryan (1991), regulating one's emotions autonomously involves learning to reflectively interpret stimuli in more integrated ways such that a person comes to experience choice with respect to the behavior that is based on a full awareness of the emotion and of the goals and values relevant to it. It would seem that becoming angry with other drivers and responding aggressively may similarly be a function of how one regulates emotions and behaviors according to autonomy and control. Those who are higher in controlled orientation, with their self-esteem based in large part on living up to interpersonal or intrapsychic expectations (Deci & Ryan, 1995), are more likely to interpret events and contexts as controlling and coercive, and to react according to a pressured, ego-involved regulatory style than those who are less control oriented.

As Deci and Ryan (1991) stated, emotions can lead automatically to behaviors or can, depending on one's motivational orientation, be mediated by intentional processes. Having a less intentional regulatory process, those who are higher in controlled orientation may tend to experience threat and coercion more frequently, and when the emotional experience is one of anger at other drivers, they may be more likely to retaliate with horn honking, tailgating, headlight flashing, obscene gestures, or deliberately obstructing the other vehicle.

The present research examined autonomy and controlled orientations as predictors of driving anger and aggressive driving behaviors. We hypothesized that (a) controlled orientation would be associated with more driving anger, whereas autonomy orientation would be associated with less driving anger; and (b) controlled orientation would be associated with more aggressive driving behavior, whereas autonomy orientation would be associated with less aggressive driving behavior. We also set out to explore (c) whether relations between motivational orientations and aggressive driving would be mediated by driving anger, and (d) whether self-esteem or social anxiety could account for the results of motivational orientations.

Method

Participants

Participants were 109 undergraduates (70 women, 39 men), enrolled in introductory psychology courses at a large southwestern urban university, who

volunteered in exchange for extra credit. The sample was 40% Caucasian, 20% Asian, 18% Hispanic, 17% African American, and 5% who chose "Other." Participants' ages ranged from 18 to 50 years ($M = 22.08$, $SD = 4.43$); 93% of the students at this university are commuters; 2 of the 109 participants reported that they did not drive and were dropped from all analyses.

Procedure

Participants completed all measures during class on the same day. The assessment took approximately 30 min. There was no communication between participants. They were urged to answer all items honestly and were reminded that all answers would remain anonymous. Following the assessment, participants were debriefed and thanked for their participation. The following measures were administered in a Latin-square design.

Measures

Motivational orientations. A revised version of the General Causality Orientations Scale (GCOS; Deci & Ryan, 1985a) was incorporated. The original GCOS consisted of 12 scenarios, 8 of which were achievement related. The revised scale employed here was an expanded version that included an additional 5 scenarios that were explicitly interpersonal (Hodgins, Koestner, et al., 1996; Ryan, 1989). Each of the 17 scenarios is followed by a controlled orientation response and an autonomy orientation response. The respondent rates both responses on a 7-point scale of how characteristic it would be of him or her. For example, one of the scenarios and its autonomy and controlled responses are as follows:

> Your friend has a habit that annoys you to the point of making you angry. It is likely that you would:

The autonomy orientation is measured by the response, "try to understand why your friend does it and why it is so upsetting for you." The controlled orientation is measured by the response, "point it out each time you notice it; that way maybe he (she) will stop doing it." Participants rate each response on a scale from 1 (*very unlikely*) to 7 (*very likely*). Scores are computed by averaging respondents' ratings across all 17 scenarios, keeping autonomy and control scores independent. Internal reliabilities (Cronbach's alphas) in this study were .81 and .75 for autonomy and control, respectively.[3]

[3]The GCOS also measures impersonal orientation, which corresponds to the amotivating aspect of events, but this dimension was not of theoretical interest in the present study. Still, for purposes of the completeness and future meta-analytic reviews, we included impersonal orientation in Table 1, and also included the results of hierarchical multiple regressions in Footnote 5.

Driving anger. Driving anger was measured with the Driving Anger Scale (Deffenbacher, Oetting, & Lynch, 1994). Participants are asked to imagine that each of 33 situations described was actually happening to them and then to rate the amount of anger that they would feel. Ratings were made on a 5-point Likert-type scale ranging from 1 (*no anger*) to 5 (*very much anger*).

The measure includes six subscales labeled *hostile gestures* (e.g., someone honks at you about your driving), *illegal driving* (e.g., someone is driving too fast for the road conditions), *police presence* (e.g., you see a police car watching traffic from a hidden position), *slow driving* (e.g., someone is driving too slowly in the passing lane, holding up traffic), *discourtesy* (e.g., someone is driving right up on your back bumper), and *traffic obstructions* (e.g., you are driving behind a vehicle that is smoking badly or giving off diesel fumes). Both total scores and subscale scores were used in the present research. Internal reliabilities (Cronbach's alphas) in this study were .93, .87, .65, .85, .87, .85, and .82 for total score and the six subscales, respectively.

In addition, a series of items asked participants to rate the degree to which they experienced driving anger when specific passengers were in the car. Thus, participants rated a separate item for each passenger, including how often they experienced driving anger when alone, when with their spouse or significant other, when with their parents, when with a friend, and when with children in the car. Responses were made on a 5-point scale ranging from 1 (*almost never*) to 5 (*very frequently*).[4]

Driving aggression. Frequency of aggressive driving behaviors was measured by the Measure of Aggressive Driving (MAD), which was created for this study. Participants responded to 11 items concerning how often they engage in various aggressive driving behaviors on a 5-point scale ranging from 1 (*never*) to 5 (*almost always*). Sample items are, "You make an obscene gesture toward someone," "You intentionally tailgate someone," and "You speed up when someone tries to pass you." Responses to all 11 items were averaged. Internal reliability (Cronbach's alpha) was .80. As additional indicators of dangerous driving, participants were also asked to report the number of traffic citations (excluding parking tickets) that they had received in the past 5 years, as well as the number of accidents in which they had been involved (as the driver) in the past 5 years.

Alternative constructs. Measures of self-esteem and social anxiety were included to examine whether they could account for the results of motivational orientations. It was possible that driving anger and aggressive driving were simply a function of low self-esteem or a tendency to become anxious in the presence of others (in this case, other drivers). Thus, self-esteem was measured by Rosenberg's (1965) 10-item measure, which contains statements such as "I feel I

[4]Degrees of freedom were lower for some of these items because some people reported that they never drove with specific passengers.

have a number of good qualities." Participants respond to each item on a Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Internal reliability was .88. Social anxiety was assessed by the social anxiety subscale of the Self-Consciousness Scale (Fenigstein, Scheier, & Buss, 1975), which consisted of six items such as "Large groups make me nervous," rated on a 5-point scale ranging from 0 (*extremely uncharacteristic*) to 4 (*extremely characteristic*). Internal reliability was .77.

Results

Table 1 provides zero-order correlations among the main variables of interest. As expected, controlled orientation was associated with more driving anger and more aggressive driving behavior. In addition, controlled orientation was associated with receiving more traffic citations. Also, driving anger was associated with more aggressive driving behavior, and aggressive behavior was associated with more accidents, which in turn were associated with more traffic citations. Finally, although we made no predictions regarding impersonal orientation, it was positively related to both driving anger and aggressive driving. This makes some sense, given that impersonal orientation is correlated positively with controlled orientation and negatively with autonomy orientation. It is also evident that autonomy orientation was positively correlated with self-esteem, whereas impersonal orientation was associated with less self-esteem and more social anxiety, as has been reported elsewhere (Deci & Ryan, 1985b). Generally, there were no significant differences with regard to gender, with the exception that men reported receiving significantly more tickets.

Driving Anger

Because of the large number of multiple regression analyses, we chose a conservative level of statistical significance ($p < .01$) for all analyses that follow. The first hypothesis was that controlled orientation would be associated with more driving anger, whereas autonomy orientation would predict less driving anger. A hierarchical multiple regression was conducted with driving anger as the criterion, including autonomy and control as predictors at Step 1, followed by their product at Step 2 to test their interaction. Table 2 provides the results of the multiple regression analyses, including the F, degrees of freedom, significance level, and partial correlation for each effect of autonomy and control on overall driving anger, as well as anger as a function of specific events. Results for the interaction are not included in Table 2, as none were significant. As shown, controlled orientation was a strong predictor of overall driving anger. Autonomy orientation did not significantly predict overall driving anger.

In addition to overall driving anger, we examined each subscale as well. Controlled orientation was significantly positively related to feeling anger as a result

Table 1

Zero-Order Correlations Among Measures

Measure	1	2	3	4	5	6	7	8	9
1. Autonomy orientation	—								
2. Controlled orientation	.15	—							
3. Impersonal orientation	-.24*	.58***	—						
4. Social anxiety	-.15	.08	.38***	—					
5. Self-esteem	.35***	-.13	-.48***	-.48***	—				
6. Driving anger	-.10	.33***	.23*	.09	-.15	—			
7. Aggressive behavior	-.20†	.24*	.29**	.04	-.12	.35***	—		
8. Tickets	.06	.22*	.10	-.04	.08	.07	.15	—	
9. Accidents	-.05	-.02	.05	.16	-.09	.09	.29**	.45***	—
10. Gender	-.08	.02	.01	-.16†	.09	.03	.02	.24*	.18†

Note. *N*s ranged from 100 to 107, depending on missing data. Gender: female = 0, male = 1.
†$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 2

Series of Multiple Regression Analyses on Different Types of Driving Anger as a Function of Motivational Orientations

Criterion variable	Controlled orientation		Autonomy orientation	
	F	*pr*	*F*	*pr*
Driving anger from all events	14.68***	.36	2.33	-.15
Hostile gestures of other drivers	4.82*	.22	0.01	-.01
Others driving slowly	15.82***	.37	2.49	-.16
Other drivers' discourtesy	6.37*	.25	1.15	-.11
Traffic obstructions	13.53***	.35	2.02	-.14
Police presence	18.85***	.40	1.02	-.10
Others driving illegally	1.02	-.10	0.83	-.09

Note. Degrees of freedom were 1 and 99 for each effect.
*$p < .05$. ***$p < .001$.

of other drivers' slow driving, traffic obstructions, and police presence. Autonomy orientation was not significantly associated with any of the driving anger subscales.

We also examined whether associations between motivational orientations and driving anger depended on who else was in the car. Accordingly, a series of hierarchical multiple regressions was conducted on anger reported with specific passengers, with autonomy and control as predictors at Step 1, followed by their product at Step 2. Table 3 provides the results of the multiple regression analyses, including the *F*, degrees of freedom, and partial correlation of each effect of autonomy and control on reported anger as a function of different passengers in the vehicle. Again, no interactions were significant. As shown, controlled orientation was associated with more anger, regardless of who else was in the car. Thus, control-oriented individuals were more likely to experience anger when driving alone, when friends were in the car, when one's parents were in the car, when children were in the car, and when one's spouse or significant other was in the car. Autonomy orientation was somewhat related to less anger only when children were in the car.

Aggressive Driving Behaviors

Hypothesis 2 was that controlled orientation would be positively related to aggressive driving behaviors and that autonomy orientation would be negatively

Table 3

Series of Multiple Regression Analyses on Frequency of Experienced Driving Anger With Different Passengers in the Vehicle as a Function of Motivational Orientations

Passengers in vehicle	*df* error	Controlled orientation		Autonomy orientation	
		F	*pr*	*F*	*pr*
None	96	9.67**	.30	0.08	-.03
Friends	94	11.22***	.33	0.46	-.07
Parents	90	8.75**	.30	2.16	-.15
Children	72	19.98***	.47	7.31*	-.30
Significant other	80	16.53***	.41	0.00	.00

Note. Degrees of freedom vary because some respondents reported that they never drove with certain types of passengers in the car.
*$p < .05$. **$p < .01$. ***$p < .001$.

related to aggressive driving behaviors. A hierarchical multiple regression analysis was conducted with the aggressive driving index as the criterion, and autonomy and control as predictors at Step 1. The product of autonomy and control was entered at Step 2. In support of the hypothesis, controlled orientation was associated with more aggressive driving behaviors, $F(1, 99) = 10.11$, $p < .001$, *pr* (partial correlation) = .31. Autonomy was not significantly related to less aggressive driving, nor was the interaction significant.[5]

As indicated by Hypothesis 3, we were also interested in the extent to which anger might mediate the relation between motivational orientations and aggressive driving. According to Baron and Kenny (1986), there is evidence of mediation when: (a) there is a significant path from the predictor variable to the

[5]In response to an anonymous reviewer, we reexamined Hypotheses 1 and 2 including impersonal orientation in the models. These results must be interpreted cautiously, as we had no a priori hypotheses concerning impersonal orientation. Hierarchical multiple regressions were conducted, including the appropriate product terms. In reexamining Hypothesis 1, controlled orientation remained a significant predictor of driving anger, $F(1, 98) = 8.95$, $p < .01$, $pr = .29$. Neither autonomy orientation nor impersonal orientation was a significant predictor. None of the two-way product terms were significant. There was a significant three-way interaction, $F(1, 94) = 7.22$, $p < .01$, $pr = .27$, for which we were unable to formulate a meaningful interpretation. In reexamining Hypothesis 2 with impersonal orientation in the model, there were no main effects. In addition, none of the two-way product terms attained significance, nor did the three-way product term. Because there were no effects related to aggressive behavior when impersonal orientation was included in the model, we did not reexamine Hypothesis 3 with impersonal orientation.

mediator variable, (b) there is a significant relationship between the presumed mediator and the dependent variable, (c) there is a significant path from the predictor variable to the dependent variable, and (d) the relationship between the predictor variable and the dependent variable is no longer significant when controlling for the mediator. As noted earlier, we found a significant relationship between controlled orientation and driving anger, and between controlled orientation and aggressive driving behavior. When driving anger was partialed, controlled orientation was not significantly related to aggressive driving behavior, $F(1, 98) = 3.76$, $p = .06$, $pr = .19$. Thus, the association between controlled orientation and aggressive driving was largely mediated by driving anger.

Social Anxiety and Self-Esteem

It is possible that relations between motivational orientations, driving anger, and aggressive driving behavior are a function of self-esteem or social anxiety, rather than motivational orientations per se. To test this, the series of hierarchical multiple regression analyses reported previously were repeated, controlling for either social anxiety or self-esteem. First, controlled orientation remained a significant predictor of general driving anger when controlling for social anxiety, $F(1, 98) = 13.98$, $p < .001$, $pr = .35$; and self-esteem, $F(1, 98) = 13.42$, $p < .001$, $pr = .35$. Furthermore, neither social anxiety nor self-esteem significantly predicted driving anger beyond motivational orientations. Second, with aggressive driving as the criterion, and controlling for social anxiety, aggressive driving behavior was still significantly predicted by control, $F(1, 98) = 9.75$, $p < .01$, $pr = .30$. When controlling for self-esteem, controlled orientation remained a significant predictor of aggressive driving, $F(1, 98) = 8.79$, $p < .01$, $pr = .29$. Furthermore, neither social anxiety nor self-esteem significantly predicted aggressive driving behavior beyond motivational orientations. Thus, social anxiety and self-esteem do not appear to account for the relations between motivational orientations, driving anger, and aggressive driving.

Discussion

Our first hypothesis received partial support in that controlled orientation was associated with feeling more driving anger. This relation held most strongly for driving anger as a result of others' slow driving, traffic obstructions, and police presence. Further, controlled orientation was linked to feeling more anger when driving alone, with one's significant other, with friends, with parents, and with children. Thus, a tendency to perceive events and contexts as coercive was associated with feeling more anger while driving, across a variety of driving situations, and without regard to who else was in the car. Autonomy orientation, on the other hand, was only somewhat associated with less driving anger when

children were in the car. Although speculative, one possible explanation is that autonomy orientation is linked to a supportive and protective caregiving style that may lead people to modulate their emotions more safely when others' lives are in their hands. This would be consistent with previous literature that has found relations between autonomy orientation and a secure attachment caregiving style (Deci & Ryan, 1985b).

We also hypothesized that controlled orientation would be associated with more aggressive driving behaviors, whereas autonomy orientation would be associated with less aggressive driving behaviors. Consistent with the hypothesis, a tendency to orient oneself toward controls was associated with more aggressive driving behaviors (e.g., making obscene gestures toward other drivers, intentionally tailgating them, or speeding up when someone tries to pass). Autonomy orientation was not significantly associated with fewer aggressive driving behaviors.

We also examined the extent to which the relation between motivational orientations and aggressive driving was mediated by driving anger. In other words, a controlled orientation may influence how one interprets the actions of other drivers leading to anger, which in turn influences an aggressive retaliation against the offensive driver. Indeed, the conditions of mediation (Baron & Kenny, 1986) were supported such that the relation between controlled orientation and aggressive driving was not significant once driving anger was held constant. Thus, the association between controlled orientation and aggressive driving was largely mediated by driving anger. To illustrate, those who are higher in controlled orientation and who tend to regulate their emotions incompletely, tend to become angry at potentially coercive actions of other drivers and proceed to deliver an obscene gesture or tailgate them as an attempt to retaliate.

Importantly, relations between motivational orientations, driving anger, and aggressive driving behavior were not accounted for by social anxiety or self-esteem. Thus, those higher in controlled orientation, who become angry while driving and thus more likely to retaliate, do not do so because they experience a higher level of social anxiety in the presence of other drivers or because they have a lower level of self-esteem. Instead, we agree with Deci and Ryan (1991) that controlled individuals (relative to less controlled individuals) tend to regulate their emotions rigidly and incompletely, particularly during experiences that they interpret as coercive or threatening.

Events and contexts that are potentially ego threatening afford an illustration of how motivational orientations influence emotional regulation and subsequent behavior. Those who are higher in controlled orientation, with their self-esteem based in large part on matching standards of excellence or living up to interpersonal or intrapsychic expectations (Deci & Ryan, 1995), are more likely to take a defensive interpersonal stance (Hodgins, Liebeskind, et al., 1996), and react according to a pressured, ego-involved regulatory style. As Deci and Ryan

(1991) stated, emotions can lead automatically to behaviors or can, depending on one's motivational orientation, be mediated by intentional processes. Having a less intentional regulatory process, those higher in controlled orientation tend to experience threat and coercion more frequently, and when the emotional experience is one of anger at other drivers, they are more likely to retaliate automatically.

It should be noted that controlled orientation was clearly related to driving anger and aggression, whereas autonomy orientation was related less clearly to the variables in this study. There may be both theoretical and methodological reasons for this. Theoretically, it is a pressured, ego-involved orientation that makes one vulnerable to driving anger. Autonomy orientation is perhaps more relevant to awareness and self-reflective capacities—qualities that are less directly relevant to whether individuals will feel rage in provocative situations and behave automatically. Methodologically, autonomy and controlled orientations were designed to be orthogonal and, therefore, very strong effects are often required for two uncorrelated variables to be related to a third variable in opposite directions.

This study is not without limitations. While the present results are consistent with the notion that controlled orientation increases susceptibility to driving anger, which in turn increases likelihood of aggressive retaliation, the cross-sectional design does not permit clear inferences about the causal direction. Also, although the vast majority of students at this large urban university commute to campus daily and represent several ethnicities and levels of socioeconomic status, the present results are limited in their generalizability to other populations.[6] Another limitation is that the measures consist of self-reports of feelings and behaviors, rather than more objective observation of the behaviors themselves. It would be useful in future research to record driving anger episodes as they occur, using a diary record procedure or by asking observers who know the participant's driving tendencies (e.g., friends, family). Although such procedures have their own limitations, they afford a more natural examination of events as they occur and are better suited for analyzing behavioral patterns over time.

The motivational perspective applied here (Deci & Ryan, 1985b, 1987, 1991) suggests that the social context in part determines an individual's motivational

[6]In response to an anonymous reviewer, we reexamined our hypotheses controlling for age, given that we had a considerable range of ages in the study. When including age in the regression predicting driving anger, the effect of controlled orientation on anger remained significant, $F(1, 98) = 12.01$, $p < .001$, $pr = .33$. Age itself was not found to be a significant predictor of driving anger. In predicting aggressive driving behavior with age in the model, controlled orientation remained a significant predictor, $F(1, 98) = 8.28$, $p < .01$, $pr = .28$, whereas age did not have a significant effect. The reviewer's concern seemed to stem from the possibility that people of different ages may have different levels of driving experience. One of the items in the driving questionnaire asked respondents, on average, how much time per week they spent driving. We reanalyzed the hypotheses controlling for this item and found no changes; nor was time spent driving a significant predictor in any of the models.

orientation. One way that a controlled orientation may develop is through internalization of the expectations of controlling parents, teachers, and peers. Another way may be through repeated exposure to, and emphasis on, deadlines, surveillance, rewards, and other methods that can be perceived as guiding or controlling one's behavior. In other words, one way to potentially reduce driving anger and aggressive responses may be to encourage autonomy-supportive social structures that afford autonomous, self-determined behavior, rather than behavior that is coerced and strongly evaluated. An environment that promotes choice and self-determination may be particularly effective in facilitating accommodating emotions and behaviors toward others. The extent to which these findings generalize to more naturalistic approaches to the study of driving anger and aggression is unclear.

Despite these limitations, the present findings point to potentially useful avenues for identifying people who may be particularly susceptible to driving anger and aggressive driving behavior. Those who regulate their behavior according to pressures and contingencies appear to be more likely to experience driving anger, to display aggressive driving behavior, and to receive more traffic citations. Thus, an ego-involved, contingency-driven personality is linked to anger toward other drivers, as well as aggressive retaliatory responses. These results suggest that the most effective interventions for dealing with aggressive driving might be aimed at managing driving anger. For example, training seminars could involve the administration of explicit information that emphasizes choice and intentionality in emotional responding and could teach alternative responses (analogous to attitude inoculation strategies with regard to drug-use situations). However, that is an issue for future research on driving anger, a topic that has clearly received more attention from the media than from social psychologists.

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