

# Passion for Driving and Aggressive Driving Behavior: A Look at Their Relationship

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The purpose of the present research was to investigate the relationship between passion for driving and aggressive driving behavior in 3 studies. Study 1 examined the association between passion and aggressive driving behavior in a sample of undergraduate students. Results showed that an obsessive passion for driving was associated with aggressive driving behavior, while harmonious passion was not. Study 2 replicated these results with an ecologically valid sample of community-dwelling drivers. Finally, Study 3 replicated the results obtained in Studies 1 and 2 in a laboratory setting using a driving simulator under controlled frustrating driving situations with judges' assessment of aggressive driving behavior. Study 3 also showed that the emotion of anger mediated the obsessive-passion/aggressive-driving-behavior relationship.

*Aggressive driving behavior* is defined as behavior performed while driving that is intended to cause physical or psychological harm to any sentient being (Dula & Geller, 2003). This can involve tailgating, horn blowing, flashing headlights, cutting in and out, swearing and hostile gestures, as well as threatening and assaulting other drivers. Such behaviors are increasingly present on our roads. Indeed, between 1996 and 2000, reported cases of aggressive driving behavior increased by a factor of 15 in Canada (Smart & Mann, 2002) and in the U.S. (James & Nahl, 2002).

A recent study showed that the prevalence rate of perpetrators of aggressive driving behavior in Ontario, Canada, was more than 30% (Smart, Mann,

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Zhao, & Stoduto, 2005). It is also a widespread phenomenon, as aggressive driving behavior has been reported in many countries, including Canada (Smart & Mann, 2002), the United States (Batten, Penn, & Bloom, 2000), Australia (Harding, Morgan, Indemann, Ferrante, & Blagg, 1998), and the United Kingdom (Joint, 1995), among others. Clearly, aggressive driving behavior has become a common occurrence and a serious social and public health problem (Asbridge, Smart, & Mann, 2006). Indeed, aggressive driving behavior has been shown to be associated with higher reports of car collisions (Wells-Parker et al., 2002).

Past research on aggressive driving behavior has basically looked at how anger can predict aggressive driving behavior, especially under frustrating conditions (Deffenbacher, Filetti, Lynch, Dahlen, & Oetting, 2002; Galovski & Blanchard, 2002; James & Nahl, 2000; Naatanen & Summala, 1976; Shinar, 1998; Vallières, Bergeron, & Vallerand, 2005). Furthermore, such research has looked at the relationship between aggressive driving behavior and some individual differences, such as trait anger (e.g., Deffenbacher, Deffenbacher, Lynch, & Richards, 2003) and susceptibility to driving stress (e.g., James & Nahl, 2000). Although such research is important, no research to date has studied if one's love or passion for driving may predispose one to act aggressively at the wheel. In the present research, in line with the dualistic model of passion (Vallerand et al., 2003), it is proposed that being prevented from fully engaging in something you love (e.g., driving), because of the presence of some obstacles while doing so, may lead one to lash out at the people responsible for these frustrations and thus to display aggressive driving behavior toward other drivers.

### A Dualistic Model of Passion

A *passion* is defined as a strong inclination toward an activity that individuals like (or even love), find important, and in which they invest time and energy (Vallerand, 2008; Vallerand et al., 2003). A passionate activity is also believed to be internalized in one's identity (Aron, Aron, & Smollan, 1992; Csikszentmihalyi, Rathunde, & Whalen, 1993; Vallerand et al., 2003). For instance, individuals who like driving very much, value it highly, and invest time and energy in it (e.g., driving around without having a specific place to go) will most likely internalize the activity of driving into their identity. Passionate individuals would then see driving as part of them, might buy a car with a driving style that resembles them, and could hardly go anywhere without it. Incidentally, car dealers have understood that people can come to value driving highly and to identify with it. Indeed, car advertisements often depict the type of driving style of a car as resembling the driver (DeBono &

Snyder, 1989): a powerful sports car with a young and attractive individual; the smooth, quiet driving of a minivan with parents and children; or the rough, shaky driving of a Jeep with an adventurous individual.

The dualistic model of passion further posits that two distinct types of passion—an obsessive type and a harmonious type—can emerge, depending on the type of internalization process that takes place (Deci & Ryan, 1985, 2000; Sheldon, 2002; Vallerand, 1997). *Obsessive passion* entails a strong desire to perform the activity that is not under the person's control. It is as if the activity controlled the person. This type of passion results from a controlled internalization of the activity into one's identity. Such internalization originates from intrapersonal or interpersonal pressure, because certain contingencies are attached to the activity (Deci & Ryan, 2002), such as feelings of social acceptance, performance, or self-esteem or because the sense of excitement from driving becomes uncontrollable.

For example, an obsessively passionate driver might have bought a sports car to enhance himself or herself in the eyes of others. Therefore, the activity of driving is pleasant on the one hand, but on the other hand it is also associated with a pressuring need to drive in a specific way (e.g., driving fast to impress others) and can provide a boost of self-esteem. Thus, although obsessively passionate individuals love their passionate activity, they feel compelled to engage in it as a result of these internal contingencies that come to control them. Individuals with an obsessive passion come to develop ego-invested self-structures (Hodgins & Knee, 2002). The activity may then come to occupy an overpowering space in the person's identity and to lead to a rigid persistence in the pursuit of the activity, even when facing obstacles. Such an inflexible engagement in the activity is then likely to lead to negative emotions (e.g., anger, frustration).

*Harmonious passion*, by contrast, is a strong desire to engage in the activity that remains under the person's control. It results from an autonomous internalization (Deci & Ryan, 2000; Ryan & Deci, 2000) of the activity into the person's identity. An autonomous internalization occurs when individuals have freely accepted the activity as important for them, without any contingencies attached to it (Deci & Ryan, 1991; Vallerand, Fortier, & Guay, 1997). The activity remains under their control because it is in concordance with their authentic selves (Hodgins & Knee, 2002). For example, a harmoniously passionate individual might buy a sports car because he or she is very sports-oriented. Thus, with this type of passion, the activity is performed out of choice, with no contingencies attached to it. Driving thus comes to occupy a significant, but not an overpowering space in the person's identity. Consequently, the person is capable of a flexible engagement in the pleasant activity and can adapt to upcoming circumstances when prevented from performing the activity as one would like, or when faced with obstacles to its full pursuit.

Such a flexible engagement in pursuit of the activity is thus unlikely to lead to anger and frustration, even in the face of obstacles and barriers.

Research has provided support for the dualistic model of passion. First, results of exploratory and confirmatory factor analyses have supported the validity and reliability of the two-factor passion scale (Vallerand et al., 2003), corresponding to harmonious and obsessive passion (Rousseau, Vallerand, Ratelle, Mageau, & Provencher, 2002; Vallerand et al., 2003; Vallerand, Rousseau, Grouzet, Dumais, & Grenier, 2006). In addition, both types of passion have been found to correlate equally and positively with measures of activity valuation and time invested in the activity. Also, both types of passion have been found to positively correlate with a measure of activity inclusion in the self and in identity (Aron et al., 1992).

Research has also shown that both types of passion lead to different types of outcomes. First, obsessive passion has been found to be positively related to negative emotions during and after activity engagement (Mageau, Vallerand, Rousseau, Ratelle, & Provencher, 2005), as well as when prevented from engaging in the pleasant activity (Ratelle, Vallerand, Mageau, Rousseau, & Provencher, 2004; Vallerand et al., 2003). Conversely, harmonious passion has been found to be associated with positive emotions during and after activity engagement and to be unrelated to negative emotions when prevented from engaging in the activity (Mageau et al., 2005; Vallerand et al., 2003).

Second, obsessive passion predicts highly rigid and persistent behavior in conditions in which activity engagement should be stopped, such as winter cycling over icy roads in Québec (Vallerand et al., 2003), persisting in dancing while injured (Rip, Fortin, & Vallerand, 2006), or heavy involvement in gambling activities (Rousseau et al., 2002) that may be conducive to pathological gambling (Philippe & Vallerand, 2007; Ratelle et al., 2004; Vallerand et al., 2003). As posited by the dualistic model of passion, obsessive passion comes with an internal compulsion to engage in the activity, even when it is impossible to perform the activity, ill advised to do so, or when the person faces obstacles within the context of his or her passionate activity. This compulsion leads, in turn, to negative emotions and to persisting rigidly in self-defeating behavior.

Conversely, harmonious passion has been found to be either unrelated or negatively related to such negative outcomes, as well as to the rigid pursuit of activity engagement when it is prevented, obstructed, or ill advised to engage in the activity. Indeed, findings have revealed that harmonious passion is positively associated with adaptive outcomes—such as flow and positive emotions (Vallerand et al., 2003, 2006), higher levels of concentration during task engagement (Mageau et al., 2005; Vallerand et al., 2003)—and is unrelated to negative emotions during task engagement (Vallerand et al., 2006).

Therefore, harmonious passion seems to lead to a flexible, adaptive engagement in the passionate activity and to provide the internal capacity to regulate oneself in situations that may interfere with the pleasure of the activity so as to not engage in self-defeating or ill-advised behavior.

### The Present Research: Passion and Aggressive Driving Behavior

We propose that the dualistic model of passion may add to our understanding of the underlying processes of aggressive driving behavior. A number of points support this assertion. First, driving can clearly be a passion. Indeed, many drivers are known to internalize driving in their identity by choosing vehicle models associated with a driving style that resembles their personalities (Sachs, 1992). Furthermore, driving has often been reported as a highly pleasant, valued activity (Lupton, 2002) in which one may invest time and energy. Second, past research has shown that not all drivers react in a similar fashion when faced with frustrating obstacles, such as traffic jams (e.g., Deffenbacher, Huff, Lynch, Oetting, & Salvatore, 2000).

The dualistic model of passion may account, at least in part, for these contextual differences. In the case of an obsessive passion for driving, the activity is internalized in a controlled fashion in one's identity. The activity of driving thus comes to control the person and breeds an internal compulsion to engage in the driving activity, leading to rigid and persistent engagement in it. Therefore, when faced with obstacles to the pursuit of the pleasant driving activity (e.g., a slow car in front of a driver), a driver characterized by an obsessive passion is unlikely to adapt flexibly to these situations. Indeed, when faced with the erratic driving of another driver, this obsessively passionate driver is more likely to seek pursuit of the activity in a rigid, persistent fashion (e.g., insisting on passing a slow driver and continuing to drive fast) that should be conducive to the experience of negative emotions (e.g., anger, frustration) and subsequent ill-advised behavior (e.g., aggressive driving behavior).

By contrast, with harmonious passion for driving, the driving activity has been autonomously internalized in the person's identity. Because it is concordant with the person's self-integrity, the activity thus occupies a significant, but not overpowering space in the person's identity. This allows one to engage flexibly in driving and to adapt efficiently to the changing circumstances of the road. Therefore, harmoniously passionate drivers facing obstacles to their pleasure of driving, such as a traffic jam or the erratic behavior of another driver should flexibly adapt to such situations without experiencing negative emotions (e.g., anger, frustration) and without engaging in inappropriate, aggressive driving behavior toward other drivers.

The purpose of the present research is to examine the relationship between passion and aggressive driving behavior. Study 1 assesses the association between passion (especially obsessive passion) and general aggressive driving behavior with a sample of undergraduate students. Study 2 tests the ecological validity of this relationship by examining the link between obsessive passion and general aggressive driving behavior in a large random sample of community-dwelling drivers. Furthermore, Study 2 investigates if the relationship between obsessive passion and aggressive driving behavior also occurred in a recent frustrating driving episode. Finally, Study 3 was conducted in a laboratory setting with a driving simulator and provides an examination of the relationship between passion and aggressive driving behavior under frustrating driving situations using both observable and self-report measures of aggression. Study 3 also seeks to determine if anger mediates the relationship between obsessive passion and aggressive driving behavior.

### Study 1

The purpose of Study 1 is to test the association between passion and general aggressive driving behavior. Participants completed the Passion Scale (Vallerand et al., 2003) and the Driving Anger Expression Inventory (Defenbacher, Lynch, Oetting, & Swaim, 2002), which assesses aggressive behavior when driving. In line with past research on passion (Ratelle et al., 2004; Rip et al., 2006; Rousseau et al., 2002; Vallerand et al., 2003), it is hypothesized that obsessive passion will be positively associated with maladaptive outcomes; in the present case, aggressive driving behavior in general. Conversely, it is hypothesized that harmonious passion will not be associated with aggressive driving behavior.

### *Method*

#### *Participants*

A total of 133 undergraduate and graduate students (87 females, 46 males) from a French-Canadian university took part in this study. They were between 20 and 66 years of age ( $M = 27.7$  years,  $SD = 8.0$ ). They had been driving for 9.8 years on average ( $SD = 8.1$  years), and drove an average of 13,070.20 km per year ( $SD = 11,688.07$  km).

#### *Measures*

*Driving Passion Scale (DPS).* The DPS was created by adapting the Passion Scale (Vallerand et al., 2003) to tap an individual's passion for

driving. The Passion Scale has been used in several studies and has been shown to display high levels of validity and reliability (Ratelle et al., 2004; Rip et al., 2006; Rousseau et al., 2002; Vallerand et al., 2003; Vallerand & Houliort, 2003; Vallerand, Rousseau et al., 2006).

The DPS is divided into two subscales of six items each: the obsessive passion subscale, and the harmonious passion subscale. Respondents use a 7-point, Likert-type scale ranging from 1 (*do not agree at all*) to 7 (*very strongly agree*) to rate the items. A sample item from the harmonious passion subscale is “Driving is in harmony with the other activities in my life,” while a sample item from the obsessive passion subscale is “I have difficulties controlling my urge to drive.”

Data collected from this study were used to conduct a confirmatory factor analysis on the Driving Passion Scale using LISREL 8 (Jöreskog & Sörbom, 2003). The analysis confirms the bifactorial structure of the scale. The  $\chi^2/df$  ratio was in the acceptable range,  $\chi^2$  (51,  $N = 133$ ) = 89.83,  $p < .000$ ,  $\chi^2/df = 1.76$ , and other fit indexes were adequate: non-normed fit index (NNFI) = .97; comparative fit index (CFI) = .98; root mean square error of approximation (RMSEA) = .075 (90% CI = .048; .100); standardized root mean residual (SRMR = .057); and normed fit index (NFI = .94). All loadings ranged from .54 to .80. Alphas in this study were .85 and .80 for the harmonious and obsessive passion subscales, respectively.

In addition to the 12 items measuring passion, participants also completed 4 items corresponding to the criteria of passion (Vallerand et al. 2003). These 4 items assess the extent to which participants like driving, invest time in driving, find driving important, and whether they consider driving to be a passion. These items were rated to on a 7-point scale ranging from 1 (*do not agree at all*) to 7 (*very strongly agree*). Correlations between the two types of passion on the one hand and these four criteria, on the other, ranged from .49 to .76 ( $p < .001$ ), thus confirming that both types of passion for driving are strongly associated with the passion criteria. These results replicate past research with the concept of passion (Vallerand et al., 2003) and support its validity and reliability as applied to driving.<sup>2</sup>

*Aggressive driving behavior.* The Driving Anger Expression Inventory (DAX; Deffenbacher, Lynch et al., 2002) assesses the extent to which one

<sup>2</sup>In the three studies in the present article, we measured these four criteria of passion. An average score of 4 and up on these criteria indicates at least a moderate level of passion (Vallerand & Houliort, 2003). In Studies 1 and 2, there were 42.3% of participants who reported being at least moderately passionate for driving. In Study 3, all of the participants were passionate for driving. It is important to note that all of the results in Studies 1 and 2 remained relatively the same when keeping only passionate participants in the analyses—partial correlations remaining the same or being slightly higher than those obtained with all participants. Therefore, all participants were kept in the analyses of all three studies.



engages in aggressive behavior when driving. Each of the 34 items is rated on a 4-point scale ranging from 1 (*almost never*) to 4 (*almost always*). The scale contains four subscales. However, in the present study, only the three subscales pertaining to aggressive behavior expression were used. The first subscale contains 12 items that assess verbal aggression expression (e.g., "I swear or yell at another driver";  $\alpha = .83$ ). The second subscale contains 11 items that tap physical expression of aggression (e.g., "I give another driver the finger";  $\alpha = .88$ ). Finally, the last subscale contains 11 items that measure aggressive use of the vehicle to express anger (e.g., "I speed up to frustrate another driver";  $\alpha = .82$ ). The DAX has proven to have adequate validity and internal reliability (Deffenbacher, Lynch, Deffenbacher, & Oetting, 2001; Deffenbacher, Lynch et al., 2002).

### *Procedure*

Participants were contacted in classrooms of different departments at a French-Canadian university. They were asked to take part in a study about driving behavior. They were assured that their answers would remain confidential and anonymous, and that they were free to participate or not. Participants who accepted the offer to take part in the study completed the DPS and DAX scales in class and returned their questionnaires to the experimenter.

### *Results and Discussion*

The DAX subscales were first screened for strength of association between them. In line with past research (Deffenbacher, Lynch, Deffenbacher et al., 2001; Deffenbacher, Lynch et al., 2002; Deffenbacher et al., 2003), correlational analyses reveal that the verbal, physical, and vehicle use aggression subscales from the DAX were all associated. Correlations ranged from .26 to .40 (all  $ps < .01$ ). Data were also screened for gender differences. ANOVAs reveal no sex differences for harmonious passion, obsessive passion, or for the three different DAX subscales (all  $F_s < 1$ ).

Partial correlations were computed among passion and the different DAX subscales (see Table 1). As predicted, the results reveal that obsessive passion for driving was positively associated with all three types of aggression ( $r_s$  range from .21 to .33,  $p < .05$ ). Furthermore, harmonious passion for driving was unrelated to aggression. These results support our hypotheses and suggest that obsessive (but not harmonious) passion for driving is implicated in aggressive driving behavior.



Table 1

*Partial Correlations Between the Two Types of Passion for Driving and Aggressive Driving Behavior: Study 1*

	Verbal expression of aggression	Physical expression of aggression	Aggressive use of the vehicle
Obsessive passion <sup>a</sup>	.21*	.33**	.33**
Harmonious passion <sup>b</sup>	.03	-.04	.00

Note.  $N = 133$ .

<sup>a</sup>Controlling for harmonious passion. <sup>b</sup>Controlling for obsessive passion.

\* $p < .05$ . \*\* $p < .01$ .

## Study 2

The aim of Study 2 is to replicate the results of Study 1 with an ecologically valid sample. A large community-dwelling sample composed of middle-age adult drivers was thus recruited. Study 2 also seeks to determine if obsessive passion is related to aggressive driving behavior in a specific frustrating driving situation that occurred recently. In line with Study 1, we hypothesize that obsessive passion for driving will be positively associated with aggressive driving behavior, both in general (i.e., DAX; Deffenbacher, Lynch et al., 2002) and in a recent frustrating driving situation. Conversely, we predict that harmonious passion will not be associated with any indicator of aggressive driving behavior.

*Method**Participants*

A random sample of 458 participants (262 females, 193 males, 3 participants did not report their gender) from the Greater Montreal area in the Province of Québec in Canada was used in this study. Participants were between 20 and 87 years of age ( $M = 47.8$  years,  $SD = 14.9$  years). On average, the participants had been driving for 27.9 years ( $SD = 13.7$ ) and drove an average of 17,473.66 km per year ( $SD = 14,411.34$  km).

*Measures*

*Driving Passion Scale (DPS)*. The DPS that we used in Study 1 was used in Study 2 as well. Alphas for the sample of this study were .80 and .79 for

the harmonious passion subscale and the obsessive passion subscale, respectively.

*Aggressive driving behavior.* The DAX (Deffenbacher, Lynch, Oetting et al., 2002) that we used in Study 1 was also used in Study 2 to assess aggressive driving behavior. However, to increase the response rate, we reduced the number of items for each subscale. Items selected were the top loading factors from a factorial analysis of all the items of the full DAX scale from the Study 1 data.

There were five items that comprised the verbal aggression subscale ( $\alpha = .85$ ), three items in the physical aggression subscale ( $\alpha = .75$ ), and three items in the aggressive use of the vehicle subscale ( $\alpha = .85$ ). Correlations for each of these short subscales with their full subscales are .85, .88, and .88, respectively (correlations are from the Study 1 data). Thus, the shorter subscales would appear to be equivalent to the full subscales.

*Aggressive reactions in a recent frustrating driving situation.* Participants were asked to describe a recent frustrating driving situation involving another driver. A scale comprised of eight items assessed participants' aggressive reactions in that situation. Each item proposes a specific way to react in a frustrating situation, and participants were asked to rate the extent (in a percentage ranging from 0% to 100%) to which they reacted that way in their recent frustrating situation. Sample items are "I swore at the other driver," or "I made hostile gestures to the other driver." Alpha for this scale was .69.

### *Procedure*

A total of 1,500 questionnaires with pre-stamped return envelopes were sent to the Société de l'Assurance Automobile du Québec (SAAQ), a provincial organization responsible for driving licenses in the Province of Québec. The SAAQ then selected from their registering base a random sample of 1,500 individuals living in the Greater Montreal area. Each selected person received by mail a questionnaire, along with a letter explaining the general purpose of the study. Participants were told that the aim of this study is to learn more from people's driving behavior. They were assured that they were free to participate or not, and that their answers would remain confidential, anonymous, and would not be sent to the SAAQ. In all, 458 individuals (265 females, 193 males) returned their questionnaires fully completed, for a response rate of 31%.

### *Results and Discussion*

Data were screened for gender differences on the passion subscales. ANOVA results reveal that men were more likely to have a harmonious

Table 2

*Partial Correlations Between the Two Types of Passion for Driving, Aggressive Driving Behavior, and Aggressive Reactions in a Recent Specific Situation: Study 2*

	Verbal expression of aggression	Physical expression of aggression	Aggressive use of the vehicle	Aggressive reactions in a recent situation
Obsessive passion <sup>a</sup>	.18**	.27**	.27**	.23**
Harmonious passion <sup>b</sup>	-.02	-.04	-.06	-.04

Note.  $N = 442$ .

<sup>a</sup>Controlling for harmonious passion. <sup>b</sup>Controlling for obsessive passion.

\*\* $p < .01$ .

passion for driving ( $M = 4.28$ ,  $SD = 1.28$ ) than were women ( $M = 4.03$ ,  $SD = 1.19$ ),  $F(1, 453) = 4.42$ ,  $p < .05$ . There was no significant difference for the obsessive passion subscale. Data were also screened for gender differences across the DAX subscales. The ANOVA results reveal one significant difference: Men were more likely to display physical, aggressive behavior ( $M = 1.39$ ) than were women ( $M = 1.24$ ),  $F(1, 453) = 7.07$ ,  $p < .01$ .

Partial correlations were computed among the passion and DAX subscales. In line with Study 1, the results show that obsessive passion was positively associated with all three types of aggression ( $pr$ s between .18 and .27,  $p < .01$ ). Conversely, harmonious passion was not associated with any type of aggression. Partial correlations were also computed between passion and the aggressive reactions in a recent frustrating driving situation. Obsessive passion was positively associated with aggressive reactions in a recent situation ( $pr = .23$ ,  $p < .01$ ), while harmonious passion was unrelated to it ( $pr = -.04$ ; see Table 2).

The results from Study 2 corroborate those obtained in Study 1. Obsessive passion was positively associated with aggressive driving behavior in general, while harmonious passion was not. Of additional interest, Study 2 reveals that these associations held true for a community-dwelling population of middle-age drivers with the same instrument (i.e., DAX; Deffenbacher, Lynch et al., 2002). More importantly, the results from Study 2 extend those of Study 1 by showing that obsessive passion was positively associated with aggressive behavior exhibited in a recent frustrating driving situation, while harmonious passion was not.

These results suggest that aggressive driving behavior might arise when obsessively passionate drivers are prevented from pursuing engagement in their pleasant driving activity because of an obstacle, such as another driver's behavior. By contrast, harmoniously passionate drivers do not exhibit such a maladaptive behavior when they face an obstacle to pleasure in an activity. These results are in line with past research on the dualistic model of passion (Ratelle et al., 2004; Rip et al., 2006; Rousseau et al., 2002; Vallerand et al., 2003) showing that only obsessive passion leads to rigid engagement and self-defeating behavior when facing obstacles to the pursuit of the passionate activity. However, the present results also extend past research in showing that such ill-advised behavior can be targeted at other people and not only at oneself.

### Study 3

Study 3 has two major purposes. First, it seeks to replicate the findings from the previous studies, with two improvements. First, Studies 1 and 2 used a survey methodology to assess the relationship between passion and past aggressive driving behavior. Such a strategy makes it impossible to determine if some other variable is responsible for the obsessive-passion/aggressive-driving-behavior relationship.

Study 3 was conducted within a driving laboratory session, allowing us to control for a number of biasing factors and to induce frustrating driving obstacles. Second, Studies 1 and 2 used a self-report measure of aggressive driving as outcome measures. Self-reports of aggressive driving might be biased, as participants might be tempted to underestimate the frequency of their aggressive behavior. In Study 3, an observable behavioral measure of aggression while driving (through judges) is used. In line with Studies 1 and 2, it is predicted that obsessive passion will be associated with aggressive driving behavior during a laboratory session when faced with induced frustrating events. It is also hypothesized that harmonious passion will not be associated with aggressive driving behavior.

A second purpose of this study is to examine the role of anger as a mediator of the obsessive-passion/aggressive-driving-behavior relationship. Research (Deffenbacher et al., 2003; Deffenbacher, Lynch, Deffenbacher et al., 2001; Deffenbacher, Lynch, Oetting, & Yingling, 2001) has suggested that aggressive driving behavior might originate from anger when faced with a frustrating situation (e.g., being in a traffic jam, following a driver who drives slowly). It is predicted that, when faced with frustrating driving situations, obsessive passion will lead to anger that, in turn, will lead to aggressive driving behavior. Thus, anger is expected to mediate the relation between

obsessive passion and aggressive driving behavior. Finally, it is hypothesized that harmonious passion will not be associated with anger.

### *Method*

#### *Participants*

A total of 44 young men highly interested in cars and in car driving were recruited from the Greater Montréal area through advertisements on the Internet and within departments of a French-Canadian university. They were between 18 and 35 years of age ( $M = 23.9$  years,  $SD = 3.8$ ), had been driving an average of 6.9 years ( $SD = 3.7$ ), and drove an average of 27,055.60 km per year ( $SD = 12,446.35$  km). Approximately half of the participants (48%) were full-time students, while the other half were workers (52%). There was no difference between students and workers on all variables (all  $F$ s  $< 1.40$ ).

#### *Materials*

Participants completed a task on a fixed-base laboratory driving simulator comprised of a complete automobile with fully functional pedals and dashboard. The driving environment was projected on a large screen showing images of urban streets. The simulation environment was completely interactive and reproduced participants' real-time behaviors. Each participant's driving session was audio-recorded and video-recorded.

#### *Measures*

*Driving Passion Scale.* The DPS that we used in the two previous studies was also used in Study 3. Alphas in this study were .80 and .79 for the harmonious passion and obsessive passion subscales, respectively.

*Anger.* We used three items ("To what extent did you feel irritated?"; "To what extent did slow drivers make you angry?"; and "To what extent did you feel provoked?") to assess anger. These items were rated on a 5-point scale ranging from 1 (*not at all*) to 5 (*totally*). In Study 3, the alpha for this scale was .69.

*Self-reported aggressive driving behavior.* A self-report questionnaire comprised of six items assessed participants' self-reported aggressive overt behavior. Verbal and physical aggressive behavior (e.g., "I verbally insulted other drivers") was assessed on the level of manifestation on the following

5-point scale: 0 = *no*; 1 = *I thought of doing the behavior*; 2 = *I thought about doing it, but I didn't try*; 3 = *I tried to do it*; 4 = *I did it*. In this study, alpha for this scale was .60.

*Objective aggressive driving behavior.* We had three judges independently code the video and sound of participants' overall driving sessions. Examples of observed variables were the number of horn honks and their type (i.e., short or long); number of aggressive commentaries, along with their intensity, rated on a 5-point scale ranging from 1 (*a little bit intense*) to 5 (*extremely intense*); and number of hostile gestures toward the other driver, along with their intensity, rated on a 5-point scale ranging from 1 (*a little bit intense*) to 5 (*extremely intense*).

All variables were transformed into *z* scores and were averaged for each judge. Correlations among judges were significant ( $p < .001$ ) and ranged from .67 to .92. All three judges' scores were averaged to yield one total score representing the level of aggressive driving behavior during the laboratory driving session ( $\alpha = .93$ ). High scores represent high levels of aggressive driving behavior.

### *Procedure*

First, participants were provided with an informed-consent form and were told that they would be audio- and video-recorded and that they could stop their participation at any time (with full compensation) during the experiment. Second, participants completed the DPS and a sociodemographic inventory.

Afterward, all participants completed a standard driving-simulation task consisting of a practice trial and the actual driving session recreating everyday, on-road trivial conditions and major obstacles. Participants were tested individually, but each participant was led to believe that he would be interacting with another driver. In reality, the other driver was a confederate who had been quickly introduced to participants as a second participant completing the task at the same time. This accomplice was perceived as the instigator of some of the provocations that were to take place on the road. Participants were told that they both had a different circuit in the simulation environment; that is, they were not in competition with each other, although at times they would meet on the road. In addition, participants were further told that they were driving to an important appointment and should try to arrive on time. Green and red lights were presented in the simulation room in order to indicate if the participant was on time or late for his appointment. Participants were told that the red light indicated a delay over the mean time normally necessary to reach the destination.

The practice trial consisted of driving on a free road without traffic or pedestrians for 10 min in order to get used to the car simulator and the surrounding environment. In the following actual trial, the obstacles and provocations were attributed to the erratic behavior of the confederate's assigned vehicle. One situation was the participant's inability to pass the confederate's car. Indeed, this interactive car was programmed so as to accelerate when participants attempted to pass it and to decelerate when participants were behind. Another road obstacle pertained to a situation in which participants were stuck behind an immobile truck, while other cars were passing in the adjacent left lane.

In addition, in order to create a situation similar to everyday driving events, participants also heard horn honking from behind their vehicle. Each of these two frustrating situations took place four times in sequence, interspersed by 1 min of free road driving equivalent to the practice trial. Participants' behaviors were audio- and video-recorded in order for independent judges to score the aggressive behavior.

After completing the task, participants were administered the aggressive driving behavior and anger self-report scales. They were then fully debriefed and received \$20 as compensation for their participation.

### *Results and Discussion*

In light of the findings from Studies 1 and 2, a one-tailed significance test was used for all analyses. Our first hypothesis was that obsessive passion would be positively associated with aggressive driving behavior. The results from partial correlations confirm our hypothesis, as only obsessive passion was positively and significantly associated with both the self-report ( $r = .29$ ,  $p < .05$ ) and observed measures of aggressive driving behavior ( $r = .28$ ,  $p < .05$ ). Harmonious passion was not associated with any of these measures (see Table 3). These findings support our first hypothesis.

The second hypothesis was that anger experienced by drivers would mediate the relation between obsessive passion and aggressive driving behavior. It was also predicted that harmonious passion would not be associated with anger. To test this hypothesis, we computed a path analysis through hierarchical regression, in line with Baron and Kenny's (1986) recommendations. Self-reported aggressive driving behavior served as the dependent variable and was regressed on the two types of passion at Step 1. The results reveal that obsessive passion predicted significantly self-reported aggressive behavior ( $\beta = .37$ ,  $p < .05$ , one-tailed), while harmonious passion did not ( $\beta = -.05$ , *ns*).

At Step 2, anger was added to the regression equation. The results reveal that anger was the only significant predictor of self-reported aggressive



Table 3

*Correlations and Partial Correlations Between the Two Types of Passion for Driving and Anger, Aggressive Behavior Self-Report, and Objective Measure: Study 3*

	Anger	Self-report of aggressive behavior	Objective measure of aggressive behavior
Obsessive passion: partial correlation <sup>a</sup>	$pr = .29^*$	$pr = .29^*$	$pr = .28^*$
Harmonious passion: partial correlation <sup>b</sup>	$pr = .01$	$pr = -.02$	$pr = -.06$
Aggressive behavior (self-report)	$r = .46^*$	—	$r = .47^*$
Aggressive behavior (objective measure)	$r = .34^*$	—	—

Note.  $N = 44$ .

<sup>a</sup>Controlling for harmonious passion. <sup>b</sup>Controlling for obsessive passion.

\* $p < .05$  (one-tailed).

behavior ( $\beta = .43, p < .05$ , one-tailed), obsessive passion being fully mediated ( $\beta = .22, ns$ ). Harmonious passion was again not significantly related to self-reported aggressive behavior ( $\beta = -.05, ns$ ; see Figure 1).

In addition, in line with Shrout and Bolger's (2002) recommendations to test mediation effects with a small sample size (also see Efron & Tibshirani, 1993; Preacher & Hayes, 2004), a bootstrap sample of 1,000 cases was created. The results show that bias-corrected bootstrap 90% confidence intervals (CIs) did not include 0 (CIs = .0035, .0788), thus suggesting that the mediation effect was significant ( $p < .05$ , one-tailed). The results of the effect proportion mediated ratio ( $P_M$ ; see Shrout & Bolger, 2002) show that 70% of the total effect was mediated by anger.

Finally, the same hierarchical regression was computed, with objective aggressive driving behavior serving as the dependent variable, and was regressed on the two types of passion at Step 1. At Step 2, anger was added to the regression equation. The results reveal that obsessive passion positively predicted objective aggressive behavior at Step 1 ( $\beta = .35, p < .05$ , one-tailed), while harmonious passion did not ( $\beta = -.07, ns$ ). However, at Step 2, the results reveal that anger was the only significant predictor of objective aggressive behavior ( $\beta = .26, p < .05$ , one-tailed), obsessive passion being fully mediated ( $\beta = .21, ns$ ). Harmonious passion was again not significantly related to

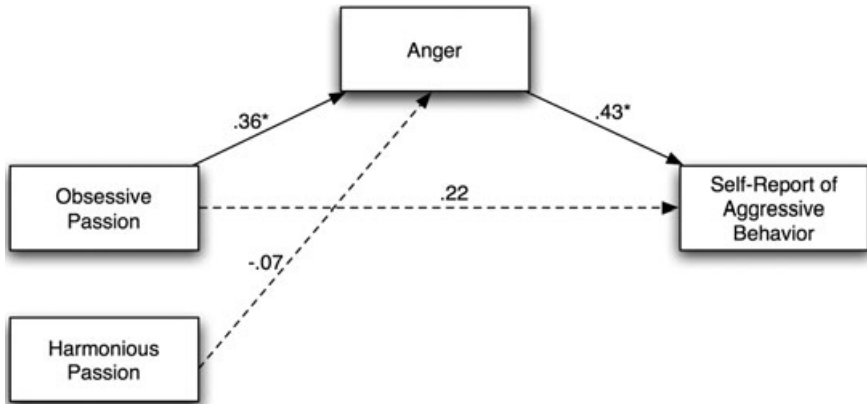


Figure 1. Beta coefficients for the pathways among the two types of passion, anger, and self-reported aggressive driving behavior. \* $p < .05$  (one-tailed). The dashed line indicates a non-significant path.

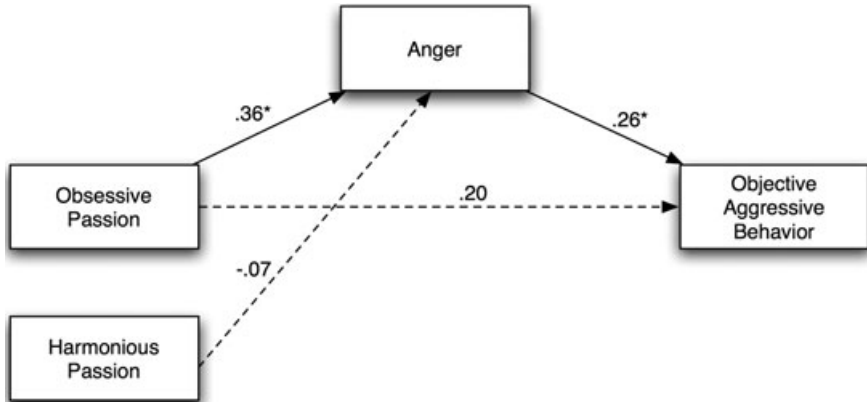


Figure 2. Beta coefficients for the pathways among the two types of passion, anger, and objective aggressive driving behavior. \* $p < .05$  (one-tailed). The dashed line indicates a nonsignificant path.

aggressive behavior ( $\beta = -.07$ , *ns*; see Figure 2). Probing of the mediation effect shows that it was significant ( $p < .05$ ; bias-corrected bootstrap 90% CIs = .0036, .0739). The results of the effect proportion mediated ratio show that 47% of the total effect was mediated by anger.

Taken as a whole, the present results support our hypotheses. First, the findings show that obsessive passion for driving was associated with the manifestation of aggressive driving behavior when faced with induced frus-

trating driving situations in a controlled environment. Harmonious passion was unrelated to aggressive driving behavior. These findings replicate those obtained in Studies 1 and 2. Furthermore, these findings were obtained with both self-report and observable behavioral measures of aggression. Second, the results show that when participants were faced with frustrating driving situations, anger was a mediator between obsessive passion and both self-report and objective aggressive driving behavior, while harmonious passion was not associated with anger.

### General Discussion

The purpose of the present research was to examine the relationship between passion and aggressive driving behavior. It is the first research to do so. A number of findings emerged. First, the results from all three studies reveal that an obsessive passion for driving was associated with aggressive behavior, while a harmonious passion for driving was unrelated to aggressive behavior. Second, the findings also uncovered that these relationships held true in three types of context: in general (through the DAX; Studies 1 and 2); in the report of a recent, real-life frustrating driving event (Study 2); and when frustrating events were induced under controlled laboratory conditions (Study 3). Finally, the results of Study 3 show that when participants were faced with frustrating events, anger mediated the relationship between obsessive passion and aggressive driving behavior. It is interesting to note that this latter result was obtained with both self-report and objective measures of aggression.

A first implication of the present findings is that they strongly support the applicability of the dualistic model of passion (Vallerand et al., 2003) to aggressive driving behavior. The present research supported the conceptual validity of the constructs of harmonious passion and obsessive passion for driving. Specifically, Study 1 confirmed the bifactorial structure validity of the scale with a confirmatory factor analysis. Furthermore, the internal reliability of the scale was shown to be adequate across all three studies. A second point dealing with support for the dualistic passion model is that, overall, the two types of passion were found to lead to different outcomes with respect to driving behavior. The results systematically show that obsessive passion positively predicted verbal and physical aggression when driving, and aggressive use of the vehicle. Harmonious passion was never found to be associated with these negative outcomes. Furthermore, as mentioned previously, these relationships held true in a variety of situations and with various samples. Therefore, these findings would appear to be rather robust.

A second implication of the present results is that they show that anger mediated the obsessive-passion/aggressive-driving-behavior relationship. If much research has focused on the role of anger in aggressive driving behavior (e.g., Deffenbacher et al., 2003; Deffenbacher, Lynch, Deffenbacher et al., 2001; Deffenbacher, Lynch, Oetting, et al., 2001), little research has examined the nature of the determinants of anger (to this effect, see Smart, Stoduto, Mann, & Adlaf, 2004).

The dualistic model of passion provides a theoretical framework to account for anger while driving and aggressive driving behavior. When the activity of driving is thwarted—such as in a traffic jam or when behind a slow driver—this interferes with the pleasure of the activity. When obsessively passionate, the person wants to pursue activity engagement because of an internal compulsion that comes to control him or her. Within such a state, being prevented from engaging in the activity by an external agent is conducive to anger toward this agent (Roseman & Smith, 2001; Scherer, 2001; Smith & Lazarus, 1993), thereby leading to maladaptive aggressive behavior.

Conversely, harmonious passion is not bred by an uncontrolled urge to engage in the activity, as the latter is engaged in out of choice. The person can then engage in self-regulation. In such a condition, the person might be able to control the experience of frustration when facing driving obstacles. Therefore, little or no anger is elicited, and no maladaptive aggressive behavior is exhibited. The results from Study 3 provide support for this sequence. Specifically, Study 3 replicated past findings showing that anger leads to aggressive driving behavior (Deffenbacher, et al., 2003; Deffenbacher, Lynch, Deffenbacher et al., 2001; Deffenbacher, Lynch, Oetting et al., 2001). However, Study 3 also reveals that only obsessive passion may lead to anger while driving, which, in turn, is conducive to aggressive driving behavior. Additional research is needed to better understand the role of harmonious passion in eliciting coping mechanisms that may prevent the experience of anger and aggressive driving behavior.

Another contribution of the present research is that Study 3 is one of the few studies to assess aggressive driving behavior in a laboratory setting with the use of a driver simulator. It is also the first to use judges to observe objective aggressive driving behavior. These methodological procedures provide strong support to the validity and reliability of the relationship observed between obsessive passion and aggressive driving behavior, and for the role of anger as a mediator of this relationship.

A last point concerns the measurement of aggression in driving. An important issue in the aggressive driving literature is the use of self-report (Lajunen & Summala, 2003). This methodology may be seen as questionable from a social desirability point of view. Study 3 shows that both self-report and observable measures of aggression were positively associated with obses-

sive passion and anger elicitation. Thus, another important contribution of Study 3 is to provide evidence that self-reports appear to represent valid indicators of aggressive driving behavior. While this may be so, it is also possible that participants might have been more inclined to be honest in their reporting of aggressive behavior, knowing that they were being video-recorded. Additional research is needed on this issue.

Some limitations of the present research must be underscored. A first limitation is that the present research dealt with aggressive driving reactions to frustrating driving situations, and did not specifically address road rage; that is, violent driving behavior. Therefore, the present results might not necessarily apply to road-rage behavior. Additional research on this issue is required. A second limitation is that only a self-report measure of anger was used in Study 3. Ideally, it might be preferable in future research to use physiological and behavioral indicators of anger in order to avoid social desirability and measurement problems associated with the self-report of emotions. A third limitation is that the sample used in Study 3 was relatively small and was composed only of males. In future research, larger samples of participants of both genders should be recruited in order to conduct more robust structural equation modeling analyses and firmly replicate the present findings.

A fourth limitation is that the present research cannot rule out an alternative explanation for the present results. Indeed, with obsessive passion, people might engage in driving because it may act to reduce tension. Therefore, people might engage in high-speed or risky behaviors in order to reduce tension (e.g., anger). Thus, facing obstacles might only exacerbate anger that already exists. Therefore, although with both types of passion, people value and like the passionate activity at similarly high levels, the reasons why they engage in the passionate activity might differ. While with harmonious passion, people might engage in driving because they enjoy the activity for itself; with obsessive passion, people might engage in driving because they enjoy the fact that driving reduces their tension. One way to verify this explanation would have been to use a baseline measure of anger in Study 3 or a measure of trait anger. However, we did not use such measures. Future research should use either a baseline level of anger or should control for trait anger in order to shed light on this issue.

Despite the aforementioned limitations, the present research offers preliminary information regarding the role of passion—especially that of obsessive passion—in aggressive driving behavior. Furthermore, the findings suggest that anger mediates the impact of obsessive passion on aggressive driving. Future research is needed to establish more firmly the psychological processes allowing harmonious passion to remain unrelated to aggressive driving behavior.

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