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# Conformity to gender stereotypes, motives for riding and aberrant behaviors of French motorcycle riders

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# 25 **Conformity to gender stereotypes, motives for riding and aberrant behaviors of French motorcycle riders**

## **Abstract**

30 As sex differences are very pronounced in motorcycle crashes, both in terms of number and severity, the present study aims to determine the relationship between gender, motives for riding a motorcycle, and risk-taking behaviors among motorcyclists. Declared aberrant behaviors, conformity to gender stereotypes and motives to ride a motorcycle were investigated among 2,262 riders of heavy motorcycles, through an Internet survey. Ages ranged from 18 to 78 years, 10.5% of the respondents were women. Results revealed the new scale on motives  
35 for riding a motorcycle was effective and allowed to show that competition motives were associated to masculinity, low femininity and youth. They also showed that maleness, masculinity, youth and competition motives were predictors of violations and femaleness and low masculinity were predictors of lapses. Furthermore, competition motives were also mediators between masculinity and aberrant behaviors, except for personal protective equipment negligence. This study gives new knowledge on the relationship between  
40 conformity to gender stereotypes, motivations and the behaviors of riders of heavy motorcycles. Results can be useful for adapting prevention campaigns to the small sub-groups that are the more at risk in the motorcyclists' population.

45 *Keywords: rider; motorcycle; gender; MRBQ; behavior; motives*

## INTRODUCTION

In many European countries, powered two-wheelers (PTW, include light and heavy motorcycles) are the vehicle category where road risk is the greatest. Despite a significant decrease in the number of fatal crashes (divided by three between 2000 and 2013) (ONISR, 2001, 2015), the risk of exposure to a road crash with a PTW is the highest in the French vehicle fleet. In France, in 2013, PTW riders accounted for 19.3% of fatalities, whereas they represented only 1.3% of the whole road traffic (ONISR, 2015). The risk of dying in a road crash is 23 times higher for the PTW riders than for car drivers (ONISR, 2015).

The number of female riders has greatly increased in the last decade: in 2012, they represented 5% of riders of heavy motorcycle (HM, motorcycles over 125 cc, which require a specific license, the A license, to ride this motorcycle category) and 10% in 2012 (ONISR, 2015). Female riders were less involved in PTW injury crashes than males and especially in fatal crashes: whereas they now represented 25% of the PTW rider population (FFSA & GEMA, 2012), they represented only 3% of the riders of PTW involved in a fatal crash (ONISR, 2017).

In 2015, it was observed that French riders between 18 and 34 years old were the riders population the most involved in fatal and injury crashes: they represented 50% of the riders involved in a fatal crash and 45% of the injured riders due to a road crash, when they represented only 20% of the whole rider's population (ONISR, 2016). Researchers showed that young drivers tended to declare riskier behaviors than more experienced drivers (Aberg & Rimmö, 1998; Lassarre, Coquelet, Hoyau, & Lahatte, 2008; Obriot-Claudiel & Gabaude, 2004; Özkan & Lajunen, 2006). Others studies also showed that the youngest drivers committed more violations (Aberg & Rimmö, 1998; de Winter & Dodou, 2010; Guého, Granié, & Abric, 2014; Obriot-Claudiel & Gabaude, 2004; Özkan & Lajunen, 2005, 2006; Parker, Reason, Manstead, & Stradling, 1995) and more errors (de Winter & Dodou, 2010; Guého et al., 2014). A study on riders, based on the theory of Reasoned Action and the Health Beliefs Model showed that youth played a greater role in risky behaviors and believes rather than inexperience (Rutter & Quine, 1996).

Besides this age effect, sex differences are well known in risk-taking. Studies showed that male drivers have more injury and fatal crashes, commit more offences (Laapotti, Keskinen, Hatakka, & Katila, 2001; ONISR, 2016) and take more risks than females ones (Barjonet, 1990; Cestac & Delhomme, 2012; Lawton, Parker, Stradling, & Manstead, 1997; Özkan & Lajunen, 2005; Pravossoudovitch, Martha, Cury, & Granié, 2015). Males also tend to

80 overestimate their driving skills (Boccaro, Delhomme, Vidal-Gomel, Dommès, & Rogalski, 2010) and evaluate their own driving skills more positively than females do (Delhomme & Meyer, 2004; Katila, Keskinen, Hatakka, & Laapotti, 2004). Males' driving skill assessment is negatively correlated to their risk (Matthews & Moran, 1986) and to their tendency « to drive over the speed limits » (Parker et al., 1995; Reason, Manstead, Stradling, Baxter, & Campbell, 1990). Therefore, males tend to evaluate positively their own driving skills, which make them taking more risks while driving, and, thus, having more crashes. Furthermore, males declare taking more risk and committing more offences, while females declare less traffic rules violations (Aberg & Rimmö, 1998; Byrnes, Miller, & Schafer, 1999; Lawton et al., 1997; Özkan & Lajunen, 2005, 2006; Reason et al., 1990; Simon & Corbett, 1996) and being more respectful of the traffic rules (Guého, 2015; Tom & Granié, 2011). Researchers showed that males tend to take more risk by deliberately breaking the traffic rules (Byrnes et al., 1999; Lawton et al., 1997; Reason et al., 1990; Simon & Corbett, 1996).

However, some studies showed that gender (Bem, 1974; Fontayne, Sarrazin, & Famose, 2000; Gana, 1995) would be a better predictor of risk-taking behavior than sex (Granié, 2009, 2010; Raithel, 2003). Sex and gender have to be distinguished. Sex refers to the biological aspect of the individual (male vs female), whereas gender can be defined as “the characteristics and traits socially and culturally considered as appropriated to males and females” (Unger, 1979), it represents the psychological and social aspect of the individual's sex (masculinity and femininity) (Hurtig, Kail, & Rouch, 2002; Hurtig & Pichevin, 1986; Unger, Hurtig, & Pichevin, 1986). Studies showed that high masculinity, which is strong conformity to masculine social stereotypes, is linked to higher risk-taking in many activities, such as playing sport (Cazenave, Le Scanff, & Woodman, 2003) or car driving (Guého, Granié, & Abric, 2012a; Özkan & Lajunen, 2006; Schmid Mast, Sieverding, Esslen, Graber, & Jäncke, 2008). Furthermore, driving is an activity which skills are associated to males (Berger, 1986; Degraeve, Granié, Pravossoudovitch, & Lo Monaco, 2015; Granié & Pappafava, 2011; Pravossoudovitch et al., 2015). The driving perceptual-motor skills are stereotypically associated with males and this activity is considered as consistent with the masculine social role (Chateignier, Chekroun, Nugier, & Dutrévis, 2011; Degraeve et al., 2015; Félonneau & Becker, 2011; Granié & Pappafava, 2011; Pravossoudovitch, 2016; Sümer, Özkan, & Lajunen, 2006). The road safety skills are stereotypically associated with females (Degraeve et al., 2015; Granié & Pappafava, 2011; Pravossoudovitch, 2016; Sümer et al., 2006). Furthermore, these stereotypes affect the individuals' behaviors. Regardless of the individual's sex, the more he/she adheres to the gender stereotypes associated with driving for

one of the two sex groups, the more he/she declares demonstrating the typical driving  
115 behaviors of this sex (Pravossoudovitch, 2016). This relation was also observed with  
pedestrians (Granié, 2008, 2009): individuals who have a high conformity to masculine  
gender stereotypes endorse more risk-taking and violations than those who have a high  
conformity to feminine gender stereotypes. To our knowledge, it has not hitherto been studied  
120 among motorcyclists, whereas we know that motorcycling is a mode of transportation  
essentially used by males, with a very specific crash risk (FFSA & GEMA, 2012; ONISR,  
2016; Oudin, 2009). Thus, we can make the hypothesis that demographic variables (such as  
sex and age) and psychosocial variables (such as gender) affect risky riding behavior.

A differentiation of risky behaviors should be made between violations – intentional – and  
mistakes – unintentional – that have different psychological sources and therefore involve  
125 different means of prevention and education (Reason et al., 1990). Thus, transgressions  
involve motivational determinants and imply changing psychological attitudes, whereas  
mistakes involve cognitive failures and specific training could be used. On a second level,  
among mistakes, errors must be differentiated from lapses, where lapses (slips and  
inattention) are involuntary deviations in the action, whereas errors concern failures in intent  
130 (Reason et al., 1990). This distinction between violations, errors and lapses has been  
examined in several studies on drivers using the Driver Behavior Questionnaire (Reason et  
al., 1990).

Tools derived from the Driver Behavior Questionnaire (DBQ) (Reason et al., 1990) have been  
developed to specifically measure riders' declared behaviors. One of the most complete  
135 questionnaires on riders' behaviors based on the conceptual framework of the DBQ is the  
Motorcycle Rider Behaviour Questionnaire (MRBQ) used for PTW riders and developed in  
United Kingdom by Elliott and colleagues (Elliott, Baughan, & Sexton, 2007). This tool was  
also validated in Turkey (Özkan, Lajunen, Doğruyol, Yıldırım, & Çoymak, 2012), in Brazil  
(Coelho et al., 2012), used in France (Banet, 2010), and was adapted to the Iranian riders  
140 (Motevalian, Asadi-Lari, Rahimi, & Eftekhari, 2011) and the Australian riders (Sakashita,  
Senserrick, Lo, Boufous, & de Rome, 2014; Stephens et al., 2017).

Thus, in motorcycle riding as in sports, different types of practices and motives associated can  
be differentiated. Riding a motorcycle can be linked to sport, with a strong physical  
involvement and shared motivations. These types of practice are more or less dangerous, and  
145 motives can be used as a marker of commitment to action. Based on the sensation seeking  
concept developed by Zuckerman (Zuckerman, 1979, 1994), which stated a link between  
sensation seeking and risk taking, Recours and colleagues (Recours, Souville, & Griffet,

2004) differentiated four motives to sport practice. *Competition* is the accomplishment derived from feeling stronger than others, where individuals participate to the activity to prove themselves (Duda, 1995; Recours et al., 2004). *Exhibitionism* is showing ones superiority to others, where individuals want to be seen and to impress others (Recours et al., 2004). *Sociability* is the will to share and to interact with others (Griffet, 1994; Recours et al., 2004). *Playing to the limits* is going as far as the individual can, until feeling conflicting sensation between scare and safety (Recours et al., 2004). Note that Tunnicliff et al. (Tunnicliff et al., 2012) use the concept of *pushing the limits*, defined as one of the three riskiest riding behaviors that can lead to a crash. However, the definition of these behaviors proposed by Recours et al. (2004) was more detailed and accurate and was used in this study. This study showed that motives in sport practices differed according to individuals' sex: males declared more motives related to competition and exhibitionism, whereas females frequently declared motives related to sociability (Recours et al., 2004). Furthermore, one study on the relationship between sporting practices and risky driving shown that male high-risk sport practitioners (e.g. BASE jumpers or paragliders) have more risky behaviors and traffic crashes as drivers than those who practice low-risk sports (e.g. swimming or dancing) (Martha, Laurendeau, & Griffet, 2010). According to the authors, this specific population of sportsmen developed a high self-confidence due to their sporting practices, which leads them to take more risks in their daily activities, such as driving a car.

Some previous studies (Bem, 1981; Kelling, Zirkes, & Myerowitz, 1976) also showed that conformity to masculine stereotypes made individuals more prone to declare risk-taking and being confident, whereas concern for others was a feminine behavior. Although, other studies showed similar links among car drivers and pedestrians (Granié, 2008; Pravossoudovitch, 2016) where risk-taking was closely related to masculinity. To our knowledge, no study has yet explored the relationship between gender stereotype conformity, motives and riders' behaviors.

The objective of the present study is to analyze the effects of the conformity to masculine and feminine stereotypes and of the different motives to ride on the riders' risk-taking behaviors. Based on the scientific literature, we expect high conformity to masculine stereotype and motives linked to competition and playing with the limits to be linked to higher risk taking behaviors. Furthermore, as the literature showed, motives linked to competition and exhibitionism, were more frequent among males (Recours et al., 2004). It was also showed that masculinity was linked to risk taking (Cazenave et al., 2003; Guého, Granié, & Abric, 2012b; Özkan & Lajunen, 2006; Schmid Mast et al., 2008). We expect to identify a link

between sex, gender stereotype conformity and motives, but also between motives and aberrant behaviors on our riders' population. More specifically, we expect to find that motives, like competition and exhibitionism, would be a mediator in the relationship between masculinity and risk-taking while riding, in this population where males are over-represented (FFSA & GEMA, 2012; Oudin, 2009).

## ***Method***

### *Materials*

Motorcyclists were recruited through social networks and web forums and were invited to respond to an anonymous online 20 minutes questionnaire entitled "Powered two-wheelers and sport practices". This questionnaire was presented as a research on PTW riders, with no more information, except that the results would be completely anonymous and that we needed to have the most truthful answer, knowing that there was no good or no bad answer.

The first part of the questionnaire was devoted to demographic questions (sex, age, socio-economic status) and motorcycle usage (license age, motorcycle category, annual average mileage and crash number of the last 12 months).

The second part is devoted to the Motorcycle Rider Behavior Questionnaire (MRBQ), to the motives for riding a motorcycle and to the Bem Sex-Role Inventory (BSRI) (Bem, 1974; Fontayne et al., 2000; Pfeffer, Fagbemi, & Stennet, 2010).

To measure riders' aberrant behaviors, the present study used the French version of the Motorcycle Rider Behaviour Questionnaire (Coquelet, Granié, & Griffet, Submitted). This version was developed for the French riders' population, and was based on the original British Motorcycle Rider Behaviour Questionnaire (Elliott et al., 2007) and the French version of the Driver Behavior Questionnaire (Guého et al., 2014).

On a six-point Likert scale (from 'never' to 'almost always'), the MRBQ was developed to determine motorcyclists' risky declared behaviors. The scale is made of 25 items, differentiating five dimensions: aggressive violations (five items, e.g. 'You get angry with a certain type of driver and show him your hostility by any available means'); lapses (eight items, e.g. 'Distracted or pre-occupied, you belatedly realize that the vehicle in front has slowed and you have to brake hard to avoid a collision'); personal protective equipment (PPE) negligence (three items, e.g. 'You ride short distances without fastening your helmet'); deliberate risk-taking (four items, e.g. 'You intentionally do a "wheelie".'); ordinary violations (five items, e.g. 'You straddle lane to overtake the vehicles in front of you').



215 Cronbach's alphas are acceptable (aggressive violations,  $\alpha=0.70$ ; lapses,  $\alpha=0.73$ ; deliberate risk-taking,  $\alpha=0.71$ ; ordinary violations,  $\alpha=0.71$ ), except for PPE negligence ( $\alpha=0.49$ ). Despite the low PPE negligence Cronbach's alpha, we decided to keep this factor to stay as close as possible to the previous MRBQ versions, included this version of Sakashita and colleagues (Sakashita et al., 2014) which alpha was .47.

220

Scale on motives for riding a motorcycle was based on a validated scale on sport motivations (Recours et al., 2004). The original scale was composed of 13 items differentiating four dimensions: competition (3 items), exhibitionism (3 items), sociability (3 items) and playing to the limit (4 items). To reduce the questionnaire's time administration and as the objective  
225 of the study was to explore the effects of competition, exhibitionism, playing to the limits and sociability on risk-taking while riding, some of the items, related to these dimensions, were selected from the original scale. Thus, the scale was composed of eight items. First, items defined by individual's confrontation to his/her own performance and other performance were selected. Two items were related to playing to the limit, that is self-confrontation ('to take risks', 'situations which give me at the same time a safe and an unsafe feeling'); three items  
230 were related to competition, that is competition with others ('to face challenges', 'To ride as fast as possible', 'to race'). Second, items related to two types of relationship with others were selected. Two items were related to exhibitionism ('to be looked at', 'to attract attention by the way I ride'); and one item, was related to sociability ('to share an experience, a moment with others'). Participants were invited to respond on a six-point Likert scale (from 'strongly disagree' to 'strongly agree') to these eight items: 'Here you can find some examples of what can be pleasant for a rider. For each example, tell us what you like or would like to do as a rider.'

To measure riders' conformity to gender stereotypes, the BSRI (Bem, 1974) was used, in its  
240 short French version validated by Fontayne et al. (Fontayne et al., 2000). This version consisted of 18 items. Ten items (e.g. I care for others') measured 'Femininity' and eight items measured 'masculinity' (e.g. 'I am dominant'). The riders were invited to respond on a seven-point Likert scale (from 'never true' to 'always true'): 'In the following proposals, tell what is the most notable in your character.' The reliability of these two factors (masculinity  
245 and femininity) was good (Cronbach's alphas: masculinity,  $\alpha=0.812$ ; femininity,  $\alpha=0.879$ ).

## Participants

This self-reported questionnaire was distributed through social networks, motorcyclists' web forums and websites, and via a targeted email campaign. The Internet is an effective medium for the posting, exchange, and collection of information in psychology and sociology-related research and data. Moreover, this way of administration is easier, less expensive than and as reliable as the more traditional paper-and-pencil way (Gosling, Vazire, Srivastava, & John, 2004; Riva, Teruzzi, & Anolli, 2003).

Only people who rode a PTW vehicle on open roads were invited to participate to this survey (individuals who only drive on racetracks or off-road were eliminated). The participants then comprised 2,500 riders from all over France, with 1% moped riders, 7.7% light motorcycle riders (motorcycles under 125 cc, that can be ride with a simple two-year-old car license) and 90.5% heavy motorcycles (HM, motorcycles over 125 cc). To avoid any bias in our results with such an imbalance between these three groups, it was decided to work exclusively on the HM rider sample. It should be noted that in France only adults over 18 years old, with a specific driving license (the A license) are allowed to ride HM.

The distribution by sex was consistent with the distribution of the French motorcyclist population: 10.5% of the sample was women whereas 12% of the 'active' riders of HM (as a driver and not as a passenger) in France in 2010 were women (ONISR, 2011).

Ages ranged from 18 to 78 years: 45.8% were aged 30-49. The mean age was 37 years (Male:  $M=37.03$ ,  $SD=12.19$ ; Female:  $M=36.35$ ,  $SD=10.98$ ). As presented in Table 1, the participants were separated into five age groups. The distribution by age was close for the two sexes ( $Khi2_{(ddl=4)}=2.49$ ,  $ns$ ). The youngest (18-25) were divided in two sub-groups (18-20 and 21-24) to see if potential aberrant behaviors of the very young riders can be distinguished from the others.

**Table 1. Numbers by sex for each age group**

Sex	Age group (years)					Total
	18-20	21-24	25-29	30-49	50-80	
Male	88	293	334	926	384	2025
Female	9	29	47	110	42	237
Total	97	322	381	1036	426	2262

## Results

### 275 *Motives for riding a motorcycle*

First, to use motives as independent variables, a principal component analysis with direct Oblimin rotation was carried out on all eight items of the riding motive scale. The scree plot indicated a two-factor solution, which accounted for 64.08% of the total variance. Table 2 shows the means, standard deviations and loadings on each axis for each item of the two-factor solution. An item loaded  $>0.39$  on both factorial axes was excluded (“to draw our  
280 attention by the way I ride”).

285 **Table 2. Means and standard deviations for the eight motives items and the two-factor solution (direct oblimin rotation)**

Items (number)	Mean (SD)	1	2
To race	1.93 (1.255)	.863	
To face challenges	1.92 (1.272)	.844	
To ride as fast as possible	2.27 (1.274)	.813	
To take risks	2.02 (1.137)	.802	
Situations which give me at the same time a safe and an unsafe feeling	2.20 (1.284)	.760	
To be looked at	3.08 (1.570)		.847
To share an experience, a moment with others	4.74 (1.422)		.763

The first axis, competition motives, explained 51.94% of the variance. It was defined by five items related to competition and to playing to the limit. All these items had in common the idea of competition (self-competition or competition with others).

290 The second axis, social motives, explained 14.46% of the variance and was determined by two items: an item related to exhibitionism and an item related to sociability. These two items were defined by the notion of relationship with community, by differentiating oneself from others or by sharing with others.

Whereas the reliability of the competition motives is acceptable ( $\alpha=0.875$ ), the reliability for  
295 social motives was very low ( $\alpha=0.463$ ) and this dimension was not kept for further analysis.

### *Relationship between sex, age, gender and motives for riding a motorcycle*

A regression model was developed to predict the effect of sex, age, and conformity to gender stereotypes as independent variables and competition motives for riding a motorcycle as  
300 dependent variables (see Table 3).

**Table 3. Standardized regression coefficients and significance levels for competition motives for riding a motorcycle**

	Competition motives
Sex <sup>a</sup>	-.036
Age	-.351***
Femininity	-.083***
Masculinity	.226***
Adjusted R <sup>2</sup>	.185***

\*  $p < 0.05$     \*\*  $p < 0.01$     \*\*\*  $p < 0.001$

305    <sup>a</sup> 1 = Male, 2 = Female

The model was significant ( $F_{(4,2019)}=115.64$ ,  $p<.001$ ) for competition motives, explaining 18.5% of the variance and showed that competition motives for riding a motorcycle were associated with respondent's age and conformity to gender stereotypes. Masculinity was positively associated with the reported competition motives for riding a motorcycle, whereas age and femininity were negatively associated with them.

*Relationship between all variables and MRBQ dimensions*

To test our hypothesis, regression analysis were made to determine which variables were predictors of each of the five MRBQ dimensions: aggressive violations, lapses, PPE negligence, deliberate risk-taking and ordinary violations. For each of the five continuous variables (aggressive violations, lapses, PPE negligence, deliberate risk-taking and ordinary violations), a first model was tested, with sex (male vs female), age, femininity and masculinity as predictors. In a second model, the competition motives dimension was added (see Table 4). The aim of this procedure in two steps was to test the mediating role of motives to ride a motorcycle in the relation between gender and aberrant behaviors. The regression procedure advocated by Baron and Kenny (Baron & Kenny, 1986) was followed. It first requires that the mediating variable (e.g., competition motives) be related to the independent variable (e.g., gender) and the dependent variable (e.g., aberrant behaviors). In addition, the other requirement specified by Baron and Kenny is that a mediating variable should predict the dependent variable (aberrant behaviors) even when the independent variable (gender) is statistically controlled, while the effect of the independent variable on the dependent measure should be substantially reduced when the mediating variable is statistically controlled. To confirm the mediation, Sobel tests (z-score test) were performed (Baron & Kenny, 1986; "Interactive Mediation Tests," n.d.).

**Table 4. Standardized regression coefficients and significance levels for MRBQ dimensions**

		Aggressive violations	Lapses	PPE negligence	Deliberate risk-taking	Ordinary violations
Model 1	Sex <sup>a</sup>	-.037	.059**	-.008	-.094***	-.035
	Age	-.323***	-.057*	.070**	-.275***	-.179***
	Femininity	-.061**	-.002	-.023	-.091***	-.128***
	Masculinity	.132***	-.111***	.009	.223***	.210***
	<i>Adjusted R</i> <sup>2</sup>	.129***	.017***	.003*	.144***	.082***
Model 2	Sex <sup>a</sup>	-.022	.068**	-.004	-.073***	-.016
	Age	-.184***	.029	.108***	-.079***	.007
	Femininity	-.029	.019	-.014	-.045*	-.084***
	Masculinity	.042*	-.166***	-.015	.097***	.091***
	Competition motives	.396***	.244***	.107***	.558***	.528***
	<i>Adjusted R</i> <sup>2</sup>	.257***	.065***	.012***	.398***	.309***

\*  $p < 0.05$     \*\*  $p < 0.01$     \*\*\*  $p < 0.001$

335 <sup>a</sup> 1 = Male, 2 = Female

The first model for aggressive violations was significant ( $F_{(4,2019)}=75.97$ ,  $p<.001$ ). Age and femininity inhibited whereas masculinity reinforced aggressive violations. The second model, with the introduction of competition motives, was also significant ( $F_{(5,2018)}=140.66$ ,  $p<.001$ ).  
 340 Femininity ( $\beta=-.061$ ,  $p<.01$ ) became non-significant when competition motives was statistically controlled ( $\beta=-.029$ , *ns*), but a simple regression with femininity and competition motives showed that femininity has no effect on competition motives, which means that competition motives was not a mediator between femininity and other variables. Masculinity ( $\beta=.132$ ,  $p<.001$ ) became less significant when competition motives was statistically  
 345 controlled ( $\beta=.042$ ,  $p<.05$ ). To test whether this pattern of results reflects a significant reduction in the variance accounted for by masculinity, a  $z$ -score test (Sobel test) was performed (“Interactive Mediation Tests,” n.d.; “Mediation (David A. Kenny),” n.d.). The Sobel test was significant ( $z=9.854$ ,  $p<.001$ ) and showed that competition motives mediated the relationship between masculinity and aggressive behaviors, a high masculinity level was  
 350 positively associated with competition motives to ride a motorcycle which were positively associated with aggressive violations.

The first regression model for lapses was significant ( $F_{(4,2019)}=9.89$ ,  $p<.001$ ). Femaleness was positively associated, whereas age and masculinity were negatively associated with lapses. The second model was also significant ( $F_{(5,2018)}=29.27$ ,  $p<.001$ ) and showed that femaleness  
 355 and competition motives were positively associated, whereas masculinity was negatively associated with lapses. Masculinity ( $\beta=-.111$ ,  $p<.001$ ) remained significant when competition motives was statistically controlled ( $\beta=-.166$ ,  $p<.001$ ) but the Beta decreased. The Sobel test was significant ( $z=7.411$ ,  $p<.001$ ) and showed that competition motives mediated the

relationship between masculinity and lapses. A high masculinity level was positively  
360 associated with competition motives to ride a motorcycle, which was positively associated  
with lapses.

The first model for PPE negligence was significant ( $F_{(4,2019)}=2.73, p<.05$ ) and showed that age  
reinforced PPE negligence. The second model was also significant ( $F_{(5,2018)}=6.00, p<.001$ ) and  
365 showed that PPE negligence was positively associated with age and competition motives for  
riding a motorcycle.

The first model concerning deliberate risk-taking was significant ( $F_{(4,2019)}=86.32, p<.001$ ) and  
showed that femaleness, age and femininity were negatively associated whereas masculinity  
was positively associated with risk-taking behaviors. The second model was also significant  
370 ( $F_{(5,2018)}=268.77, p<.001$ ) and showed that competition motives for riding a motorcycle was  
also positively associated with risk-taking behaviors. Masculinity ( $\beta=.223, p<.001$ ) remained  
significant when competition motives was statistically controlled ( $\beta=.097, p<.001$ ) but the  
Beta decreased. The Sobel test was significant ( $z=10.27, p<.001$ ) and showed that competition  
motives mediated the relationship between masculinity and deliberate risk-taking. A high  
375 masculinity level was positively associated with competition motives to ride a motorcycle,  
which was positively associated with deliberate risk-taking.

The first model for ordinary violations was significant ( $F_{(4,2019)}=46.38, p<.001$ ) and showed  
that femaleness and femininity were negatively associated whereas masculinity was positively  
associated with ordinary violations. The second model was also significant ( $F_{(5,2018)}=181.95,$   
380  $p<.001$ ) and showed that competition motives for riding a motorcycle was also positively  
associated with ordinary violations. Masculinity ( $\beta=.210, p<.001$ ) kept significant when  
competition motives was statistically controlled ( $\beta=.091, p<.001$ ) but the Beta decreased. The  
Sobel test was significant ( $z=10.051, p<.001$ ) and showed that competition motives mediated  
the relationship between masculinity and ordinary violations, which means that a high  
385 masculinity level was positively associated with competition motives to ride a motorcycle  
which was positively associated with ordinary violations.

## DISCUSSION

The aim of this study was to analyze the effects of the conformity to masculine and feminine  
390 stereotypes, of the different motives to ride on the riders' risk-taking behaviors and to explore

the mediated relationship between masculinity and risk-taking by the competition motives to ride a motorcycle.

395 According to our results, sex and gender were predictors of MRBQ dimensions: Femaleness and low masculinity were associated with lapses, while maleness, low femininity and high masculinity were associated with violations. These results are in line with other studies that showed a greater propensity among females to declare more errors and males to declare more road transgressions (Aberg & Rimmö, 1998; Özkan, Lajunen, & Summala, 2006; Pravossoudovitch, 2016). This could be explained by gender stereotype conformity: the present study showed that masculinity was positively associated with ordinary violations and 400 deliberate risk taking, and negatively associated with lapses. Femininity was negatively associated with aggressive and ordinary violations. Previous studies (Bem, 1981; Granié, 2013; Kelling et al., 1976) showed that in western societies, masculinity is stereotypically associated with risk-taking. Risk-taking has a greater social value for males than for females (Hopkins & Emler, 1990), and this is probably why male riders declared more violations, 405 mainly in a masculine and coded sub-group such as that of motorcycle riders (Berger, 2007; Favre, 1980; Oudin, 2009).

It was shown that age was associated with PPE negligence (for the oldest participants), deliberate risk-taking and aggressive violations (for the youngest participants). In the literature on riders as well as on drivers (Aberg & Rimmö, 1998; Özkan & Lajunen, 2005; 410 Özkan et al., 2006; Rutter & Quine, 1996), it was found that the youngest declare more violations than the oldest, in particular for young males.

The results showed that competition motives were associated with gender and age: masculinity was positively associated with competition motives, whereas femininity and age were negatively associated with competition motives. Youth, high masculinity and low 415 femininity were associated with of competition motives. Recours et al. (2004) observed that, in sport practice, females were more likely to be motivated by sociability, whereas males were more attracted by competition and exhibitionism. As previously shown in the literature (Bem, 1974; Fontayne et al., 2000), the results of the present study show that males and more generally individuals complying with masculine gender stereotypes are more motivated by 420 self-confidence and competition, which are conducive to more risk-taking.

The present study showed that our new scale for motives for riding a motorcycle, based on a sport practicing study, was effective. It allowed to highlight two major dimensions (competition motives and social motives) and to gain new information on the reasons why

riders have chosen to ride a motorcycle and how these motives could affect the way the riders  
425 behave on HM.

As Recours et al. (2004, p.2) stated, for sport practices, “motive is an interaction of internal  
factors (unconscious and conscious psychological compulsions) and external factors (social  
and familial gratification and recognition).” Here, for motorcycle practice, competition  
430 motives can be associated with ‘internal factors’ and social motives with ‘external factors’, as  
the first involve an action to test and surpass oneself; the second are related to social  
recognition and significance, by differentiating oneself or sharing an experience. Results  
hence showed that competition motives were positively associated with all the MRBQ  
dimensions. The more the riders declared competition motives to ride a motorcycle, the more  
they declared aberrant behaviors. It was also shown that motives were mediators between  
435 gender and all the aberrant behaviors, except PPE negligence. It seems that riding for  
competition motives, which are highly associated with masculinity as our results showed,  
played a masculinity booster role, which means that people who have a high level of  
masculinity tended to declare aberrant behaviors, and that this phenomenon is reinforced if  
they also declared competition motives to ride a motorcycle. Thus, level of masculinity leads  
440 participants to be more motivated by playing to the limit, competition and challenge that bring  
them to declare more frequently aberrant behaviors.

Some limitations should be taken into account. Some studies showed that declared behaviors  
collected with the DBQ or tools developed from the DBQ are very close to the real road  
users’ behaviors. First, the responses to the DBQ seem not to be affected by the social  
445 desirability (Lajunen & Summala, 2003; Sullman & Taylor, 2010). Then, other studies  
showed that some behaviors highlighted by the DBQ were valid measures of actual behaviors  
(Zhao et al., 2012; Helman & Reed, 2015). Thus, even if we cannot guarantee that the  
aberrant behaviors highlighted by the present study are the effective riders’ behaviors, we can  
suppose they are close to their real way to ride.

450 Moreover, the individuals targeted are riders who are often passionate about motorcycles.  
According to Crosset & Beal (1997), individuals who belong to a sub-world, like that of  
heavy motorcycles, are passionate and readily take part in a questionnaire designed for them.  
Moreover, the participants were essentially recruited through social media (specialized pages  
on social networks and web forums), which means that this population can be considered  
455 motorcycle ‘specialists.’ This could have skewed our results, since our sample may not be  
representative of the entire French rider population. New studies should be conducted on the  
more general population of riders (especially one that does not only use PTW) and on car



drivers, allowing comparing the results on these two road users' populations. However, this study already gives new knowledge concerning the riders of HM, especially on the link  
460 between aberrant riding behaviors and sex, gender, motives for riding.

## Appendix

465

### MRBQ's five dimensions and 25 items

Dimensions	Items
Aggressive violations	You sound the horn, roar your engine, or flash your headlight to show your irritation to another driver
	You can't overtake the vehicle in front of you, whose speed is too slow according to you, and you make the driver understand by gesturing at him
	You get angry with a certain type of driver and show him your hostility by any available means
	A driver bothers you. You overtake and cut him up You 'stick' to the vehicle ahead of you
Lapses	You notice belatedly the flashing green arrow authorizing you to turn
	You notice belatedly the light has turned green
	Distracted or pre-occupied, you belatedly realize that the vehicle in front has slowed and you have to brake hard to avoid a collision
	You lose your balance and nearly fall while you're stopped
	You stall when stopping or getting going again
	You enter a bend too fast and feel as if you might lose control You mean to ride to destination A, and you 'wake up' on the road to destination B, maybe because you are accustomed to going there You forget to raise the stand before selecting first gear
PPE negligence	You decide not to wear gloves
	You ride short distances without fastening your helmet
	You ride without wearing specific motorcycle protective clothes
Deliberate risk-taking	You intentionally do a 'wheelie'
	You intentionally brake hard to do a 'stoppie'
	You intentionally do a wheel spin You get involved in unofficial races with other riders or drivers
Ordinary violations	You straddle lanes to overtake the vehicles in front of you
	You disregard the speed limit late in the evening, at night or in the early hours of the morning
	You open up the throttle and just 'go for it' on country roads
	You ride on the zebra areas or on the emergency lanes to jump ahead of vehicles which are stopped or driving slowly You ride between two lanes of fast moving traffic

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