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Research Article

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## French Motorcyclists and the 80 km/hr Speed Limit: Conditionality and Risk-Taking with Regard to Age, Type and Power of Motorbike

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### Abstract

After months of controversy, the speed limit on two-way secondary French roads without a median strip was reduced from 90 to 80 km/hr on 1 July 2018. Thousands of car drivers and motorcyclists have since protested against this measure, and the present study concerned the latter group. Starting from the Theory of Conditionality in the field of social thinking, which holds that prescriptions are massively conditional, a specific questionnaire based on 23 conditional scripts has been devised. A total of 661 male motorcyclists were asked about the conditions justifying the transgression of the 80 km/hr limit. Results showed that those motorcyclists who exceeded this limit did so by at least by 20 km/hr. A personalized assessment of speed, the pleasure associated with driving, and good road and weather conditions were the most conditional situations, while situations linked to the risk of loss of control were the least conditional. This study suggests that the determinants of risk-taking must be studied at the group and context levels, and that behavior is influenced by the system of social norms. Although this system may conflict with the Highway Code, it reflects an adaptation of the group linked to a need for meaning.

**Keywords:** Motorcyclists, 80 km/hr., Theory of conditionality, legitimate transgressions, social behavior

### 1. Introduction

Speeding is a crucial factor in fatal accidents on French roads, especially outside built-up areas. On 1 July 2018, the French Government reduced the speed limit from 90 to 80 km/hr. on two-way roads without a median strip. It promised to study the impact of this measure on accidents with “precision and objectivity” (CISR, 2018 (Interdepartmental Committee on Road Safety)). A study among motorists prior to this reduction showed that this measure was not understood. It was considered by road professionals to be pointless. As Catteau and Gaymard [3] wrote: “The problem of the measure’s credibility rests firstly on the belief that it is a measure to make motorists pay” (our translation, p. 59). Ever since this measure was announced, there has been a continual wave of demonstrations and

discontent, especially among members of the French Federation of Angry Motorcyclists (FFMC), who have requested meetings with regional authorities to put forward arguments in favor of withdrawing this measure.

However, accident figures for motorcyclists are high, given that they only make up 1.6% of total traffic. The riders of two-wheelers have a significantly higher death risk than car drivers [5, 21]. Motorcyclists represented 19% (N = 627) of road deaths in France in 2018 [19]. Over the same distance, the risk of being killed is 22 higher for a person on a motorcycle than for a person in a car. This figure rises to 26 for riders of high-powered motorcycles [19]. Concerning age group, 18 - 34 year-olds represent 40% of the motorcyclists who are killed and 44% of those who are injured. It worth noting that according to the results, 61% of motorcyclists killed were driving on roads outside built-up areas, 31% in built-up areas, and 8% on motorways. While motorcyclists are mainly killed in collisions with private cars (N = 262, 42%), many motorcyclists also die without the involvement of a third party (211 of the 627 motorcyclists killed in 2018; 34%). The figures also tell us that mortality increases with the power of the motorbike: 39% of motorcyclists killed had high-powered motorbikes, and this figure reached 44% for accidents without a third party.

Derived from research on the normative and peripheral aspects of social representations, the theory of conditionality [10, 11, 12] emphasizes that social prescriptions are conditional [7, 9], and has served as a framework for several studies in the field of road safety. Until now, these studies have concerned either just motorists, focusing on their age and sex, or interactions between motorists and pedestrians. This research shows that the Highway Code is practiced conditionally, and that more debatable a rule is, the less it is respected. These legitimate transgressions of rules of the Highway Code are considered acceptable by drivers [8, 10, 11]. Use of the Conditional Scripts Questionnaire (CSQ), which compares different road scenarios (speed limit, red light, amber light, stop sign, continuous line, no entry, seat belt), has shown that respecting the speed limit is the most conditional. Other highly conditional situations justifying transgressions include infrastructures, type of vehicle, being alone or not, time pressures, the purpose of the journey, distraction, the environment (clear road), and knowing the road. "You have been drinking" and "You have toddlers in the car" are the least conditional [10]. When comparing young drivers with older drivers, the speed limit scenario remains the most conditional for both groups, although young drivers have higher overall conditionality scores than older ones. Scenarios can also be superimposed, showing "the existence of shared conditionality" [12, p. 3]. Recent studies show that very young drivers (18-19) are less conditional than young ones (20-24). Conditionality changes over time and adapts to the means of automatic check sanctions. Since the installation of red-light-cameras, there has been less conditionality in this scenario, whereas conditionality has increased for the continuous white line, and there seems to be a more pronounced difference today between young male and female drivers [17]. Gaynard and Tiplica [15, 16] also worked on the conditional respect of drivers toward pedestrians, and modelled conditionality by means of Bayesian networks. These authors showed that conditional respect is greatly linked to pedestrians' attitudes, and that female drivers are more empathetic toward them than male drivers.

Conditionality linked to speed among motorcyclists has not been yet studied with a specific CSQ. The reduction of the speed limit from 90 to 80 km/hr. for much of France's secondary road network, and the opposition demonstrated by motorcyclists are what prompted the present study. Conditionality can be regarded as a calculated risk [10], and it seemed useful to investigate motorcyclists' more disproportionate evaluations, insofar as they might accentuate risky behavior.

This theoretical approach led us to develop the following eight hypotheses:

H1: All situations are conditional, except for "You have been drinking";

H2: The least conditional situations are those that suggest possible loss of motorbike control;

H3: The most conditional situations are linked to pleasure, and to the personalized assessment of speed and danger;

H4: Conditionality varies according to age. The youngest motorcyclists are the most conditional;

H5: Conditionality varies according to the type of motorbike;

H6: Conditionality varies according to the power of the motorbike;

H7: Responses to this question ["On roads limited to 80 km/hr., you usually exceed the speed limit by" (answer between 0 and more than 40 km/hr.)] vary according to age and type of motorbike;

H8: There are correlations between conditional situation 1 ("You are in a hurry"), 7 ("You are going to work") and 15 ("You know the road well").

## 2. Material and Method

### 2.1 Questionnaire

#### 2.1.1 Initial part

The first part allowed us to collect data on participants' age, the type and power of their motorcycle, and their annual mileage. Participants were also asked how often they usually exceeded the speed limit on roads limited to 80 km/hr. (see Hypothesis 7), in order to confirm that they did not respect this limit. The final question was why they rode a motorcycle.

#### 2.1.2 Conditional Scripts Questionnaire

Using Gaymard's method [10], a conditional scripts questionnaire around the 80 km/hr. speed limit based on 23 conditional situations, was developed. Twelve situations were taken from the original questionnaire, and 11 were more specific to the world of motorcyclists, such as riding on a winding road. As a preliminary phase had shown that motorcyclists never ride to 80 km/hr. on the secondary network, the following formulation has been adopted: "You find yourself driving at 100 km/hr. or over on a road limited to 80 km/hr. if..." Responses to each of the 23 conditional situations were given on a 6-point scale ranging from unconditional observance (Absolutely never) to unconditional transgression (Absolutely all the time).

The questionnaire was posted online on various social networks and biker forums. Motorcyclists from all over France answered.

Ethics and deontology: This research work takes care to respect the consent of the participants with a privacy statement and by informing them that they can withdraw on the survey at any time. In addition, since the questionnaire is posted on the Internet, it leaves individuals free to choose whether or not to click on the link to complete it. The anonymity of each participant is respected and the data has been treated confidentially. Moreover, participation in this research has no impact on the integrity and physical and mental health of the participants and this research is not on a sensitive issue.

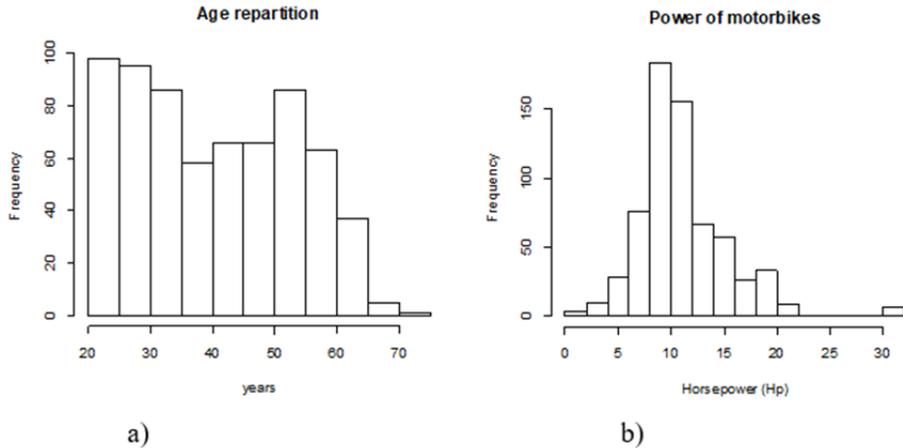
### 2.2 Population

The number of motorcyclists who filled out the questionnaire is 661. Some several exclusion criteria were applied. Women, motorcyclists with less than 3 years of experience, and people living abroad were not included in the target population. These exclusion criteria were defined in order to target male motorcyclists who had been accustomed to the 90 km/hr speed limit before it was reduced in July 2018 (in France, 92% of powered two-wheeler drivers are male (<https://www.lemonde.fr/blog/tra-nsports/2018/09/19/92-conducteurs-deux-roues-motorises-hommes/>)).

### 3. Results

#### 3.1 First part

Participants' mean age was 40.67 years (SD = 12.86), and mean horsepower was 11.66 (SD = 4.27). Mean annual mileage was 7 779 km (SD = 4 295). Figure 1 contains a histogram showing the age distribution and the power of participants' motorbikes.



**Figure 1:** Distribution of (a) age and (b) motorbike power

The vast majority (approximately 80%) of participants owned either a roadster, an on-road motorcycle, or a sport motorcycle. The following recap shows how many (number in brackets) owned each type of motorbike: Cross (1), Custom (31), Neo-Retro (10), Roadster (268), On-road (139), Scooter (2), Sidecar (2), Sport (125), Supermoto (10), Trail (73).

Furthermore, just 25 of the 661 motorcyclists (3.8%) rode for a given practical need, with the remaining participants driving for pleasure.

Participants' responses about how much they usually exceeded the speed limit on roads limited to 80 km/hr show that just 3.18% of them stated that they respected the 80 km/hr. limit, and more than 96% of them stated that they did not (between 0 and 20 km/hr. = 63.69%; between 20 and 40 km/hr. = 27.53%; more than 40 km/hr. = 5.60%). Furthermore, the mean score of 2.4 (SD = 0.64) on this question confirmed that motorcyclists exceeded the 80 km/hr. limit by at least 20 km/hr.

#### 3.2 Conditional Scripts Questionnaire.

H1: All situations are conditional, except for "You have been drinking".

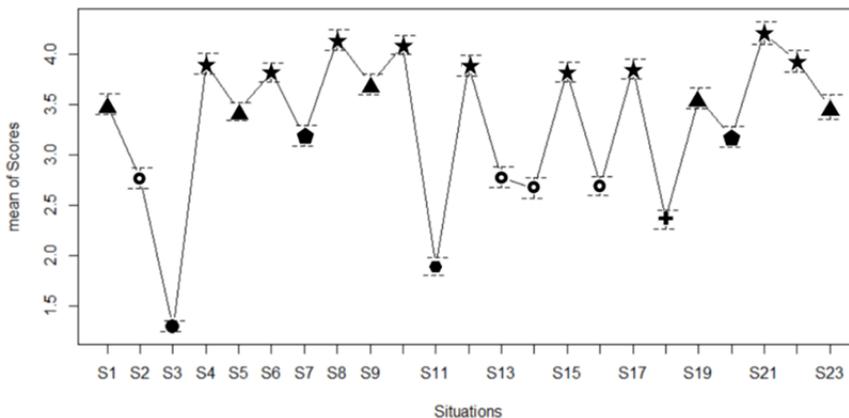
The mean scores for the various situations in the CSQ are given in Table 1, together with the third quartile (q<sub>0.75</sub>), which separates the lowest 75% of the ordinal data from the highest 25% (Gaymard, 2007). The lower the mean score for a given situation, the less conditional it is. A score of 1 means that the situation is "absolutely not" conditional. Situations 3 and 11 were between "absolutely never" and "never" (see Tab. 1).

A Friedman test showed that there were significant differences between the mean scores for the various situations ( $p < 2.2e-16$ ), which could form several groups.

Figure 2 indicates situations that did not differ significantly from each other at the significance level of 1%, according to the pairwise comparison using Conover's all-pairs test. Thus, the following

groups of situations could be identified:

- Group 1 (mean score = 3.965) with symbol (★) in Figure 2:
  - S<sub>4</sub> (“You are alone on the motorbike”); S<sub>6</sub> (“You are on a straight road”); S<sub>8</sub> (“You are riding for pleasure”); S<sub>10</sub> (“The sky is clear and the road is dry”); S<sub>12</sub> (“There is nobody on the road”); S<sub>15</sub> (“You know the road well”); S<sub>17</sub> (“The road is in good condition”); S<sub>21</sub> (“You consider that the limit is too low”); S<sub>22</sub> (“You know there is no speed camera”);
- Group 2 (mean score = 3.539) with symbol (▲) in Figure 2:
  - S<sub>1</sub> (“You are in a hurry”); S<sub>5</sub> (“You are riding with friends”); S<sub>9</sub> (“You are on a winding road”); S<sub>19</sub> (“The journey is short (less than 2 hours)”); S<sub>23</sub> (“You consider it hazardous to ride more slowly”);
- Group 3 (mean score = 3.190) with symbol (◆) in Figure 2:
  - S<sub>7</sub> (“You are going to work”); S<sub>20</sub> (“The journey is long (more than 2 hours)”);
- Group 4 (mean score = 2.727) with symbol (●) in Figure 2:
  - S<sub>2</sub> (“You are distracted”); S<sub>13</sub> (“There are people on the road”); S<sub>14</sub> (“It’s nighttime”); S<sub>16</sub> (“You don’t know the road”).



**Figure 2:** Situations with the same symbol did not differ significantly according to Conover’s all-pairs test with the significance level set at 1%

H<sub>2</sub>: The least conditional situations are those that suggest a possible loss of motorbike control (S<sub>3</sub>, S<sub>11</sub>, S<sub>18</sub>).

As can be seen in Table 1, the top three rows, which correspond to the least conditional situations in the CSQ, depict situations with a high risk of losing control of the motorbike.

H<sub>3</sub>: The most conditional situations are linked to pleasure, personalized assessment of speed, and perception of hazard (S<sub>8</sub>, S<sub>10</sub>, S<sub>21</sub>, S<sub>22</sub>, S<sub>23</sub>).

The situations with the highest mean scores were S<sub>21</sub> (“You consider that the limit is too low”; mean score = 4.217), S<sub>8</sub> (“You ride for pleasure”; mean score = 4.143), and S<sub>10</sub> (“The sky is clear and the road is dry”; mean score = 4.093). Situation 23 was not among the most conditional ones, which also included S<sub>22</sub> (“You know there is no speed camera”; mean score = 3.931) and S<sub>4</sub> (“You are alone on the motorbike”; mean score = 3.909). Thus, risk-taking was clearly linked to these most conditional situations.

**Table 1:** Mean scores in ascending order and third quartile for the 23 situations of the CSQ.

Situation	Description	Mean score	Q <sub>75%</sub>
S <sub>3</sub>	You have been drinking	1.295	1
S <sub>11</sub>	It's raining, it's snowing, the road is wet or there is fog	1.891	3
S <sub>18</sub>	The road is in poor condition	2.357	3
S <sub>14</sub>	It's nighttime	2.671	4
S <sub>16</sub>	You do not know the road	2.689	3
S <sub>2</sub>	You are distracted	2.768	4
S <sub>13</sub>	There are people on the road	2.777	4
S <sub>20</sub>	The journey is long (more than 2 hours)	3.186	4
S <sub>7</sub>	You are going to work	3.193	4
S <sub>5</sub>	You are riding with friends	3.435	4
S <sub>23</sub>	You consider it hazardous to ride more slowly	3.478	5
S <sub>1</sub>	You are in a hurry	3.509	4
S <sub>19</sub>	The journey is short (less than 2 hours)	3.564	4
S <sub>9</sub>	You are riding on a winding road	3.708	5
S <sub>6</sub>	You are on a straight road	3.821	5
S <sub>15</sub>	You know the road well	3.826	5
S <sub>17</sub>	The road is in good condition	3.854	5
S <sub>12</sub>	There is nobody on the road	3.892	5
S <sub>4</sub>	You are alone on the motorcycle	3.909	5
S <sub>22</sub>	You know there is no speed camera	3.931	5
S <sub>10</sub>	The sky is clear and the road is dry	4.093	5
S <sub>8</sub>	You are riding for pleasure	4.143	5
S <sub>21</sub>	You consider that the limit is too low	4.217	6

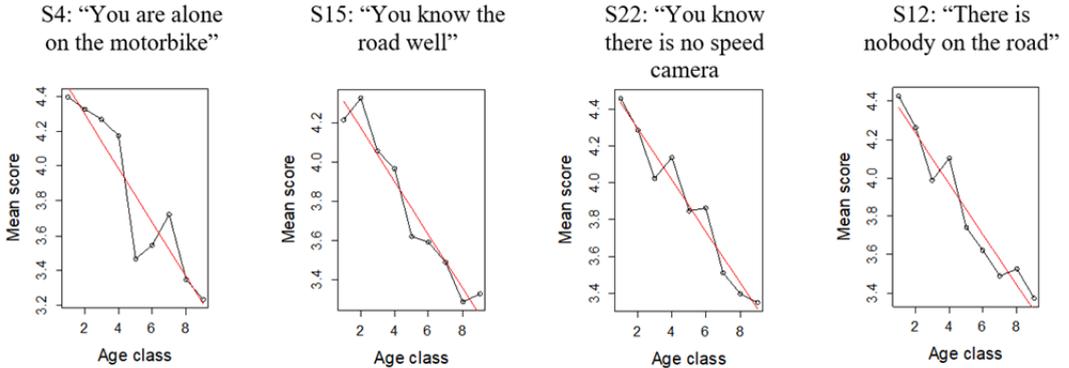
H4: Conditionality varies according to the age of the motorcyclist. The youngest motorcyclists are the most conditional.

As some ages were only represented by a small number of participants, we decided to group them into nine age groups (see Table 2).

Table 3 sets out the p values of the Kruskal-Wallis test we used to assess whether age group had an impact on the scores for the 23 situations in the CSQ. In 17 of these situations, age group had a significant impact on the conditionality score. When we analyzed all these situations in greater depth, we found that the older the motorbike drivers, the less conditional they were (mean scores decreasing with age). An illustration is given in Figure 3, where the situations corresponding to the four smallest p values of the Kruskal-Wallis test are shown, but the same tendency was recorded for all the remaining situations.

**Table 2:** Number of motorcyclists in each age group.

Group	1					2					3					4				
Age	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
No. participants	6	18	20	27	27	29	20	15	14	17	17	28	14	15	12	14	10	15	9	10
Group	5					6					7					8				
Age	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
No. participants	7	15	12	9	23	12	12	17	13	12	15	27	16	11	17	14	14	6	18	11
Group	9																			
Age	61	62	63	64	65	66	67	71												
No. participants	13	10	6	6	2	3	2	1												



**Figure 3:** Illustration of the four situations in the CSQ where age had the greatest impact on conditionality (red line indicates trend).

**Table 3:** *P* values of the Kruskal-Wallis test used to assess whether age group had an impact on the scores for the 23 situations in the CSQ (*p* values < 5% in bold).

Situation	1	2	3	4	5	6	7
<i>p</i>	<b>1.652e-05</b>	1.720e-01	3.333e-01	<b>1.087e-10</b>	<b>8.157e-06</b>	<b>3.891e-04</b>	<b>3.373e-07</b>
Situation	8	9	10	11	12	13	14
<i>p</i>	<b>2.699e-03</b>	<b>7.382e-04</b>	<b>6.403e-06</b>	3.980e-01	<b>1.130e-07</b>	<b>3.957e-02</b>	3.872e-01
Situation	15	16	17	18	19	20	21
<i>p</i>	<b>1.635e-09</b>	3.003e-01	<b>3.585e-06</b>	2.893e-01	<b>3.373e-07</b>	<b>2.228e-02</b>	<b>2.456e-05</b>
Situation	22	23					
<i>p</i>	<b>1.164e-08</b>	<b>2.966e-02</b>					

H5: Conditionality varies according to the type of motorbike.

Some motorbike types were underrepresented in our dataset (very small sample sizes). We therefore just compared motorbike types with more than 20 motorcycles (i.e., custom, roadster, on-road, sport, and trail).

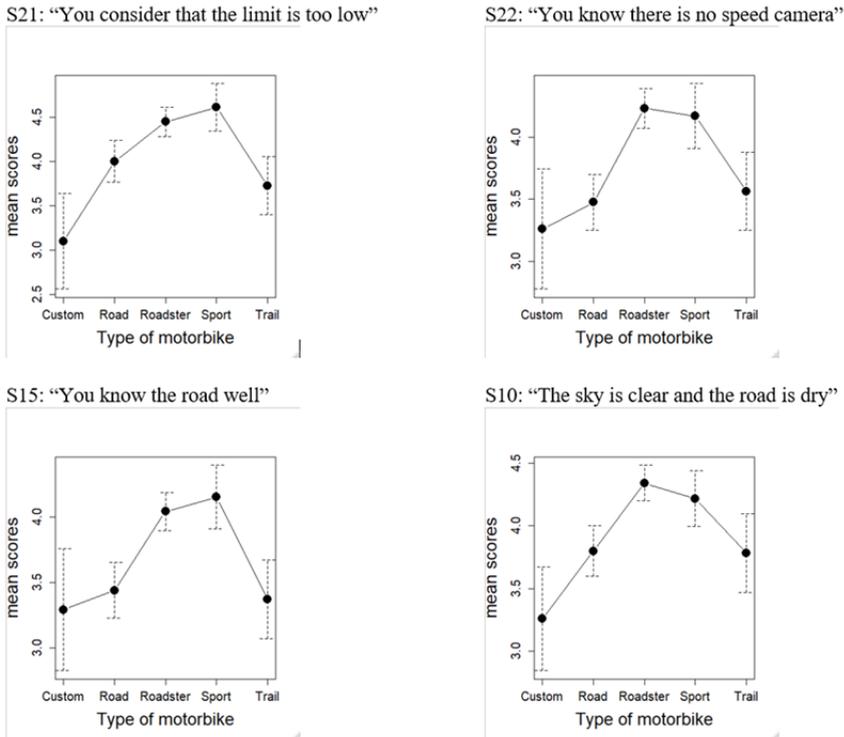
Table 4 gives the *p* values of the Kruskal-Wallis test used to verify whether mean scores differed significantly according to type of motorbike. Significant differences (*p* < 5%) are shown in bold. The table shows that for almost every situation, the mean scores depend significantly on the type of motorbike. The only exceptions were for less conditional situations where the rider might lose control of the motorbike:  $S_3$  (“You have been drinking”),  $S_{11}$  (“It’s raining, it’s snowing, the road is wet or there is fog”), and  $S_{18}$  (“The road is in poor condition”).

**Table 4:** *P* values of the Kruskal-Wallis test used to assess whether motorbike type had an impact on the scores for the 23 situations in the CSQ (*p* values < 5% in bold).

Situation	1	2	3	4	5	6	7
<i>p</i>	<b>8.86e-06</b>	0.1361	0.3888	<b>4.98e-08</b>	<b>8.40e-07</b>	<b>8.82e-04</b>	<b>4.62e-05</b>
Situation	8	9	10	11	12	13	14
<i>p</i>	<b>1.42e-05</b>	<b>3.93e-07</b>	<b>2.27e-08</b>	0.2530	<b>3.06e-08</b>	<b>7.88e-03</b>	<b>0.0256</b>
Situation	15	16	17	18	19	20	21
<i>p</i>	<b>6.46e-09</b>	<b>1.39e-03</b>	<b>3.37e-07</b>	0.0506	<b>1.61e-06</b>	<b>4.46e-03</b>	<b>9.51e-10</b>
Situation	22	23					
<i>p</i>	<b>4.69e-09</b>	<b>3.73e-04</b>					

On closer inspection, we found that in almost all the situations where the Kruskal-Wallis test was

significant, according to the pairwise comparisons using Conover's all-pairs test, there was a significant difference in mean scores between sport and roadster motorbikes and custom, on-road, and trail motorbikes. As illustrated in Figure 4, the mean scores for the former were clearly higher than those for the latter, meaning that the owners of roadsters or sport motorbikes were more conditional than the owners of custom, on-road or trail motorbikes. Figure 4 only illustrates the situations with the lowest p values for the Kruskal-Wallis test, but the same conclusion is observed to the other situations, where motorbike type had an impact on conditionality.

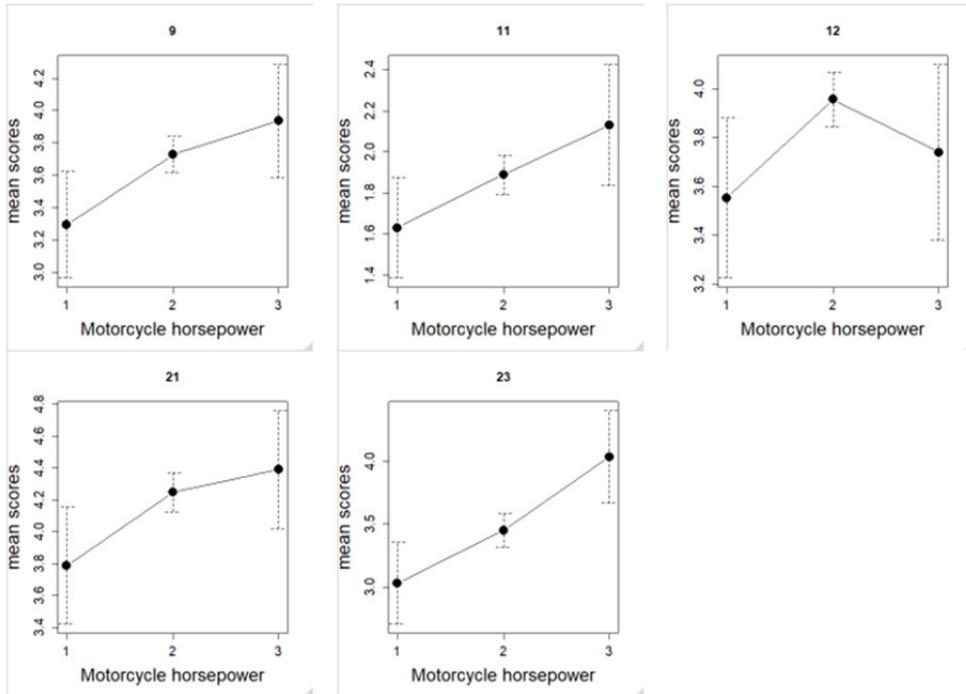


**Figure 4:** Illustration of the four situations in the CSQ where type of motorbike had the greatest impact on conditionality (dotted line indicates 95% confidence interval for the mean).

H6: Conditionality varies according to the power of the motorbike.

Motorbikes were grouped into three categories according to their power: Category 1 (< 8; less powerful motorcycle); Category 2 (8-16; intermediate); and Category 3 (> 16; more powerful motorcycle).

Significant results were observed for the following situations:  $S_9$  ("You are riding on a winding road"; significant differences between Categories 1 and 3; Kruskal-Wallis  $p = 0.0168$ );  $S_{11}$  ("It's raining, it's snowing, the road is wet or there is fog"; significant differences between Categories 1 and 3; Kruskal-Wallis  $p = 0.0476$ );  $S_{12}$  ("There is nobody on the road"; significant differences between Categories 1 and 2; Kruskal-Wallis  $p = 0.0490$ );  $S_{21}$  ("You consider that the limit is too low"; significant differences between Category 1 and Categories 2 and 3; Kruskal-Wallis  $p = 0.0176$ );  $S_{23}$  ("You consider it hazardous to ride more slowly"; significant differences between Category 3 and Categories 1 and 2; Kruskal-Wallis  $p = 2.1e-4$ ). As illustrated in Figure 5, in this last situation, the score was significantly higher for Category 3 (more powerful motorbikes) than for the other two categories.



**Figure 5:** Illustration of the five situations in the CSQ where conditionality varied significantly according to the power of the motorbike.

H7: Responses to this question vary according to age and type of motorbike: "On roads limited to 80 km/hr, you usually exceed the speed limit by?"

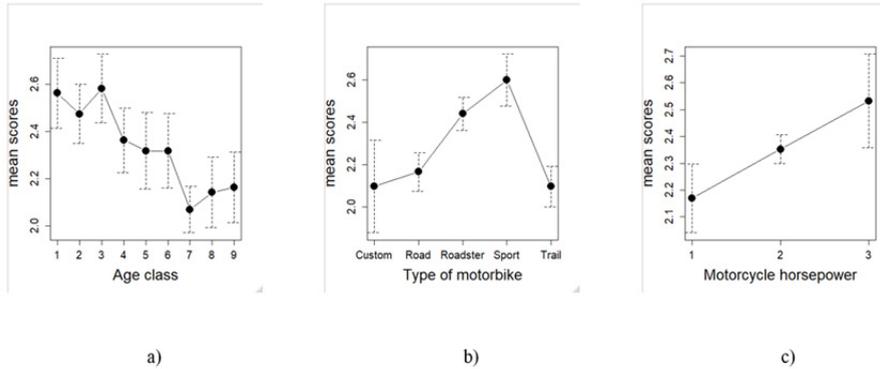
For the reasons mentioned in H4, H5 and H6, we maintained the same groupings of age, motorbike type, and motorcycle horsepower to test this hypothesis.

According to the Kruskal-Wallis test, age had a significant impact on participants' answers to this question ( $p = 2.86e-09$ ; see Fig. 6a). The pairwise comparisons using Conover's all-pairs test revealed a significant difference in the mean scores of the age groups (1, 2, 3) and (7, 8, 9) at a significance level of 5%. Thus, the mean score of participants aged 21-35 years was significantly higher than that of participants over 51 years.

The Kruskal-Wallis test revealed that motorbike type also had a significant impact on participants' answers ( $p = 1.61e-11$ ; see Fig. 6b).

At a significance level of 5%, pairwise comparisons using Conover's all-pairs test revealed a significant difference between mean scores for the sport and roadster types and the custom, on-road and trail types. Thus, the mean scores of participants who owned a sport or roadster motorbike were significantly higher than those of participants who owned a custom, on-road or trail motorbike.

The mean scores on this question differed significantly according to motorcycle horsepower (Kruskal-Wallis  $p = 1.52e-3$ ; see Fig. 6c). The mean score was significantly higher for the third category (horsepower > 16) than for the second category (horsepower = 8-16), according to Conover's all-pairs test ( $p = 0.0427$ ). The mean score was significantly higher for the second category than for the first category (horsepower < 8), according to Conover's all-pairs test ( $p = 0.0432$ ). We can therefore conclude that the greater the horsepower, the higher the mean score on this question.



**Figure 6:** Impact of age (a), type of motorbike (b) and motorcycle horsepower (c) on mean scores for exceeding the 80 km/hr. speed limit (dotted line indicates 95% confidence interval for the mean).

H8: There are correlations between conditional situations 1 (“You are in a hurry”), 7 (“You are going to work”) and 15 (“You know the road well”).

Kendall rank correlation coefficients between these situations show that there is a correlation between situations 1 and 7 (0.47), situations 1 and 15 (0.49) and situations 7 and 15 (0.45). All these correlation coefficients were significant and positive ( $< 2.2e-16$ ), meaning that there was a real link between these situations. A chi-squared independence test showed that all the situations were clearly dependent ( $p < 1E-6$ ). There was therefore coherence between participants’ answers for these three situations. We observed that the higher percentages were on the main diagonal of these tables, meaning that participants who answered in a certain manner to situations 1, 7, or 15 in the CSQ tended to answer quite similarly to the other two remaining situations.

#### 4. Discussion

Conducted a few months after the imposition of the 80 km/hr. speed limit on secondary roads in France, the present study was the first to focus on the conditionality of speeding among motorcyclists. According to the figures for 2018, although they represented just 1.6% of the motorized traffic, motorcyclists represented 19% of road deaths in France, and motorcycle crashes are a common cause of mortality across the world [27].

Motorists are known to have a specific relationship with the Highway Code e.g. [10, 18, 25], but there have been fewer in-depth studies on this subject among motorcyclists.

This study differed from more conventional approaches, for example concerning personality and risky driving e.g. [4, 26]. Instead, it was rooted in the theory of conditionality, which describes the functioning of norms in the field of social thinking [7,11]. According to this theory, standards are massively conditional, and previous research in the field of road safety has enabled two systems to be identified. The Highway Code constitutes the formal or legal system (*legal norms*), while the behavior of road-users is part of a social system (*social norms*) with its own functioning [10, 11]. The latter should not be underestimated, as it offers a framework for reading social behavior and the meaning of action in a specific context. For example, motorists adapt the Highway Code to the circumstances, and this behavior is regarded as legitimate in the representation. According to Flament [7], “Urban traffic offers multiple examples of behavior that everyone knows is illegal, but which is produced without a bad conscience or public disapproval. It is therefore recognized as socially legitimate” (p. 93, our translation).

A previous evaluation of road conditionality using a specific questionnaire with 127 driving situations [10] showed that the speed limit scenario is the most conditional, and this finding is stable

over time, as the latest results confirm it [17]. For motorists, the speed limit is debatable in many circumstances linked, for example, to the driver (e.g., alone in the vehicle, distracted), the road infrastructure (e.g. on a motorway, on an empty road), the time factor (e.g., late in the evening, in a hurry), the purpose of the journey (going to work) or a personalized assessment (e.g., speed limit is too low). This explains why the authorities have so much difficulty with speed limits, and why the reduction in the limit sparked such a wave of protests, particularly among motorcyclists, who saw this measure as a way for the government to multiply fines. We therefore constructed a CSQ adapted to motorcyclists, including several situations that had already been assessed with motorists and which were used to develop the hypotheses.

The hypothesis 1 predicted that all situations would be conditional, except for “You have been drinking”. This was mostly verified, for although it was absolutely unconditional, it was the only situation with a  $q_{0.75}$  of 1 and the very low mean score of 1.295. Among motorists, this situation is also the least conditional ( $q_{0.75} = 0.90$ ). This result can be explained by the wording inducing “an alcoholic state”, which is severely punished by the traffic laws. Gaynard [10] showed that with wording adapted to the legal threshold (2 glasses of alcohol. The law changed on 1 July 2015: 0 glass for a young driver with a probationary license), conditionality is higher. Even more than it is for motorists, alcohol is considered to be incompatible with riding a two-wheeler, as the rider is much more exposed to loss of control. However, the 2018 accident figures for motorcyclists in France show that the proportion involved in a fatal accident with a blood alcohol level above the legal limit of 0.5 g/l ( $N = 93$ , 19%) was similar to that of motorists (20%). Of these 93 motorcyclists, 85 had a blood alcohol level above 0.8 g/l, and 61 had a level above 1.5 g/l [19].

The hypothesis 2 predicted that the situations related to the risk of losing control of the motorcycle would be the least conditional, and this was confirmed by the results. It can be seen that apart from the “You have been drinking” situation, the weather, poor road conditions or ignorance of the road ( $q_{0.75} = 3$ ) were the situations that led to more caution. Concerning the weather, seasonal factors put bikers at risk. Figures show that risk is higher for the summer months, with motorcyclists representing 25% of road deaths over the 6 months from April to September [19]. Moreover, results showed that the situation “The sky is clear and the road is dry” ( $S_{10}$ ) was one of the most conditional (mean = 4.093;  $q_{0.75} = 5$ ). Another factor was linked to riding at night, which appeared less conditional than for motorists. Figures from the US Department of Transportation (<https://www.iii.org/fact-statistic/facts-statistics-motorcycle-crashes>) show that mortality rates are no higher at night. For example, a rate of 15% is observed between 9 p.m. and midnight, and 8.4% between midnight and 3 a.m., while between 3 p.m. and 6 p.m. and between 6 p.m. to 9 p.m., the rates are 20.9% and 21.4%. However, the problem of biker mortality at night should not be underestimated, and in our data, the level of conditionality was not negligible ( $q_{0.75} = 4$ ). Redelmeier and Shafir [20] conducted an original study that showed that the full moon is linked to a higher risk of fatal motorcycle crashes.

Concerning poor road conditions, motorcyclists have only two points of contact with the road, and are therefore overexposed to loss of balance, compared with four-wheeled vehicles. Research shows that poor road surfaces have a direct impact on road safety [2,24]. Finally, unfamiliarity with the roads leads to more caution, and confirms the statistics showing (as they do for motorists) the impact of routine journeys on accidents [19].

The hypothesis 3 predicted that the most conditional situations would be linked to pleasure, personalized assessment of speed, and perception of hazard. Not surprisingly, considering the limit to be too low justified most the transgressions of the 80 km/hr. speed limit ( $q_{0.75} = 6$ ). Gaynard [10] identified the impact of personalized assessment among young motorists not only for speed but also for the stop sign: drivers did not comply with the stop sign for example if they did not understand its purpose or if the road was clear. Excessive speed is a widespread problem among motorcyclists e.g. [22]. Among those accused of causing fatal accidents, excessive or unsuitable speed is more prevalent among bikers than among motorists (between 56 and 58% of 18- to 44-year-olds) [19], even though speed is already the most conditional scenario among motorists [10, 11, 12, 17]. Riding for pleasure is another situation that justifies not respecting the speed limit. In our sample, 96.2% stated that they rode for

pleasure. Pleasure is an essential motivation for bikers. An international study showed that pleasure is the most important motivation, together with freedom [6]. Among the most conditional situations, "You know there is no speed camera" ( $S_{22}$ ) (mean = 3.931;  $q_{075} = 5$ ) is a situation linked to changes in legislation. Before the legislation of 1 July 2015, the owners of powered two-wheelers could choose the size of their license plates. After this date, new two-wheelers put into circulation had to have plates with specific dimensions (210 x 130 mm). Two years later, this rule was extended to all two- or three-wheeled vehicles in circulation. This measure, which makes it easier to read registration numbers, has impacted bikers' behavior, as they have to pay more attention to speed cameras. However, this cautious behavior is limited to areas equipped with these cameras, the main motivation being not to lose points and pay fines. Contrary to our hypothesis, situation 23 ("You consider it hazardous to ride more slowly") was not among those with the most conditional mean scores.

The hypothesis 4 predicted that conditionality would vary significantly according to age. It was validated for 17 situations. Mean conditionality scores decreased with age. These results had already been observed with motorists, except for very young drivers with a probationary license, who are more cautious. In the latter study [17], however, the drivers were younger (18-19 years) than the youngest age group in our sample (21-25 years). French statistics concerning fatalities among motorcyclists (ONISR, 2018), indicate that the age group most severely affected is 18-34 years, as it represents 20% of the population, but 40% of those killed and 44% of those injured. However, between 2010 and 2018, there was an increase in the mean age of motorcyclists killed and injured (+74% for 55-64 years and +122% for 65-74 years).

H5 and H6, which predicted significant variations in conditionality, depending on the type and power of the motorcycle, were validated in certain situations. Results indicated that the owners of roadster or sport motorbikes were more conditional than those of custom, on-road or trail motorbikes in 19 situations (H5). These results showed that the riders of roadster and sport motorbikes are more conditional when it comes to speeding than the riders of other types. However, there was no difference in the four least conditional situations ( $S_2$ ,  $S_3$ ,  $S_{11}$ ,  $S_{18}$ ). Motorcyclists stated that they were less distracted (situation 2) than motorists, for whom this situation was one of the most conditional, justifying the transgression not only of the speed limit, but also of the amber light (second most conditional scenario) and the no-entry sign. The problem of distraction among motorists has been accentuated with the advent of the mobile phone [13, 14].

Regarding Hypothesis 6, conditionality varied significantly in five situations according to motorcycle horsepower (less powerful, intermediate, and more powerful), with drivers of less powerful motorcycles reporting more cautious behavior. Interestingly, these five situations included situation 23 ("You consider it hazardous to ride more slowly"), which was initially associated with greater conditionality (H3). Ultimately, the more powerful motorcycles had significantly higher scores than the two other categories. Scores for the most conditional situation ("You consider that the limit is too low";  $S_{21}$ ), followed a gradient that depended on the power of motorbike, as did scores for situation 9 ("You are riding on a winding road"). Other results confirmed greater risk-taking among owners of the more powerful motorbikes. One of the less conditional situations, considered as hazardous for bikers ("It's raining, it's snowing, the road is wet or there is fog";  $S_{11}$ ), was significantly more conditional for the more powerful motorcycles. It may be that, in common sense of the drivers, very powerful motorcycles are associated with a greater capacity for safety because of the technological aspects of these motorcycles. Finally, situation 12 ("There is nobody on the road") was more conditional for the intermediate category. According to the personality trait approach e.g. [26], sensation-seeking motorcyclists are more aware of traffic conditions. In our study, those who drove more powerful motorcycles appeared less impacted by the traffic on the road, meaning that behavior on the road cannot be attributed solely to personality factors, not least because the road is an interactional space. There is little information in the literature about motorcycle type and accidents, although Teoh and Campbell [23] commented that "Riders prone to higher risk driving behavior may choose more powerful and performance-oriented motorcycles. Motorcycle performance capability also may influence the likelihood that drivers will speed or engage in other risky maneuvers." (p. 507). These authors analyzed types of motorcycles and fatal crash data in the

United States. They observed, for example, that the driver death rate was much higher for *supersport* motorcycles than for *cruiser* motorcycles (less horsepower than motorcycles in sport classes). French figures [19] indicate that mortality increases with motorcycle horsepower. Owners of powerful-motorcycle represent 39% of the motorcyclists killed—a figure that rises to 44% for accidents with no third party. Hypothesis 7 allowed us to confirm the impact of age, type of motorbike and motorcycle horsepower on speeding on roads limited to 80 km/hr. (excesses ranging from 0 to more than 40 km/hr.). Motorcyclists aged 21-35 years who rode a more powerful sport or roadster motorbike exceeded the speed limit significantly more than the other bikers, in terms of age, type of motorbike, and motorcycle horsepower. Hypothesis 8 was also validated. There was a correlation between situations 1 (“You are in a hurry”), 7 (“You are going to work”) and 15 (“You know the road well”). For motorists, these were among the most conditional situations. This result indicates that the behavior of motorcyclists is also related to occupational factors. As a reminder, traffic accidents are the leading cause of death at work, and the number of commuting accidents increased significantly in 2018 [1]. French figures show that 42% of the persons killed in commuting accidents (home-work) were riding powered two-wheelers, which are only used in 2% of home-work journeys. During weekdays, there is a peak in mortality among motorcyclists between 7 a.m. and 8 a.m.

## 5. Conclusion

The present study of the conditionality of the 80 km/hr. speed limit among motorcyclists confirmed that this measure does not make sense to them, with practices attesting to a mean excess of more than 20 km/hr. Like motorists, motorcyclists have a very conditional relationship with speed, and in particular the 80 km/hr. limit because - they judge this limit to be too low; -they ride for pleasure and they feel safe when the roads and weather are good. Even more risky behaviors were identified, based on age, type of motorcycle, and horsepower. So should we be fatalistic about motorcycle accidents? Our results could inform prevention or the implementation of specific measures, given that speed cameras only have limited effects in equipped zones. The present study suggests that the determinants of risk-taking should be studied according to group and at context level. For example, respecting the speed limit is a perceived barrier because it diminishes the pleasure of driving. Otherwise, the prevention of work-related road risks could incorporate more specific measures for motorcyclists. On 15 January 2020, just 18 months after its introduction, the 80 km/hr. speed limit on the secondary network was devolved to departmental councils, which were given the authority to set a maximum authorized speed 10 km/hr. higher than that provided for in the Highway Code. Currently, a quarter of all French departments are in the process of returning to 90 km/hr for part of their road network ([https://www.liberation.fr/france/2020/02/02/la-vitesse-revient-avec-precipitation\\_1776848](https://www.liberation.fr/france/2020/02/02/la-vitesse-revient-avec-precipitation_1776848)).

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