

The role of values in road safety culture: Examining the relationship between valuation of freedom to take risk and accident risk among motorcycle riders and car drivers

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Abstract: Focus on paternalistic values versus individual freedom is a fundamental theme, which defines the status of road safety in different settings. The present study examines the role of values related to freedom to take risk in traffic in road safety culture based on survey data from car drivers ($n = 882$) and motorcycle riders ($n = 330$) from two countries with distinctly different road safety records: Norway, which had the lowest road mortality rate in Europe with 20 road deaths per million inhabitants in 2017, and Greece, which had 69 road deaths per million inhabitants, which was well above the EU average of 50. Contrary to our first hypothesis, we do not find a statistically significant higher valuation of freedom to take risk in traffic among Greek drivers and riders than among drivers and riders from Norway. In line with our second hypothesis, we find that motorcycle riders in both countries value freedom to take risk in traffic significantly higher than car drivers in their country. Regression analyses indicate a relationship between higher valuation of freedom to take risk in traffic and risky rider behaviours, which are related to accident involvement. Our results indicate that values focusing on freedom to take risk have an important role in road safety culture, presumably legitimizing and motivating risky driving/riding. This is in line with previous research, where riders cite freedom as the main enjoyment factor for riding. Previous studies find six times higher accident risk among riders than drivers, which is explained partly by pointing to risky rider behaviours.

Keywords: Greece, motorcycles, Norway, road safety culture, values, Vision Zero

1 Introduction

1.1 Background

National focus on paternalistic values versus individual freedom is a fundamental theme, which defines the status of road safety in different countries (Elvebakk 2015). Elvebakk (2015) points out that paternalistic measures force people to do something for their own sake, which they might not have chosen to do themselves, if they had not been ‘forced’ to do so. The balance

between individual freedom and state intervention, or ‘paternalism’ is largely a political (ideological) and cultural issue, and increased road safety is often a result of increased paternalism and less individual freedom for road users. Moeckli & Lee (2007) link for instance the relatively low level of road safety in the United States to the American values of individualism, self-realization and freedom (to take risk in traffic). Correspondingly, the risk of road fatalities per million population is twice as high in the US, as the European average (WHO 2022). This indicates that there might be a link between cultural values involving acceptance for paternalistic measures, low focus on individual freedom to take risk in traffic and road safety.

Road safety culture is a relatively new analytical concept, and although there are no commonly accepted definitions of road or safety culture (Edwards *et al.* 2014), several of the existing definitions include values and attitudes (Lonerio 2007; Moeckli & Lee 2007). We define road safety culture (RSC) as shared values and attitudes signifying what is important (e.g. safety, mobility, respect, politeness), shared norms prescribing certain road safety behaviours, and thus shared patterns of behaviour and shared expectations regarding the behaviours of others (Nævestad *et al.* 2022). Values and attitudes legitimize and motivate road user behaviours and the norms prescribing behaviours (Kaçan *et al.* 2019; Gehlert *et al.* 2014; Seymer 2013).

The current study examines values related to freedom to take risk in traffic (i.e. the opposite of paternalism). The Cambridge Dictionary defines freedom as ‘The condition or right of being able or allowed to do, say, think, etc. whatever you want to, without being controlled or limited’. When applied to traffic and road safety, individual freedom concerns the right to ‘act as you want’ (i.e. take risks) without being controlled or limited. This may apply to e.g. drivers’ speeding in traffic, driving without using seat belt, driving when drunk etc. Although individual freedom is a crucial value in Western democracies, road users’ individual freedom to take risk in traffic is restricted in several ways. The road safety progress in Western countries in the last decades is closely related to measures limiting individuals’ freedom to take risk in traffic, e.g. limiting speed, enforcing seat belt use (Moeckli & Lee 2007).

The present study examines the role of individual freedom values in RSC based on survey data from car drivers and motorcycle riders from two countries with distinctly different road safety records: Norway, which had the lowest road mortality rate in Europe with 20 road deaths per million inhabitants in 2017, and Greece, which had 69 road deaths per million inhabitants, which was well above the EU average of 50 (Adminaite *et al.* 2018).

We hypothesize a lower focus on individual freedom to take risk among the Norwegian riders and drivers, as this country has adopted Vision Zero, has the highest road safety level in Europe and presumably the most comprehensive regulations of drivers’ freedom (Hypothesis 1). Previous research indicates that there seems to be a link between cultural values involving high focus on individual freedom to take risk in traffic, risky behaviours and low road safety (Elvebakk 2015). Nævestad *et al.* (2022) has found such relationships, comparing car and bus drivers in Norway, Greece and Israel.

Additionally, we hypothesize a higher focus on individual freedom to take risk among motorcycle riders across countries (Hypothesis 2). There are two main reasons for this. First, many riders cite freedom as the main enjoyment factor of riding (Broughton 2005). In a survey directed to motorcycle riders, Broughton (2005) asks respondents to provide their main reasons for liking motorcycle riding. Freedom, was the most common reason for riding, followed by riders’ sense of belonging to ‘the biking, community’, the convenience of riding a powered two-wheeler, while excitement was listed as the fourth reason. Second, previous studies find higher accident risk among riders than drivers (Bjørnskau *et al.* 2012; DaCoTa 2012). In Norway, the accident risk of motorcycle riders is six times that of car drivers (Bjørnskau *et al.* 2012). The generally higher risk also applies internationally (DaCoTa 2012). The higher

accident risk of motorcycle riders is explained partly by pointing to risky rider behaviours, e.g. over speeding (Bjørnskau *et al.* 2012; DaCoTa 2012). Cars and motorcycles are different in several additional respects, e.g. related to the physical vulnerability of riders versus drivers (Rowden *et al.* 2016). Moreover, previous research also indicates that motorcycle riding more often than car driving is related to identity, and that those in the group with which one rides represent an important source of social influence (Tunnicliff *et al.* 2011). Thus, it is not unreasonable to expect the existence of common road safety values related to individual freedom to take risk in traffic among motorcycle riders and a common motorcycle RSC, extending across countries.

We hypothesize that there is a relationship between motorcycle riders' valuation of freedom to take risk, risk taking and accident risk. Based on previous research (Kaçan *et al.* 2019; Gehlert *et al.* 2014; Seymer 2013; Ajzen 2001), we hypothesize that the influence of RSC values on road safety behaviours generally is mediated analytically through attitudes, as they are more specific.

1.2 Objectives

The objectives of the study are to: (1) compare the values/attitudes related to individual freedom to take risk among car drivers and motorcycle riders in Norway and Greece; (2) examine the factors influencing values/attitudes related to individual freedom to take risk in these groups; (3) examine the relationship between values/attitudes, risky driving/riding and accident involvement; and (4) discuss whether values/attitudes can be influenced in an attempt to increase road safety.

2 Theoretical perspective and previous research

2.1 Values and attitudes as aspects of road safety culture

The safety culture concept was introduced in the wake of the Chernobyl disaster in 1986, when the International Atomic Energy Agency (IAEA) analysed the organisational setting that preceded the disaster. The concept of organisational safety culture has become relatively popular since then, both among researchers, managers and policy makers. Organizational safety culture can be defined as 'safety relevant aspects of culture in organizations' (Antonsen 2009).

The post Chernobyl disaster focus on organisational safety culture among safety scholars in different sectors also inspired a focus on safety culture in road traffic among road safety scholars (Edwards *et al.* 2014). The safety culture concept was first applied to professional drivers, as these are members of organisations, and then also later to private road users (Bjørnskau *et al.* 2012). Although there are no commonly accepted definitions of road or traffic safety culture (Edwards *et al.* 2014), several of the existing definitions include values and attitudes (Özkan & Lajunen 2011; Lonerio 2007; Moeckli & Lee 2007). In the present study, we measure attitudes which we hypothesize to represent underlying values. Schwartz (1992) defines six key aspects of values, e.g. values refer to desirable goals, they transcend specific actions and situations, they serve as standard or criteria. Attitudes are closely related to values, but the former are more context specific (Seymer 2013).

Several studies indicate that values and attitudes comprise an important element of RSC (Lonerio 2007; Moeckli & Lee 2007), and that they influence road safety behaviours (Kaçan *et al.* 2019; Gehlert *et al.* 2014). The relationships between these concepts are outlined in different theories. The expectancy value model hypothesizes for instance that the attitude towards a behaviour is influenced by beliefs about its consequences, which is weighed by the subjective value of the consequences (Fishbein & Ajzen 1975). The Theory of Planned Behaviour (TPB)

describes in turn how attitudes form into behavioural intentions and behaviour. TPB predicts that our behaviour is the result of our intention to carry out the behaviour, and that our intention to carry out a particular behaviour is influenced by our attitudes towards the behaviour, subjective norms and our perceived control over our behaviour (Ajzen 1991).

2.2 The relationship between road safety culture values and road safety behaviours

Based on Ajzen (2001), Seymer (2013) and Gehlert *et al.* (2014), we hypothesize that the influence of RSC values on road safety behaviours generally is mediated analytically through attitudes, as they are more specific. Attitudes can be defined as a summary evaluation of an entity with some degree of favour or disfavour (Ajzen 2001). Thus, while freedom to take risk in traffic may represent a general RSC value, more specific attitudes may be related to specific types of risk taking, e.g. speeding, non-use of seat belts and driving under the influence. According to Gehlert *et al.* (2014), attitudes consist of a cognitive, an affective and a behavioural component. If we take attitudes to driving under the influence as an example, the cognitive component contains thoughts and ideas that a person holds about this ('it is dangerous'), the affective component consists of feelings and emotions concerning driving under the influence ('it is morally despicable') while the behavioural intention component concerns the practical implications ('I will never do it').

It is, however, important to remember that attitude is not the only variable influencing road safety behaviours. Previous studies have also found that demographic factors influence road safety behaviours: these report e.g. of more violations among younger drivers and among male drivers.

2.3 The relationship between road safety behaviours and accidents

Violations are the type of behaviours that is most closely related to accident involvement. Previous studies using behaviour items from the Manchester Driver Behaviour (DBQ) questionnaire find relationships between self-reported violations in traffic and accident involvement (Warner *et al.* 2011; de Winter & Dodou 2010). Studies comparing Northern and Southern European countries have found a larger incidence of aggressive violations in the latter, which were related to drivers' accident involvement (Warner *et al.* 2011). These results were also supported in the study of Nævestad *et al.* (2019a) and Nævestad *et al.* (2019b), which included car drivers, bus drivers and heavy goods vehicle drivers.

3 Methodology

3.1 The 'Safe Culture' project

The study was conducted within the research project 'Safety culture in private and professional transport: examining its influence on behaviours and implications for interventions', undertaken by the Institute of Transport Economics of Norway (TOI) in cooperation with the National Technical University of Athens (NTUA). The methods for data collection in the present project have been approved by the Norwegian Centre for Research Data (NSD), which assists researchers with research ethics of data gathering, data analysis, and issues of methodology. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements. Results from this project focusing only on bus drivers in Norway and Greece have been presented in Nævestad *et al.* (2019b) and results from both professional and private drivers in Norway and Greece have been presented in Nævestad *et al.* (2019a). The present study builds on and takes further a previous paper, focusing only on riders and drivers in Greece (Nævestad *et al.* 2020). The purpose of the previous

study was to compare road safety behaviours and road safety culture across five geographical regions in Norway and Greece. The previous study did not focus on road safety values/attitudes among the studied groups, as the current study does. The present study also builds on and take further a previous study of car drivers and bus drivers in Norway, Greece and Israel, which focuses on the role of values for national RSC in these three countries (Nævestad *et al.* 2022).

3.2 Recruitment of respondents

The study is based on survey answers from car drivers and motorcycle riders in Norway and Greece (see Table 1). The Norwegian car drivers were recruited through the Preference Database of the Norwegian Postal Service. In September 2017, e-mails with web-links to the survey were sent to people in three Norwegian counties, including the capital Oslo. Counties were selected based on differences in accident risk and attitudes. Of the 45 452 people who received the e-mail, 6 727 people (14.8%) opened the e-mail, and 645 (9.6%) completed the survey. The Norwegian motorcycle riders were recruited with the help of the Norwegian motorcycle union, which distributed the survey link to its members in Oslo and the two counties. To increase response rates, Norwegian respondents were informed that they could participate in a draw for a present card of 2 000 NOK, if they wanted to. The Greek car drivers and motorcycle riders were recruited through a marketing research company in Greece, which was under the scientific supervision of researchers from the NTUA. Recruitment of drivers in Greece was also difficult, therefore, it was decided to approach candidates in person and further explain the scope of the survey. This helped eliminate their doubts and fears about confidentiality and about the use of the information they would provide. Respondents in Greece were sampled from two different areas: the capital Athens and a Greek island.

Table 1 Distribution of drivers/riders in Norway and Greece, including the proportion of males

Country	Count	%	Males (%)	Mode	Count	%	Males (%)
Norway	733	61%	66%	Car	596	49%	59%
				MC	137	11%	94%
Greece	479	39%	72%	Car	286	24%	64%
				MC	193	16%	85%
TOTAL	1 212	100%	68%		1 212	100%	68%

When comparing motorcycle riders in Norway and Greece, it is important to note that powered two wheelers (PTWs), i.e. mopeds and motorcycles are common in Southern European countries. In comparison, motorcycle riding is generally a seasonal (summer) activity in Norway, which often is related to leisure (DaCoTa 2012). Based on this, we may expect that the purpose of the motorcycle trips in Norway and Greece often may be different (e.g. leisure vs. practical daily transport), that the average rider characteristics (e.g. age, gender) are different, and that the types of motorcycles are different (e.g. larger and more powerful motorcycles in Norway vs. smaller and more flexible motorcycles in Greece). To make the motorcycle rider samples as comparable as possible, we have only included motorcycle riders from both countries, and not riders of PTWs in general (i.e. mopeds are not included).

3.3 Survey Themes

3.3.1 Background variables

Both surveys among car drivers and motorcycle riders included questions on background variables like age, experience as a driver, gender, kilometres driven with a car, or motorcycle in the

last two years, how often respondents drive/ride, what kind of car or motorcycle they drive/ride and respondents' education.

3.3.2 *Values/attitudes*

The survey includes three questions on individual freedom to take risk in traffic. These questions are partly based on Elvebakk *et al.* (2016), and measure attitudes that we hypothesize to reflect underlying values related to road safety. Previous factor analyses (Nævestad *et al.* 2019b) using these questions have indicated a 'freedom to take risk factor', comprised of three questions: (1) Road users should be able to choose risky activities in traffic, as long as they do not expose other to risk, (2) A skilled person can take more risks than others, (3) Road users know best themselves how they should behave in traffic. These questions were combined into an index (min = 3, max = 15; Cronbach's Alpha: 0.526). In previous studies, we have also included a scale measuring paternalistic values (Nævestad *et al.* 2022; Nævestad *et al.* 2019b) but we concluded that this scale measures attitudes to national road safety measures, and not attitudes which are related to behaviours. For that reason, we only included the scale measuring individual freedom to take risk in the present study.

3.3.3 *Descriptive norms*

Shared (descriptive) norms are one of the key elements in our definition of RSC. Descriptive norms refer to individuals' perceptions of what other people (in the relevant reference group) actually do (Cialdini *et al.* 1990). We have developed a descriptive norms index, which focuses on riders/drivers' attribution of violations to other drivers in their country. We measure descriptive norms by means of seven questions, based on the Driver Behaviour Questionnaire (DBQ) items (Reason *et al.* 1990). Respondents were asked: 'When driving in my country, I expect the following behaviour from other drivers: (1) That they sound their horn to indicate their annoyance to another road user, (2) That they become angered by a certain type of driver and indicate their hostility by whatever means they can, (3) That they overtake a slow driver on the inside, (4) That they drive when they suspect they might be over the legal blood alcohol limit, (5) That they drive without using a seatbelt, (6) That they disregard the speed limit on a motorway road, and (7) That they disregard the speed limit on a residential road'. Five answer alternatives ranged between 1 (none-very few) and 5 (almost all/all). The 7 items were combined into a descriptive norms index (Cronbach's Alpha: 0.897).

3.3.4 *Authority focus on road safety*

The survey also includes questions about authority focus on road safety: 'Road safety is one of the most important priorities for the authorities in my country'. Answer alternatives ranged from 1 (totally disagree) to 5 (totally agree).

3.3.5 *Road safety behaviours*

Road safety behaviours are measured by means of ten items taken from the DBQ. The DBQ items that are used in the present study focuses on both drivers and riders, and we have chosen DBQ items that are suitable for both drivers and riders. The DBQ answer alternatives have been changed from relative to absolute alternatives (e.g. question: 'For every ten trips, how often do you ...?', alternative answers: 'Never', 'Once or twice', 'Three or four times', 'Five or six times', 'Seven or eight times', 'More than eight times but not always', 'Always'). The behaviours were: 'Disregard the speed limit on a residential road', 'Disregard the speed limit on a motorway road', 'Pull out of a junction so far that the driver with right of way has to stop and let you out', 'Drive when you suspect you might be over the legal blood alcohol limit', 'Drive without using a seat belt/helmet?', 'Race away from traffic lights with the intention of beating the driver next to you', 'Sound your horn to indicate your annoyance to another road user', 'Become angered by a certain type of driver and indicate your hostility by whatever means you

can', 'Become angered by another driver and give chase with the intention of giving him/her a piece of your mind' and 'Overtake a slow driver on the inside'. These were combined into an index (Cronbach's Alpha: 0.855).

3.3.6 Accidents

We report results for one question on respondents' crash involvement while driving in the last two years, with four answer alternatives: (1) no, (2) yes involving property damage, (3) yes, involving personal injuries, and (4) yes, involving fatal injuries.

3.3.7 Incidents

The survey also includes questions about traffic incidents in the last 2 years. This refers to 'near misses' in the last 2 years for riders, which is defined as situations where the riders or others have had to brake and/or turn heavily to avoid a collision. For drivers, this refers to situations where they have dented or scratched their car or touched an object (e.g. a post, a wall, or another car while parking) in the last 2 years.

3.4 Analysis

When comparing the mean scores of different groups, one-way ANOVA tests, which compare whether the mean scores are equal (the null hypothesis) or (significantly) different are used. Tukey post-hoc tests are conducted. Three regression analyses have been conducted. In the first analysis, the factors predicting respondents' scores on the freedom to take risk variable are analysed. In the second analysis, factors predicting respondents' risky driving/riding are analysed. Linear regression analyses are used in the two first analyses. In the third regression analysis, the factors predicting respondents' answers on a dependent variable measuring accident involvement are analysed. Logistic regression analysis is used in this analysis, as the dependent variable has two values (Accident: no = 1, yes = 2). Odds ratios are presented, and they indicate whether the odds of accident involvement are reduced or increased, when the independent variables increase with one value. Of course, it is impossible to conclude about causality, as this is a cross-sectional and correlational study. The term predict is nevertheless used when the regression analyses are described.

4 Analysis and Results

4.1 Description of the sample

Table 1 provides a distribution of drivers/riders in Norway and Greece. Respondents from Norway are generally older than the respondents from Greece, especially the motorcycle riders: 44% of the Norwegian car drivers were 46 years or older, while 72% of the motorcycle riders was. Corresponding shares for Greek respondents were 42% and 29%. The differences in riders'/drivers' experience are in accordance with the age differences. Over half of the riders and drivers in Norway had over 20 years of experience, while the corresponding shares in the Greek sample were 25% and 37%.

4.2 Values/attitudes related to individual freedom

The first aim of the study is to compare the values/attitudes related to individual freedom to take risk among car drivers and motorcycle riders in Norway and Greece. We made an index comprised of the sum scores of the three questions measuring individual freedom (min = 3 points, max = 15 points; Cronbach's Alpha = 0.526). Table 2 compares mean scores on this index among car drivers and motorcycle riders in the two countries.

Table 2 Mean scores on the index for individual freedom to take risk in traffic among car drivers and motorcycle riders in the two countries

Country	Mode	Count	Individual freedom	
			Mean	S.D.
Norway	Car	596	6.4	2.5
	MC	137	7.5	2.8
	All	733	6.6	2.6
Greece	Car	286	6.9	2.4
	MC	193	7.8	2.6
	All	479	7.2	2.5
All	Car	882	6.6	2.5
	MC	330	7.7	2.7

Post-hoc tests (Tukey) were conducted to examine whether the differences between the mean scores were significantly different on the individual freedom scale, using one-way ANOVA. The main result is that the mean scores of motorcycle riders in both countries on the freedom to take risk are relatively similar ($p = 0.788$). This indicates shared values related to freedom to take risk in traffic among riders across countries. The mean scores between riders and drivers in each country on the freedom to take risk in traffic index were significantly different ($p = 0.001$). These results are in accordance with Hypothesis 2. Table 2 indicates somewhat higher scores on the freedom to take risk in traffic index among the Greek riders and drivers, compared with the Norwegian respondents. However, the difference between the riders across countries is, as noted, not statistically significant. Neither is the difference between the car drivers across countries ($p = 0.069$). Thus, our results do not support Hypothesis 1. Comparing country scores on the index, we see a difference of 0.6 points versus a difference of 1.1 points when comparing transport modes. Thus, our results indicate, in line with Hypothesis 2, the importance of transport mode (car vs. MC) over country when it comes to freedom to take risk in traffic.

4.3 Factors influencing values/attitudes

The second aim of the study is to examine the factors influencing values/attitudes related to individual freedom to take risk in traffic in the studied groups. In Table 3 we show results from a regression analysis, where we examine independent variables influencing respondents' values/attitudes when it comes to freedom to take risk in traffic.

The analysis in Table 3 indicates that seven variables contribute significantly to values/attitudes focusing on freedom to take risk. Gender and age contribute negatively, which means that women and older driver focus less on drivers' freedom to take risk in traffic. Greek nationality contributes positively meaning that Greek drivers focus more on drivers' freedom to take risk in traffic, controlled for the other variables in the model. Additionally, we see that the variable car-motorcycle contributes positively and significantly, indicating that motorcycle drivers focus more on freedom to take risk in traffic. The variable 'Authority focus on road safety' measures whether respondents perceive that road safety is a clear priority of authorities in their respective countries. The variable contributes negatively, indicating that respondents who perceive that the authorities in their country have road safety as a clear priority, focus less on freedom to take risk in traffic.

We also see a statistically significant and negative relationship between descriptive norms and focus on freedom to take risk in traffic. This means that, when controlling for the other variables

in the model (e.g. nationality) respondents who report higher levels of road violations among other drivers in their country value freedom to take risk less than those who report higher levels of road violations among other drivers in their country. Greek respondents score significantly higher ($p = 0.001$) on the descriptive norms index than the Norwegian respondents (18 points versus 11 points (cf. Table 4). This means that Greek respondents report riskier driving among other drivers in their country. Education contributes significantly and negatively, indicating that the higher levels of education respondents have, the lower they value freedom to take risk in traffic.

Table 3 Linear regression, beta coefficients; dependent variable: ‘Freedom to take risk in traffic’

Variables	Individual freedom
Gender (Male = 1, Female = 2)	-0.115***
Age	-0.124***
Nationality (Norwegian = 1, Greek = 2)	0.142***
Car-MC (Car = 1, MC = 2)	0.105***
Authority focus on road safety	-0.075***
Descriptive norms	-0.194***
Education	-0.079***
MC type (Other = 1, Scooter = 2)	0.040
Adjusted R ²	0.091

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

We have also included motorcycle type in the model, based on the question in the survey: ‘What type of motorcycle do you usually ride’. We have dichotomized this variable into: (1) Other types of motorcycles, and (2) Scooter type motorcycles. The reason for this is that we find higher scores on the risky riding index among the riders of scooter motorcycles compared with riders of other types of motorcycles (21.1 vs. 18.2; $p = 0.001$). Scooter motorcycle riders also score significantly higher on the freedom to take risk index in our sample than other motorcycle type riders (8.1 vs. 7.4; $p = 0.04$). The motorcycle type variable does not, however, contribute significantly in the model. Finally, the adjusted R² value indicates that the model explains 9% of the variation in the dependent variable.

4.4 Relationships between values/attitudes, risky driving/riding and accident involvement

The third aim of the study is to examine the relationship between values/attitudes, risky driving/riding and accident involvement. In Table 4, we show the mean scores of the index measuring ‘Risky driving/riding’ and the index measuring descriptive norms. The first is an index comprised of 10 DBQ items, e.g. over speeding, driving under the influence, aggressive violations, driving without helmet/seat belt etc. Descriptive norms is an index comprised of seven items, focusing on what kind of road safety behaviours respondents expect from drivers from their own country. The questions are based on DBQ-items (cf. Section 2.3).

Comparing national scores for risky driving/riding, we see significantly higher scores among Greek vs. Norwegian respondents ($p = 0.001$). This means riskier driving/riding in the Greek sample, than in the Norwegian sample. Comparing risky driving/riding for car drivers vs. motorcycle riders, we see significantly higher scores for riders ($p = 0.001$). This means riskier driving among the motorcycle riders than the car drivers. Comparing national scores for descriptive norms, we see significantly higher scores among Greek vs. Norwegian respondents ($p = 0.001$).

This means that the drivers/riders in the Greek sample expect more risky driving/riding from car drivers in their own country than drivers/riders in the Norwegian sample expect from drivers in their own country. Comparing descriptive norms for car drivers vs. motorcycle riders, we see relatively similar scores within countries. Thus, car drivers and motorcycle riders attribute approximately the same level of risky driving/riding from car drivers in their own country, indicating that descriptive norms provide a meaningful indicator of national road safety culture.

Table 4 Mean scores on the index measuring risky driving/riding and the index measuring descriptive norms, among car drivers and motorcycle riders in the two countries

Country	Mode	Count	Risky driving/riding		Descriptive norms	
			Mean	S.D.	Mean	S.D.
Norway	Car	596	15.3	4.4	10.7	3.6
	MC	137	16.5	4.0	10.8	2.7
	All	733	15.6	4.4	10.7	3.4
Greece	Car	286	19.7	9.5	18.6	7.1
	MC	193	21.0	10.0	17.2	6.4
	All	479	20.3	9.7	18.0	6.8
All	Car	882	16.8	6.8	13.3	6.2
	MC	330	19.2	8.4	14.5	6.1

Table 5 shows the results of a regression analysis with ‘Risky driving/riding’ as the dependent variable. In this analysis, we examine the factors influencing risky driving/riding.

Table 5 Linear regression, standardized beta coefficients; dependent variable: ‘Risky driving/riding’

Variables	Risky driving/riding
Gender (Male = 1, Female = 2)	-0.148***
Age	-0.061**
Nationality (Norwegian = 1, Greek = 2)	-0.022
Car-MC (Car = 1, MC = 2)	0.028
Descriptive norms	0.490***
Freedom to take risk in traffic	0.108***
MC type (Other = 1, Scooter = 2)	0.034
Adjusted R ²	0.290

Note: * p < 0.1; ** p < 0.05; *** p < 0.01

The demographic background variables like respondents’ gender and age contributes significantly and negatively. This means that older drivers and female drivers are involved in less risky driving/riding, controlled for the other variables in the model. The variable ‘Descriptive norms’ contributes positively and significantly, indicating that the riskier driving respondents attribute to other drivers in their country, the riskier behaviours they are involved in themselves. The variable ‘Freedom to take risk in traffic’ also contributes significantly and positively indicating that the more respondents value freedom to take risk, the riskier behaviours they are involved in themselves, controlled for the other variables in the model. These two variables are the key elements in our definition of RSC, which we see are the most important predictors of risky driving/riding.

It should also be mentioned that the reason that ‘Car-MC’ does not contribute significantly in the model is due to the inclusion of the variable ‘Freedom to take risk in traffic’. When we include variables stepwise, the ‘Car-MC’ variable contributes significantly at the 5% level until the variable ‘Freedom to take risk in traffic’ is included. This is in accordance with our theoretical assumptions about the relationship between RSC values and road safety behaviours. Finally, the adjusted R^2 value indicate that the model explains 29% of the variation in the dependent variable.

We also examine the factors influencing accident involvement, in accordance with the third aim of the study. We calculate respondents’ risk based on estimated million kilometres (kms) driven in the last two years with car or motorcycle, and the share of respondents who answered that they had experienced an accident (minimum property damage) in the last two years. As expected, we see a higher risk for motorcycle riders, and generally a higher risk for riders and drivers in Greece than in Norway. The accident risk for car drivers in Norway was 4.4 accidents per million kms, while the corresponding risks for Norwegian riders was 11.9, while it was 7.9 for Greek drivers and 14.3 for Greek riders (Nævestad *et al.* 2020). A logistic regression analysis was conducted with accident involvement as the dependent variable. This is displayed in Table 6.

Table 6 Logistic regression, odds ratios; dependent variable: ‘Accident involvement’ (No accident: 0, Accident: 1)

Variables	Accident involvement
Age	0.696
Nationality (Greek = 0, Norwegian = 1)	0.522***
Car-MC (MC = 0, Car = 1)	0.909
Mileage	1.003
Risky driving/riding	1.023**
Incidents	0.339***
Freedom to take risk	0.991
MC type (Other = 1, Scooter = 0)	1.013
Nagelkerke R^2	0.092

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

First, nationality contributes significantly to accident involvement, controlled for the other variables in the analysis. The value indicates that being Norwegian involves lower odds of being involved in an accident, controlled for the other variables in the analysis. Second, risky driving/riding contributes significantly to drivers’ and riders’ accident involvement. This means that the more involved riders and drivers are involved in risky driving/riding, the higher are the odds of accidents. The variable ‘Incidents’ also contribute significantly, when controlling for the other variables in the model This refers to ‘near misses’ in the last two years for riders, which is defined as situations where the riders or others have had to break and/or turn heavily to avoid collision. For drivers, this refers to situations where they have dented or scratched their car, or touched an object (wall, post etc). Surprisingly, experiencing such incidents is related to lower odds of accidents, when controlling for the other variables in the model. The Nagelkerke R^2 value indicates that 9% of the variation in respondents’ accident involvement is explained by the model.

5 Discussion

5.1 Values/attitudes among motorcycle riders and car drivers across countries

The first aim of the study was to compare the values/attitudes related individual freedom among car drivers and motorcycle riders in Norway and Greece. We hypothesized a lower focus on individual freedom to take risk among the Norwegian riders and drivers, as this country has adopted Vision Zero, has the highest road safety level in Europe and presumably the most comprehensive regulations of drivers' freedom (Hypothesis 1). Our results did not support this hypothesis, as we did not find statistically significant lower scores on the freedom to take risk index among Norwegian riders and drivers. This is in contrast to previous research focusing on car drivers and bus drivers in three countries, indicating a relationship between national RSC values, involving high focus on individual freedom to take risk in traffic, risky behaviours and low road safety (Elvebakk 2015).

We hypothesized a higher focus on individual freedom to take risk among motorcycle riders across countries (Hypothesis 2), as many riders cite freedom as the main enjoyment factor or riding (Broughton 2005), and as previous studies find six times higher accident risk among riders than drivers, which is explained partly by pointing to risky rider behaviours, e.g. speeding (Bjørnskau *et al.* 2012; DaCoTa 2012). The difference between the mean scores of motorcycle riders across countries was not significant, indicating a shared valuation of freedom to take risk among motorcycle riders across countries, which was higher than that of car drivers. The difference between riders and drivers were nearly twice as big as the difference between countries. Thus, our data supports Hypothesis 2, indicating the importance of transport mode (i.e. motorcycle vs. car) over country when it comes to freedom to take risk in traffic.

5.2 Factors influencing values/attitudes related to individual freedom

The second aim of the study was to examine the factors influencing values/attitudes related to individual freedom in the studied groups. In these analyses, we controlled for several variables. Results indicated, for example, that women and older driver focus less on drivers' freedom to take risk in traffic. In these analyses, we also saw that nationality significantly influenced values/attitudes related to individual freedom, indicating more focus on freedom to take risk in traffic among Greek riders/drivers, controlled for the other variables in the analysis. We also saw that transport mode significantly influenced values/attitudes related to individual freedom, indicating that motorcycle riders focus more on freedom to take risk in traffic. These results also apply when controlling for several variables related to the individual (e.g. age, gender) and national level (e.g. authorities' focus on road safety).

5.3 Relationships between values/attitudes, risky driving/riding and accident involvement

The third aim of the study was to examine the relationship between values/attitudes, risky driving/riding and accident involvement. Our results generally indicate relationships between values/attitudes related to freedom to take risk and the risky driving/riding of the respondents, which subsequently was related to respondents' accident involvement. Our results indicate that motorcycle riders have a higher valuation of freedom to take risk in traffic than car drivers, riskier road behaviours and a higher accident risk. This is in line with previous research (Bjørnskau *et al.* 2012; DaCoTa 2012). Additionally, when looking closer at the motorcycle riders in our sample, we find differences between them—scooter motorcycle riders score significantly higher on the freedom to take risk index in our sample than other motorcycle type riders. They also score higher on risky riding. This is in line with previous research, although this has found that riders of racing replica bikes have a riskier behaviour in traffic and a higher

accident risk (Bjørnskau *et al.* 2012). The riders of racing replica bikes in our sample also score high on the risky riding index, but this group is small in our sample ($n = 20$). Riders of ‘Other’ motorcycle types and off-road motorcycles have the lowest scores on the risky riding index, indicating a certain heterogeneity in the motorcycle sample.

We conducted a regression analysis with a ten-item ‘Risky driving/riding’ variable as the dependent variable. Results indicated that the more respondents value freedom to take risk, the riskier behaviours they are involved in themselves. Based on previous research (Kaçan *et al.* 2019; Gehlert *et al.* 2014; Seymer 2013), we assume that RSC is comprised of relatively abstract values (e.g. ‘freedom to take risk in traffic’) and more specific attitudes (e.g. ‘Road users should be able to choose risky activities as long as they do not expose others to risk’), and that the more specific attitudes are related to risky behaviours (e.g. ‘I exceed speed limits on motorway roads’, ‘I drive without a helmet’, ‘drive without using seat belt’). These are the relationships that we have measured in the present study. Based on previous research, we assume that RSC values influence road safety behaviours through attitudes, and more specifically the cognitive, affective and behavioural intention modes of attitudes (Kaçan *et al.* 2019; Gehlert *et al.* 2014; Seymer 2013; Ajzen 2001).

Descriptive norms also contributed significantly, as indicated in our previous research (Nævestad *et al.* 2020; Nævestad *et al.* 2019a; Nævestad *et al.* 2019b). This means that the level of driver violations respondents expected from other drivers in their countries, were related to their own reported levels of road violations. Descriptive norms may influence behaviour by providing information about what is normal and expected in certain groups (Cialdini *et al.* 1990). Descriptive norms provide information about what is normal and expected among other drivers in the country, or the transport mode of the respondents (e.g. among motorcycle riders). Thus, based on Cialdini *et al.* (1990), we may hypothesize that the mechanism explaining the relationship between RSC and road safety behaviours is subtle social pressure to behave in accordance with ‘what is normal’ in your primary reference group (Nævestad *et al.* 2020; Nævestad *et al.* 2019a; Nævestad *et al.* 2019b). In our multivariate analyses, we see relationships between descriptive norms among the respondents in the different groups (i.e. the national level of risky driving/riding) and the risky driving/riding of the respondents. To conclude, our research indicates that RSC is made up by at least the following key elements: shared values/attitudes, descriptive norms and shared patterns of behaviours. We find systematic relationships between these elements, and we also find that the shared patterns of behaviours (i.e. risky driving/riding) are related to accident involvement.

5.4 Are values/attitudes related to freedom to take risk a cause or result of risky behaviours?

We have explained how we assume that values precede road safety behaviours above. However, with our cross-sectional research design, we do not know the extent to whether values actually precede actions, or whether it is the other way around. It is thinkable that people with risky driving/riding behaviours, adapt their more or less espoused values related to their behaviours, to justify or legitimize their own risky driving/riding. This would mean that values do not necessarily precede actions, but that they follow actions, and that their rationale or role is to legitimize and justify this behaviour. Although it may be difficult to conclude about this, we may conclude that this discussion may be less relevant. No matter how values have come into place, this discussion indicates that an important role of RSC values may be to legitimize and motivate road safety behaviours, whether they come before or after behaviours in the first place. Below, we will delve more into the discussion of how RSC values come into place.

5.5 Policy implications: Can values/attitudes be influenced?

The fourth aim of the study was to discuss whether values/attitudes can be influenced in an attempt to increase road safety. We have found a relationship between values related to freedom to take risk and risky driving/riding. As RSC values motivate and legitimize road safety behaviours, we may assume that if we are able to change the values, it will lead to less risky driving/riding in the groups that have the highest valuation of freedom to take risk and the highest levels of risky driving/riding. Following this conclusion, it is relevant to ask how RSC values come about and specify these mechanisms in order to be able to influence them. Some scholars distinguish between different cultural levels, generally referring to deep and shallow levels (Haukelid 2008; Schein 2004). Schein (2004) provides the most well-known depiction of cultural levels. He divides organizational culture into three analytical levels. The deepest, most important level is taken-for-granted, basic assumptions that influence what we pay attention to, what things mean, how we react emotionally and how we act. Basic assumptions generate espoused values, which refer to explicit strategies, goals and philosophies. Espoused values generate artefacts (physical, verbal and actions), which represent the shallowest level of organizational culture. These are easy to discern, but hard to decipher, as Schein (2004) puts it. In a similar fashion, Haukelid (2008) discerns between three cultural levels: the linguistic level, a more tacit and taken for granted level and a more basic philosophical or epistemological level, where culture is considered a prerequisite of knowledge. These examples indicate that RSC values seem to reside in the deeper cultural levels, meaning that they may be hard to discern, and change, as they to some extent may be taken for granted and implicit. Values may however also be espoused, but such values may also be in conflict with taken for granted values (Haukelid 2008).

Additionally, values are often parts of more comprehensive RSC, where they may play an important role in a larger cultural picture. For instance, freedom plays a crucial role in the American culture, and this is coupled to freedom to take risk in traffic (Moeckli & Lee 2007), and a lower road safety level than, for example, in Europe (WHO 2022). Additionally, freedom might be said to play a similar crucial cultural role in an overarching motorcycle culture. As indicated by the research of Broughton (2005), freedom, was the most common reason for riding, reported by motorcycle rider respondents. In our study, as in previous research, this was related to higher levels of risky road behaviours, and a higher accident risk than among car drivers (Bjørnskau *et al.* 2012; DaCoTa 2012). In these cultural settings, values play an important ideological role, they are also related to identity, behaviours, and presumably also resistance against state interventions and paternalistic measures limiting the freedom to take risk. Thus, these examples illustrate that the importance and role of values in specific cultures may also influence how easy it is to change or influence them. Broughton (2005) concludes that freedom is the main reason for riding provided by motorcycle riders, indicating that this is a primary value. To use the example of RSC in the US again, freedom is mentioned as a crucial American value, also influencing American RSC (Moeckli & Lee 2007). This culture and its valuation of freedom has limited seat belt laws, helmet wearing laws and other paternalistic measures in the US. These examples illustrate the pervasiveness of cultural values, and how difficult it may be to change them.

Nevertheless, we may assume that values may change in different sociocultural contexts, e.g. countries and subgroups of road users. In the present study, we have examined factors influencing respondents' valuation of freedom to take risk in traffic and found out that this was influenced by both factors at the individual level (gender, age, education) and factors at the state level (e.g. authorities' focus on road safety). Based on the former, values may change e.g. as the population of drivers/riders becomes older. Based on the latter, it is conceivable that different types of road safety policies related to engineering, enforcement, education and e.g. RSC

campaigns, involving high focus on road safety among authorities at different levels (national, regional, municipal) might influence road safety values. In accordance with this line of thinking, Nævestad *et al.* (2022) discusses whether Vision Zero can be seen as a successful example of cultural engineering, and/or an example of an innovative policy developed in an already paternalistic RSC. Vision Zero is both a moral value and vision and a comprehensive set of paternalistic road safety measures limiting drivers' freedom to take risk. Perhaps similar efforts can be introduced to influence RSC values among motorcycle riders, through a dialogue between traffic safety authorities and riders. This might be done through systematic measures signalling increased authority focus on motorcycle rider safety, e.g. through design of guardrails, road safety inspections focusing on riders' needs (e.g. curves, visibility, roadside terrain), technical controls of motorcycles, specific education, information to riders, etc.

5.6 Methodological limitations and questions for future research

5.6.1 *Different recruitment of respondents*

The recruitment of respondents, motivational measures and administration of the surveys were different in the two countries (cf. Section 2.2). This is a potential methodological weakness of the study which is important to bear in mind when interpreting the results.

5.6.2 *Representativeness*

When interpreting the results, drawing inferences about differences between the RSCs in the countries and between car drivers and motorcycle riders, it is also important to remember that the national samples are relatively small, and that respondents may not be representative of the respective national populations of car drivers and motorcycle riders. Thus, future studies could involve larger samples, especially for the motorcycle riders. It is also important to remember that the population of motorcycle riders is far more heterogenous than we have been able to communicate and examine in the present study. This is an important issue for future research, focusing on RSC, including values. This research should also focus on the potential existence of different cultural values in different cultural subgroups of motorcycle riders, and the factors influencing these values.

5.6.3 *Identifying key influencing variables*

Some of variables in the survey were developed in our SafeCulture project (e.g. questions aiming to measure respondents' valuation of individual freedom in traffic safety). The variables that are included in the multivariate regression analyses are mostly based on previous research suggesting their importance. There are few previous studies of factors influencing respondents' valuation of individual freedom in traffic safety, and thus the inclusion of variables influencing this could be more well informed. These issues could explain the relatively low R^2 value in the analysis of factors influencing respondents' valuation of individual freedom in traffic safety. Thus, an important task for future research is to identify more and better indicators of valuation of individual freedom in traffic safety, and factors influencing this. The attitudes we have used to measure freedom to take risk are rather general, and this indicates an important area for future research: perhaps more specific attitudes are more strongly related to risky behaviours, and thus more important for road safety.

5.6.4 *Different national road safety contexts*

Finally, it is important to remember that the road safety contexts in Norway and Greece are very different and comprised by several unique factors influencing RSC. Nævestad *et al.* (2019a) hypothesize that national RSCs in the two countries are influenced by: (1) interaction, (2) infrastructure, (3) enforcement, (4) education, (5) road user composition, and, perhaps also (6) the financial crisis in Greece. As noted, the contexts for motorcycle use are also very

different in Norway and Greece, as indicated by different seasonal trends in riding, the rider population, trip purposes and types of motorcycles that are used.

6 Conclusions

Results indicate that riders in both countries value freedom to take risk in traffic significantly higher than drivers in their countries. This indicates shared RSC values among motorcycle riders across countries, focusing on freedom to take risk in traffic. Regression analyses indicate a relationship between higher valuation of freedom to take risk in traffic and risky rider behaviours, which are related to accident involvement. Although it may be hard to conclude whether motorcycle riders' higher accident risk than car drivers is a result of their appreciation of freedom to take risk, we see a pattern involving higher valuation of freedom to take risk, and higher levels of risk taking, which is related to higher risk of accidents among motorcycle riders. Our results indicate that values focusing on freedom to take risk have an important role in RSC, presumably legitimizing and motivating risky driving/riding. Our discussion also indicates that values may have crucial importance in RSC, making them hard to influence in order to improve road safety. The present study provides a unique contribution to the literature on road safety culture, as there are few other studies focusing on the role of values in RSC, and how they influence road safety behaviours and accident involvement.

An important policy implication to draw from this study is that when developing traffic safety interventions, it is important to remember that risky riding/driving might be related to underlying cultural values. Our study indicates that RSC values seem to reside in the deeper cultural levels, meaning that they may be hard to discern, and change, as they to some extent may be taken for granted and implicit. Moreover, values are often parts of more comprehensive RSC, where they may play an important role in a larger cultural picture. Based on this, it is relevant to ask whether values should be a target for interventions at all. As values are relatively abstract, often implicit and 'taken for granted', it might be more practically feasible to attempt to influence more specific attitudes related to concrete activities (e.g. speeding, helmet wearing). In practice, this would mean whether it is possible to influence the cognitive (e.g. 'riding without a helmet is dangerous') and affective (e.g. 'riding without a helmet is morally despicable') components of attitudes related to specific types of risky behaviour, in manners which influences the behavioural intentions (e.g. 'I will never ride without a helmet'). This is an important and interesting issue for future research.

Additionally, it is important to note that we compare mean scores on indexes related to freedom to take risk values and risky behaviours. Thus, we should not assume that all motorcycle riders have a generally risky riding behaviour and a high valuation of freedom to take risk. We may rather conclude that when comparing mean scores on these indexes with car drivers, we see that riders score significantly higher than drivers. Previous research indicates that there are subgroups within the motorcycle rider population which have riskier behaviours and higher accident risk than others, e.g. depending on the motorcycle type that is used (Bjørnskau *et al.* 2012). We see the same in our study—scooter motorcycle riders score significantly higher on the freedom to take risk index in our sample than other motorcycle type riders. They also score higher on risky riding. Thus, it is perhaps particularly relevant to target such subgroups of riders focusing on the cognitive and affective components of attitudes related to specific types of risky behaviour. This is, however, likely to be a challenging task, as values often are taken for granted and related to identity. However, having an understanding of the importance of these factors is a necessary place to start when developing road safety measures targeting high risk road user groups.

CRedit contribution statement

Tor-Olav Nævestad: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing—original draft. **Alexandra Laiou:** Conceptualization, Investigation, Methodology, Writing—original draft. **George Yannis:** Conceptualization, Investigation, Methodology, Writing—original draft.

Declaration of competing interests

The authors declare no competing interests.

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Ethics statement

The methods for data collection in the present project have been approved by the Norwegian Centre for Research Data (NSD), which assists researchers with research ethics of data gathering, data analysis, and issues of methodology. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

Availability of data

The data are available on request to the authors.

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Questionnaire

Background questions	
Gender	1) Male, 2) Female
What is your nationality?	1) Norwegian 2) Greek
Age group	1) < 26 2) 26-35 3) 36-45 4) 46-55 5) 56+
For how long have you had your motorcycle license? (car license for drivers)	1) 0-5 years 2) 6-10 years 3) 11-15 years 4) 16-20 years 5) More than 20 years
What kind of motor bike do you usually ride?	1) Touring 2) Off-Road 3) Racing type 4) Scooter 5) Chopper 6) Classic motor bike 7) Other, specify
What type of car do you usually drive?	1) Passenger car 2) Station wagon 3) Van 4) Pick up 5) SUV 6) Other, specify
Approximately how many 100 km have you driven with a motorcycle in the two last years?	Estimated number of 100 km with a motor bike in the two last years
Approximately how many 1 000 km have you driven with a car in the two last years?	Estimated number of 1000 km with a car in the two last years
What is your highest education?	1) Primary school 2) High school 3) Lyceum 4) Professional school / Technological university 5) University
Questions measuring risky riding/driving	
For every ten trips you drive/ride a motorcycle/car approximately how often do you do the following things:	1) Never 2) Once or twice 3) Three or four times 4) Five or six times
Become angered by a certain type of driver and indicate your hostility by whatever means you can	

Sound your horn to indicate your annoyance to another road user	5) Seven or eight times
Disregard the speed limit on a residential road	6) More than eight times but not always
Pull out of a junction so far that the driver with right of way has to stop and let you out	7) Always
Drive when you suspect you might be over the legal blood alcohol limit	
Ride without wearing a helmet/Drive without wearing a seat belt	
Disregard the speed limit on a motor way road	
Race away from traffic lights with the intention of beating the driver next to you	
Become angered by another driver and give chase with the intention of giving him/her a piece of your mind	
Overtake a slow driver on the inside	

Questions measuring descriptive norms

When driving in my country, I expect the following behaviour from other drivers:	1) none/very few
That they become angered by a certain type of driver and indicate their hostility by whatever means they can	2) less than half
That they sound their horn to indicate their annoyance to another road user	3) about half
That they disregard the speed limit on a motor way road	4) more than half
That they overtake a slow driver on the inside	5) nearly all/all
That they drive when they suspect they might be over the legal blood alcohol limit	
That they drive without using a seat belt	
That they disregard the speed limit on a residential road	

Questions measuring values/attitudes

Road users know best themselves how they should behave in traffic	1) Totally disagree
Road users should be able to choose risky activities in traffic, as long as they do not expose other to risk	2) Disagree somewhat
A skilled person can take more risks than others	3) Neither agree or disagree
	4) Agree somewhat
	5) Totally agree

Other questions

Traffic safety is one of the most important priorities of the government in my country	1) Totally disagree
	2) Disagree somewhat
	3) Neither agree or disagree
	4) Agree somewhat
	5) Totally agree

During the last two years, have you been involved in near misses (situations where you or others have had to break and/or turn heavily to avoid collision) in traffic while driving a motor bike?

- 1) No
- 2) Yes (filter-how many times)

During the last two years, have you dented or scratched your car, or touched an object (e.g. a post, a wall, another car while parking)?

- 1) No
- 2) Yes (filter-how many times)

During the last two years, have you been involved in a traffic accident while driving a motor bike? (You may choose more than one alternative)

- 1) No
- 2) Yes, an accident with material damage only
- 3) Yes, an accident with injury to people
- 4) Yes, an injury with fatal injury to people

During the last two years, have you been involved in a traffic accident while driving a car? (You may choose more than one alternative)

- 1) No
- 2) Yes, an accident with material damage only
- 3) Yes, an accident with injury to people
- 4) Yes, an injury with fatal injury to people