



Traffic culture as symbol exchange – A cross-country comparison of Russia and Norway

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ABSTRACT

The core aim of the study was to gain insight into the cross-country differences in traffic risk perception and driving behaviour and also how culture and cultural differences may influence perceived risk and risk behaviour by comparing a sample of the Russian population with a sample of the Norwegian population. A new measurement instrument aimed at measuring culture as symbol exchange was applied. Self-completion questionnaire surveys were carried out among representative samples of the Norwegian ($n = 247$) and the Russian ($n = 299$) population aged 18 years and over. The results showed that culture defined as symbol exchange was weakly associated with risk perception. It is suggested that research carried out to date on the role of culture in risk research may have focused on criterion variables which are not very relevant. However, while traffic safety culture does not seem to be important for risk perception, this study shows that it seems to be relevant for drivers' risk behaviour and thus it is still relevant and important to focus on traffic culture in risk research despite the fact that culture does not predict perceived risk. As symbol exchange, the newly developed measure of traffic safety culture is capable of predicting drivers' risk behaviour in traffic and is therefore a valid predictor of traffic safety.

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1. Introduction

The frequency of serious traffic accidents in low- and middle-income countries is large compared to Norway and other Western countries and will be a serious threat to public health in developing countries by the year 2020 unless effective countermeasures are implemented (Murray and Lopez, 1996; Peden and Hyder, 2002; WHO, 2004). The same is also the case when countries in Western and Eastern Europe are compared. In Norway, a high-income country, the number of serious accidents in traffic is low, while in Russia, a middle-income country, the number of traffic accidents and risks related to such accidents are significantly higher. This article aims to present insights into cross-country differences in traffic risk perception and driving behaviour and also how culture and cultural differences may influence perceived risk and risk behaviour by comparing sample populations from Russia and Norway. In this respect, it is problematic that the concept of culture lacks a unanimous definition. The concept's plurality reflects the problems encountered in grasping a full understanding of the term. Although an extensive body of research has contributed to a theoretical understanding of the concept, there have been many problems in attempts to develop a coherent and proper under-

standing of the term culture. This is probably also relevant for the outcome of empirical investigations. It may even be argued that empirical research is relatively meagre compared to theoretical contributions. Thus, one challenge for empirical research is to mirror the variety and wide spectrum in contributions that have defined culture theoretically. There are at least four main theoretical approaches to understanding the role of culture in risk perception and in other areas: culture as social organisation (Douglas, 1970; Douglas and Wildavsky, 1983), culture as artefacts (Cole, 1996), culture as value exchange (Hofstede, 1980), and culture as symbol exchange.

The capability of Douglas's cultural theory (culture as social organisation) (Douglas, 1970; Douglas and Wildavsky, 1983) has previously been examined with regard to explaining perceived risk, risk behaviour, and demand for risk mitigation in transport (Boholm, 1996; Oltedal and Rundmo, 2006, 2007; Oltedal et al., 2009). According to this theory, perception is culturally constructed. The perception of risk is a function of cultural adherence. According to Wildavsky and Dake (1990, p. 42) the cultural theory of risk can be used to 'predict and explain what kind of people will perceive which potential hazards to be how dangerous'. However, this conclusion has gained very meagre support in other empirical studies (Marris et al., 1998; Oltedal and Rundmo, 2006, 2009). Sjöberg (2000) concluded that culture should not be regarded as a relevant factor when it comes to predicting risk perception.

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At least two explanations appear likely for the above-mentioned conclusions. The first is that culture is not able to predict risk perception at all, while the second calls for reconsideration of how culture is defined and understood, albeit without concluding that culture is not relevant for risk perception. An alternative approach to culture as social organisation is to focus on values and beliefs. This is in line with Hofstede's (2001) cross-cultural approach. He distinguished between the well-known five dimensions of culture, namely (1) entitled power distance, i.e. the extent to which it is accepted that power is unequally distributed, (2) individualism versus collectivism, (3) masculinity, which is related to gender roles, (4) uncertainty avoidance, i.e. society's tolerance of uncertainty and ambiguity, and (5) long-term orientation, which deals with virtue versus truth (see Hofstede, 2001 for a thorough presentation of the dimensions). Cole (1996) took a quite different approach to culture and cultural psychology compared to Hofstede (2001). Inspired by Russian psychology, culture is conceived to be a manifestation ending up with 'artefacts'. Artefacts are defined in terms of being simultaneously conceptual and material. An artefact is defined as 'an aspect of the material world that has been modified over the history of its incorporation into goal-directed human action' (Cole, 1996, p. 117). The operationalisation of culture defined in terms of artefacts is, however, a multi-level observational approach that starts by describing artefacts within a micro-level.

To define culture as artefacts is one of several ways to define this concept. Other ways are to define culture in terms of either social organisation or values and beliefs. Rampton (2001) summarised the four main categories of definitions of culture as an elite canon, as sets of values, beliefs, and behaviours, as reflection of socio-economic relations, and as the processes and resources involved in situated, dialogical sense-making. These categories closely match the perspectives presented above. Perceiving culture as 'elite canon' is to define it in terms of artefacts (Cole, 1996). The perception of culture as sets of values, beliefs, and behaviours corresponds to Hofstede's understanding of the essential core of culture (Hofstede, 2001, p. 9). Douglas and Wildavsky's (1983) cultural thinking may be categorised as culture conceived in terms of socio-economic relations.

A more generic definition of culture compared to those described above could be to conceive it in terms of 'communication', such as 'symbol exchange'. Geertz (1973), for example, defined culture in terms of symbol exchange. However, this definition of culture seems to form an essential reference for the above cited scholars in the field of psychology. Cole argues that there are coincidences between the artefacts theory and Geertz's symbolic theory (Cole, 1996, p. 122): symbols might be understood as artefacts. Hofstede (2001, p. 327) also refers to how 'thinking, feelings and reactions [are] acquired and transmitted mainly by symbols'.

Despite the fact that Douglas and Wildavsky (1983) did not use the concept of symbol exchange, such an understanding of culture may be important (Douglas, 1970). Douglas (1996) showed that symbol exchange forms an essential condition in her cultural theory. She defined in terms of social organisation and this was seen as an alternative to personality explanations of risk perception. The Saussurian theory of symbols seems to form a natural basis for Douglas' (1996) understanding of symbol, i.e. as communication. Despite that fact that the Saussurian perspective on symbols has been criticised, it still represents an attempt at operationalising culture. Saussure's (1974) semiology is a general theory about how signs are constituted in terms of arbitrariness and differences. Communication is independent of signs as such, but depends on the way in which they are structured and the context in which they appear. Communication is constituted by the use of oppositions of the sounds that appear within a language. This perspective on language represents a dynamic theory that opens up for different uses

of the same language. This creates dialects, depending on certain regions or certain subcultures.

Communication is more than pure language. Within a culture there are many different sign systems used for communication, such as gestures, paintings, music, and even behaviour. There may be the same type of arbitrariness and differences that constitute other means of communication. It could be argued that symbol exchange also should be included when operationalising culture. Thus, the challenge is first of all to operationalise symbol exchange in a sufficiently flexible manner. Culture is not stable, but a dynamic entity that includes changes. The same is true of language, and that is what Saussure's semiology aims to cover. The flexibility should be revealed in different forms of sensitivity. The measurement instrument must be sensitive to differences in communicational systems, and also differences in communicational styles within the systems. The more the former are elaborated, the more adequate the measurement instrument will be for capturing the whole range of variety in symbol exchanges, and the more the latter are elaborated, the more fine-meshed the measurement instrument will be to include subcultures within other cultures. Both requirements will encounter the understanding of culture as dynamic and changeable entity.

Traffic behaviour is also related to symbols and communication. It is inevitable that drivers will understand signals from other drivers' signs and communication concerning, for example, their behavioural intentions and indicators of driver anger. An understanding of other drivers' communication can be essential for avoiding accidents and therefore an understanding of culture as symbol exchange may be seen as relevant to traffic safety. Thus, there are reasons to suggest that a cultural theory built on symbol exchange should be more valid when it comes to predicting traffic risk perception and driver behaviour.

In social cognition models, such as the Theory of Reasoned Action and the Theory of Planned Behaviour, it is hypothesised that attitudes, norms, and behavioural intentions predict behaviour (Ajzen and Fishbein, 1980; Ajzen, 1991). In addition, risk perception can be a predictor of intentions as well as behaviour. Rundmo and Jørgensen (2008) showed that attitudes towards traffic safety, risk perception, worry predicted risk behaviour in high and middle income countries. In low-income countries the percentage of explained variance was found to be low, i.e. attitudes and perceived risk seemed to be of less importance for behaviour, especially compared to high-income countries. Thus, the prediction model fitted the data in high- and middle-income countries, but not in low-income countries, indicating that prediction models based on social cognition theory may be culturally biased. If this is the case, it could be expected that the capability to predict self-reported risk behaviour would differ in the two countries examined in the present article, and consequently it is interesting to examine prediction models separately for the two samples in order to examine whether or not the prediction model may be culturally biased. Accordingly, the specific aims of the present study are as follows:

1. To examine the reliability of a new measurement aimed at measuring culture and traffic culture as symbol exchange.
2. To investigate cross-country differences in culture and traffic culture and also risk perception and risk behaviour in traffic in Norway and Russia.
3. To test the prediction validity of culture and risk perception on drivers' risk behaviour in traffic and to compare the prediction capability among Norwegian and Russian drivers.

2. Samples

A self-completion questionnaire was distributed by post to a representative sample of the Norwegian population aged 18 years

and over. Respondents in this sample were recruited by random selection from the Norwegian Population Registry. Of the 978 questionnaires distributed by Post, 163 were returned. This resulted in a problematically low response rate of 16.7%. In order to address this, the questionnaire was distributed to 84 students at the Norwegian University of Technology and Science (NTNU). Of the 84 questionnaires distributed at the NTNU, 84 were returned (a 100% response rate). This resulted in a Norwegian sample of 247 participants. Simultaneously with the Norwegian data collection, a Russian version of the same questionnaire was distributed among a stratified sample in Russia ($n = 299$). This sample was stratified from different parts of the municipality of St. Petersburg. Experts of local demographics guided the sampling procedure in order to cover lower, middle, and upper-class areas. Individuals in these areas ($n = 245$) were randomly recruited and interviewed using the questionnaire. The respondents were contacted personally either at their workplace, in shopping malls, or public places, where they were subsequently interviewed. In the Norwegian sample, 59% of the respondents were female and 41% male, while corresponding figures for the Russian sample were 60% and 40% respectively. There were no significant gender differences between the samples: $\chi^2 = .076, p > .05$. The average age of the respondents in the Norwegian sample was 47 years and in the Russian sample it was 37 year. This is a significant difference: $F = 43.411, p < .001$. However, this was expected due to the fact that the average life expectancy is lower in Russia compared to Norway. In Norway, 40% of the respondents had received a college and/or university education, while for Russia the figure was 36%. A total of 13% of the Norwegian respondents had vocational education as their highest level of completed education and the corresponding figure for Russia was 42%. With regard to high school education, the figures were 40% and 21%, respectively. In Norway, 6% had primary and secondary school as their highest level of education and in Russia 1% had this level. The tendency that a larger part of the sample population from Russia had practical or vocational education compared to the sample from Norway, made the differences between the two countries statistically different: $\chi^2 = 59.012, p < .001$. In Norway 29% of the respondents drove a car for a distance of less than 100 km each month, 33% drove more than 100 km but fewer than 500 km, 28% drove more than 100 km but fewer than 2000 km, and 10% drove more than 2000 km. The corresponding figures for the Russian sample were 19%, 27%, 32%, and 23%, respectively. However, there was a slightly significant tendency that Russians drove more kilometres per month compared to Norwegians: $\chi^2 = 18.144, p > .01$.

3. Questionnaire

A new measurement instrument for traffic safety culture in particular and for culture in general was developed as part of the study project (see Klempe et al., 2009). In addition to Norway and Russia, the questionnaire has also been used in studies carried out in African and Asian countries (Rundmo and Jørgensen, 2008). The items designed to measure culture were proposed by experts on traffic safety and research in each of the participating countries and draught versions were discussed with the experts before the questionnaire was used. Culture was understood to be symbolic exchange, which in the present study is defined as 'forms of communication'. In the measurement instrument communication was related to different symbol systems and contextualised. Language, senses, and behaviour were hypothesised to represent the main categories of 'forms of communication'. The three categories were then divided onto two binary opposing forms. Thus, culture was considered to consist of three pairs of binary opposing forms, in total six forms or dimensions. The first pair was written and oral

culture, the second pair was visual and auditive culture, and the third pair was extravert and introvert culture. A total of four indicators were intended to measure each of the six dimensions, in total 24 indicators for measuring traffic safety culture and 24 indicators to measure culture in general. Factor analysis with oblique rotation and list wise exclusion was carried out to identify the dimensions of traffic safety culture in particular and culture in general. The dimensional structure and the loadings of the indicators are shown in the Tables 1 and 2. A few indicators had to be removed from the analysis because they failed to load. Thus, the analysis showed that a total of 18 indicators measured the six dimensions of traffic safety culture and 13 indicators were intended to identify culture in general. Concerning general culture, the analysis failed to identify an auditive culture and hence five dimensions were identified.

A previously validated measurement instrument was used to measure attitudes towards road traffic safety (Rundmo and Iversen, 2004). Responses were scored on a 5-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Factor analysis revealed that the attitude indicators fell into the six following dimensions: attitudes towards to speak out to an unsafe driver, drinking and driving, speeding, rule violation and sanctions, traffic rules and knowledge, and attitudes towards pedestrians. The first dimension consisted of the following two indicators: 'If my friends were passengers of an unsafe driver, I would join them' and 'In the absence of other good alternatives, I would let an unsafe driver drive me home'. The second dimension (drinking and driving) also contained two indicators, and concerned respondents' attitudes to driving while intoxicated by alcohol or to being passengers of a driver that they knew had consumed alcohol. The third dimension (speeding) consisted of indicators such as 'If you are a decent driver it is acceptable to drive a bit faster' and 'It makes sense to increase speed to drive past cars which are driving too slowly'. The two test indicators of the fourth dimension (rule violation and sanctions) related to respondents' willingness to violate road traffic regulations, such as speed limits. The fifth dimension (traffic rules and knowledge) related to respondents' general awareness and knowledge of road traffic regulations. The sixth and final dimension (attitudes towards pedestrians) contained such indicators as 'If a pedestrian is run down by a car, the pedestrian is to blame'.

In addition to culture, traffic risk perception was measured, i.e. the subjective assessment of the probability of a traffic accident and the judgement of severity of consequences if an accident should take place. The probability measure of risk perception fell into two dimensions: accident-specific situations and role-related accidents. The first dimension included seven indicators concerning the probability of different types of road traffic accidents, such as encountering accidents, the car running off the road, and collisions with pedestrians. The second dimension contained four indicators related to the probability of accidents as either a driver of a motor vehicle, rider of a bicycle, pedestrian in traffic, or passenger in a motor vehicle. The judgement of severity of consequences if an accident should take place was related to accident-specific situations. The dimension was unidimensional (seven items) and included indicators regarding judgments of severity of consequences if specific accidents occurred (e.g. car running off the road, head-on accidents, and collision with an animal).

Driver behaviour was also measured by a measurement instrument previously validated by Rundmo and Iversen (2004). Only respondents holding a driving licence were asked to respond to this measure. This instrument asked about drivers' judgements concerning how often they carried out certain actions in traffic. The responses were scored on a 5-point Likert-type scale ranging from 'never' to 'very often'. The instrument of driver behaviour was subdivided into six factors. Factor analysis identified six dimension of self-reported risk behaviour: self-reported behaviour

Table 1
Dimensional structure of traffic safety culture.

	Dimensions					
	1	2	3	4	5	6
<i>Dimension 1: Written culture</i>						
What I read about dangers, I take seriously	.75	.14	.16	-.01	.09	-.07
I consider a written request to be particularly serious	.73	.01	-.05	.02	.14	-.07
I prefer reading what the law says on right and wrong in traffic	.72	.16	.15	.07	-.02	.12
I enjoy following press debates concerning traffic regulations	.62	.21	.25	.17	-.13	.21
<i>Dimension 2: Auditive culture</i>						
While in traffic, I'm especially aware of the sounds around me	.17	.76	.06	.04	.16	.13
I react strongly to sounds signalling danger	.01	.71	.19	.07	.11	-.17
It is important to look for signs of danger	.32	.63	.02	.14	-.01	-.03
<i>Dimension 3: Oral culture</i>						
I enjoy hearing about what others consider right or wrong in traffic	.04	-.00	.77	.21	.05	-.01
I take oral corrections of my behaviour in traffic seriously	.23	.19	.69	.05	.03	-.08
I consider an oral request to be particularly serious	.13	.14	.57	-.07	.13	.25
<i>Dimension 4: Extravert culture</i>						
Prompt reaction to road signs is very important	.08	.21	-.10	.65	.06	-.07
I act according to the image of traffic that I see	.18	.05	.13	.63	.06	-.09
In traffic I usually behave as others are likely to expect me to	-.15	-.08	.17	.59	.09	.34
I'm especially aware of how other people behave in traffic	.04	.39	.23	.41	-.11	.16
<i>Dimension 5: Conscientious culture</i>						
When someone honks their horn, I think I've done something wrong	.03	.10	-.01	.01	.81	.15
Few sounds indicate that traffic is running smoothly	.09	.07	.20	.14	.66	-.09
<i>Dimension 6: Introvert culture</i>						
If everyone followed their own convictions, traffic would run smoothly	.09	.06	.13	.14	.15	.75
People's behaviour can change in dangerous situations	.03	.15	.13	.36	.19	-.52

Table 2
Dimensional structure of general culture.

	Dimensions				
	1	2	3	4	5
<i>Dimension 1: Visual culture</i>					
I find that visual images give us the best stories	.79	.15	.04	.05	.12
I think a picture can say more than a thousand words	.79	.02	.05	.27	-.04
I often draw pictures/patterns in order to understand	.70	.11	.10	-.02	.24
<i>Dimension 2: Written culture</i>					
The written word always applies	.09	.76	.00	-.03	.03
I remember best what I have read	.18	.65	.05	.27	.11
Writers/authors are important storytellers in society	.02	.64	.17	.12	.21
<i>Dimension 3: Introvert culture</i>					
It is common to follow one's inner voice	-.01	-.05	.81	.10	.02
Difficult situations in traffic are best solved by doing what I've been told	.03	.10	.62	.24	.19
If one does not follow one's inner voice, society will fall apart	.26	.30	.62	-.19	.00
<i>Dimension 4: Extravert culture</i>					
I think there should be a connection between life and learning	.11	.05	.22	.79	-.01
I think public persons should set good examples	.12	.20	-.03	.75	.16
<i>Dimension 5: Oral culture</i>					
I enjoy listening to stories	.05	.09	.09	.09	.84
I remember best what I've been told	.24	.20	.08	.06	.72

related to drinking and driving, rule violations, precautionary behaviour, speeding, seatbelt use, and driver behaviour when children are at play. The first dimension included four indicators related to how often the respondents used their car when intoxicated by alcohol or how often they travelled as passengers with a driver that they knew had consumed alcohol. The second dimension (rule violations) included six test indicators related to how often drivers carried out acts such as driving above the speed limits in order to reach important appointments and how often they continued to drive even when they felt tired. The third dimension (precautionary behaviour) consisted of four indicators related to how often the respondents slowed down due to cues which communicated caution (e.g. traffic signs). The fourth dimension (speeding) consisted of three indicators related to how often the respondents

slowed down in densely populated areas or when they were approached by pedestrians in the road traffic system. The fifth dimension (seatbelt use) included two indicators concerning how often the drivers used seatbelts on longer and shorter trips respectively. The sixth and final dimension (driver behaviour when children are at play) only contained one indicator and related to how often the drivers reduced their speed when a road sign indicated the possibility of children playing in a designated area. The reliability and internal consistency of the indices of road safety attitudes, risk perception, and self-reported risk behaviour have been tested in previous studies (Iversen, 2004; Nordfjærn and Rundmo, 2009; Nordfjærn et al., 2009).

The questionnaire also included a section which contained measures of demographic characteristics, such as gender, age,

Table 3

Cross-country differences in traffic culture and general culture between Norwegian and Russian subjects.

	Norway	Russia	F	Cohen's <i>d</i>
<i>Traffic culture</i>				
Written culture	2.59	2.59	.00	.00
Auditive culture	2.11	2.12	.09	.03
Oral culture	2.51	3.06	71.26***	.84
Extravert culture	1.84	2.14	35.04***	.58
Conscientious culture	2.68	2.66	.01	.01
Introvert culture	2.74	2.64	3.22	.17
<i>General culture</i>				
Visual culture	2.95	3.01	.47	.07
Written culture	2.74	2.43	23.04***	.47
Introvert culture	2.98	2.95	.18	.04
Extravert culture	1.83	1.77	.82	.08
Oral culture	2.50	2.32	5.36*	.24

Wilks $\lambda = .74$, $p < .001$, ** $p < .01$.

* $p < .05$.

*** $p < .001$.

educational achievement, employment status, and whether or not the respondents held a driving licence.

4. Results

The results of a multivariate analysis of variance (MANOVA) aimed at examining the cross-country differences in traffic culture in particular and culture in general between Russia and Norway are shown in Table 3. There was an overall significant difference in the respondents' judgements in the studied countries: Wilks $\lambda = .74$, $p < .001$. Concerning traffic culture, the Russian population sample expressed an oral and extravert culture to a larger extent than the Norwegian sample. The significant differences in culture in general were caused by significant differences in written and oral culture. In general, Norwegians expressed their culture in general to be characterised as more written and oral compared to the Russians. Differences in cultural expression seem to vary considerably regarding traffic culture in particular and culture in general.

A MANOVA analysis was also carried out to examine cross-country differences in attitudes towards traffic safety (Table 4). There was a significant overall difference: Wilks $\lambda = .50$, $p < .001$. The Norwegian population exhibited more 'ideal' attitudes compared to the Russian population. This was the case on all six attitude dimensions. As shown by the Cohen's *d*, the cross-country differences were moderate to large.

Cross-country differences in risk perception and self-reported risk behaviour are shown in Table 5. There was a significant overall difference in perceived risk (Wilks $\lambda = .87$, $p < .001$) and in risk behaviour in traffic (Wilks $\lambda = .55$, $p < .001$) when the two samples were compared. Concerning risk perception, the Russian population judged the severity of consequences if an accident should take place to be larger compared to the Norwegian population. There

Table 4

Cross-country differences in attitudes towards traffic safety between Norwegian and Russian subjects.

	Norway	Russia	F	Cohen's <i>d</i>
Speak up to an unsafe driver	3.83	3.31	26.68***	.50
Drinking and driving	1.64	1.27	25.33***	.50
Speeding	3.99	3.02	166.90***	1.24
Rule violation and sanctions	2.80	2.29	33.96***	.54
Attitudes towards pedestrians	3.45	3.16	24.32***	.46
Traffic rules and knowledge	3.58	3.38	70.34***	.70

Wilks $\lambda = .50$, $p < .001$,

*** $p < .001$.

were only minor cross-country differences in probability assessments. Russians holding a driving licence reported their behaviour in traffic to be more risky compared to Norwegian drivers. This was the case on all six dimensions of risk behaviour.

The associations between culture and attitudes towards traffic safety on the one hand, and between culture and risk perception on the other hand were examined separately for the sample populations from Russia and Norway. A stepwise hierarchic block regression analysis aimed at predicting risk perception related to the assessment of probability of experiencing a traffic accident in person (analysis 1) and also judgement of severity of consequences if an accident should take place (analysis 2) were carried out separately for each of the two samples, in total four analyses. The predictor variables were attitudes towards safety, traffic safety culture, and culture in general. The F-change values showed that neither attitudes towards traffic safety nor attitudes towards culture (traffic safety culture as well as culture in general), contributed significantly to the explained variance. This was the case for both samples (Table 6). The percentage of explained variance in risk perception (probability assessments and judgement of severity of consequences) was below 5% in all four analyses. Thus, in accordance with research carried out previously, the results of the present study show that culture was weakly and insignificantly associated with risk perception.

The next step was to examine the associations between attitudes, risk perception, and culture on the one hand, and between attitudes, risk perception, and risk behaviour in traffic on the other hand. This analysis was restricted to respondents who held a driving licence. A stepwise hierarchic block regression analysis showed that 37% of the variance in drivers' road traffic risk behaviour was explained in Norway and 33% in Russia (Table 7). The results also showed, as expected, that attitudes significantly contributed to explained variance. However, contrary to what has been shown above, traffic safety culture also contributed significantly to explained variance in risk behaviour. As expected, the associations between general culture and road traffic risk behaviour were insignificant in both the Norway sample and the Russia sample. Further, risk perception was insignificantly associated with behaviour.

5. Discussion

The results of the study have shown that culture defined as symbols was weakly associated with risk perception, as indicated in previous studies (Marris et al., 1998; Olstedal and Rundmo, 2006, 2007; Olstedal et al., 2009). The results of research conducted in recent years may indicate that Wildavsky and Dake's (1990, p. 42) conclusion that culture as social organisation (Douglas, 1970; Douglas and Wildavsky, 1983) is capable of predicting and explaining how people perceive dangers may be misleading. The present study, in common with studies that have applied alternative concepts of culture compared to Mary Douglas' cultural theory, has come to the same conclusion. Does this imply that culture is irrelevant in risk research?

It may be that research carried out hitherto on the role of culture in risk research may have focused on a criterion variable that is not very relevant. Culture does not seem to be important for risk perception. However, the present study shows that it seems to be relevant for risk behaviour and thus it is still relevant and important to focus on culture in risk research despite the fact that culture does not predict perceived risk. However, it is not primarily culture in general which predicts drivers' road traffic safety behaviour but, as expected, traffic safety culture more specifically. This is the case in Norway and in Russia, thus indicating that the hypothesis concerning associations between attitudes towards safety, risk perception, and driver behaviour is not culturally biased. This shows that

Table 5

Cross-country differences in risk perception and risk taking behaviour between Norwegian and Russian subjects.

Risk perception	Norway	Russia	F	Cohen's d
<i>Probability assessments</i>				
Risk perception specific situation and probability assessment	2.62	2.56	.65	.06
Role-related risk perception and probability assessment	2.65	2.72	.46	.06
Risk perception specific situation and evaluation of severity of the consequences	2.85	3.45	63.15***	.75
<i>Self-reported risk behaviour</i>				
Drinking and driving	1.23	1.52	26.92***	.88
Rule violations	1.85	2.10	26.94***	.65
Precautionary behaviour	2.44	2.40	.46	.08
Speeding	1.50	1.89	39.77***	.74
Seatbelt use	1.41	2.61	234.21***	2.34
Behaviour when children are at play	1.55	2.09	34.97***	.66

Wilks $\lambda = .87$, $p < .001$,Wilks $\lambda = .55$, $p < .001$,*** $p < .001$.**Table 6**

Predictors of risk perception in Norway and Russia.

Variables entered	Norway F change value	Russia F change value	Norway F change value	Russia F change value
Attitudes towards traffic safety	1.96 (NS)	.94 (NS)	2.86*	.42 (NS)
Traffic culture	.73 (NS)	1.37 (NS)	.99 (NS)	1.91 (NS)
General culture	1.55 (NS)	1.12 (NS)	1.18 (NS)	2.26*

NS = not significant.

* $p < .05$.**Table 7**

Predictors of driver behaviour in Norway and Russia.

Variables entered	Norway β -value	F-change	Russia β -value	F-change
<i>Attitudes towards traffic safety</i>				
Speak out to an unsafe driver	-.20	10.04***	-.11	8.68***
Drinking and driving	.15		.19	
Speeding	-.09		-.10	
Rule violation and sanctions	.01		-.07	
Attitudes towards pedestrians	-.06		-.04	
Traffic rules and knowledge	-.12		-.15	
<i>Risk perception</i>				
Risk perception in specific situation and probability assessment	.15	1.56(NS)	.10	2.62(NS)
Role-related risk perception and probability assessment	-.16		-.06	
Risk perception in specific situation and evaluation of severity of the consequences	-.05		-.12	
<i>Traffic culture</i>				
Written culture	.29	10.51***	.15	4.60***
Auditive culture	.26		.12	
Oral culture	.000		.10	
Extravert culture	.05		.20	
Conscientious culture	.03		-.04	
Introvert culture	-.13		-.01	
<i>General culture</i>				
Visual culture	-.05	.63(NS)	.12	1.09(NS)
Written culture	.00		.06	
Introvert culture	-.07		-.10	
Extravert culture	.01		-.01	
Oral culture	.06		-.03	

Adjusted $R^2 = .37$ (Norway), .33 (Russia).*** $p < .001$, NS = not significant.

the newly developed measure of traffic safety culture as symbols is capable of predicting driver risk behaviour in traffic and therefore is valid as a predictor of traffic safety.

Numerous studies have shown that risk perception and attitudes towards traffic safety are significantly associated with drivers' risk behaviour (see e.g. Iversen, 2004, for an overview) as well as for their priority for safety and demand for risk mitigation (see e.g. Moen, 2008). The results of the present study have shown that traffic safety culture understood as symbols may be associated with behaviour and may be equally important to safety attitudes as

a predictor variable of the relevant types of behaviour. In an intervention study aimed at revealing the traffic safety attitudes of adolescents aged between 18 and 19 years, Iversen et al. (2005) showed that self-reported risk behaviour was reduced, and in a cross-sectional survey Rundmo and Iversen (2004) attitudes towards safety predicted self-reported behaviour. Furthermore, self-reported risk behaviour predicted traffic accidents.

To our knowledge, previous studies that have investigated the role of culture in risk perception have not operationalised culture as symbols, but have applied other approaches to culture as

the theoretical basis of their operationalisation and measures of 'culture'. It is interesting to note that previous studies have not examined associations between culture and risk behaviour, but have mainly focused on the association between culture and perceived risk. In line with previous studies, the results of the present study have shown that culture seems to be of little importance for risk perception. Based on the findings of the present study, it is not possible to conclude decisively about other perspectives and operationalisation of culture in relation to their capability for predicting risk behaviour in general and road traffic behaviour more specifically. Further research should aim to compare various approaches and operationalisations of culture with regard to risk behaviour. Of course, it is not possible to draw any decisive conclusions about the relative validity and appropriateness for explaining risk behaviour of an understanding and operationalisation of culture as symbols in relation to other approaches on culture.

Why should culture be important for risk behaviour, yet at the same time not be significantly related to perception of risk? Due to lack of empirical research it may be difficult to give plausible explanation. However, Rundmo (1994) found significant associations between 'objective' risk, i.e. risk estimates based on quantitative methodology, and perceived risk. On the other hand, Brehmer (1987) argued that the difference between 'objective' and perceived risk is exigent and that 'objective' estimates also depend on choices, decisions, and weighting of severity of consequences, and thus are not very different for perceived risk. However, the fact that accidents take place and people are injured may be conceived to be an 'objective' fact. It may also be an argument that, contrary to 'objective' estimates, perceived risks primarily and mainly are based on intuitive judgement, which is not totally independent of the real dangers of accidents. Consequently, it may be that the extent to which a person judges a hazard or an activity to be risky primarily depends on the 'real' basis of the judgement even when it is intuitive, i.e. on the 'objective' risk, and further that culture does not have a noteworthy role in forming such intuitive judgements, as opposed to the importance of the real risk of how they are perceived. This understanding could be elaborated into hypotheses for further research. Contrary to what seems to be true for risk perception, it could be hypothesised that traffic safety culture is important for drivers' risk behaviour, and the results of the present study would support such a hypothesis.

In studies of cross-country differences the results may be interpreted as cross-cultural differences. However, cross-country differences cannot be interpreted as cross-cultural differences without examining differences in culture by measuring and documenting the way in which the cultures differ. Alternative explanations for cross-country differences, i.e. country differences in demographic and social-economic characteristics, should also be evaluated and controlled for. The present study is a cross-country comparison of traffic safety issues in Russia and Norway. Differences were also found in culture, measured as symbols, between the Russian and Norwegian populations. Further research should look into the relative importance of such cultural differences and also differences in demographic and socio-economic characteristics.

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