Perception of road accident causes

Ward Vanlaar (BIVV / IBSR, Belgium)
George Yannis (NTUA, Greece)

Abstract

A theoretical two-dimensional model on prevalence and risk was developed. The objective of this study was to validate this model empirically to answer three questions: how do European drivers perceive the importance of several causes of road accidents; are there important differences in perceptions between member states; do these perceptions reflect the real significance of road accident causes?
Data were collected from 23 countries, based on representative national samples of at least 1,000 respondents each (n=24,372). Face-to-face interviews with fully licensed, active car drivers were conducted using a questionnaire containing closed answer questions. Respondents were asked to rate 15 causes of road accidents, each using a six-point ordinal scale. The answers were analyzed by calculating Kendall's tau for each pair of items to form lower triangle similarity matrices per country and for Europe as a whole. These matrices were then used as the input files for an individual difference scaling to draw a perceptual map of the 15 items involved.
The model fits the data well and enabled us to answer the three questions of concern. The data clearly support the hypothesized model. The relative perception of the European drivers, regarding each of the fifteen potential accident causes, was analyzed in terms of these dimensions. Furthermore, the differences in perception among the drivers from the participating countries were assessed.
To conclude, individual difference scaling offers some promising possibilities to study drivers' perception of road accident causes.

Keywords: road accident causes, perception, individual difference scaling, perceptual map

1. Introduction

Different models regarding the relation between attitudes and behavior stress the importance of awareness of traffic laws or of risk in traffic as a first step to change driver behavior and improve road safety (Christ et al., 1999; Homel, 1988). The argument is that as long as drivers do not know what constitutes dangerous traffic behavior, they cannot refrain from behaving dangerously. Of course this is a simplified way of looking at the traffic safety problem: these models acknowledge that besides knowledge, other conditions have to be fulfilled before people react (see also: Grayson, 2003; Weinstein, Nicolich, 1993). There will always remain a group of people for whom awareness of risk does not suffice to adapt their behavior, leading to the statement that knowledge is a necessary but insufficient condition for safe behavior in traffic.

Zhang and Prevedouros (2005) investigate drivers' perception of accident risk due to rain. More than 2,000 responses to a web-based survey were analyzed to determine how rain conditions affect driver behavior. Drivers recognized a higher accident risk when driving in the rain especially in heavy traffic. Driver perceptions of accident risk were found to be independent of gender, age, driving experience, level of education and car types.

Peltzer and Renner (2003) surveyed a sample of 130 taxi-drivers in South Africa. While their research encompassed a broader range, including superstition and risk-taking, Peltzer and Renner also obtained data pertaining to the perception of road accident causes. A principal components factor analysis with varimax rotation was computed in order to find an interpretable structure of dimensions underlying the perceived causes of accidents in the sample. All thirty options were perceived as important causes of accidents by more than 80% of the respondents. The three most important perceived causes were: insufficient knowledge of traffic rules; dangerous parking; and drug or alcohol consumption, and the three least important were: bad luck; absence of pavements; sanctions being too lenient.

Behavioral risk models focus on the problems experienced by road users in perceiving, accepting and controlling risk (van den Bossche, Wets, 2003). A well-known behavioral risk model is Wilde's risk homeostasis model (Wilde 1988, 1994). Wilde relates risk perception to risk acceptance. The objective risk perceived is evaluated and compared to the accepted risk. Technical risk models study user behavior and risk in specific physical situations. The vehicle (e.g. size, brakes, stability), road (e.g. geometry, surface, intersections), and traffic (e.g. volume, speed, gaps) may be considered as situational stimuli to driver behavior. Most of these models are on the aggregated level.

The objective of this research is to understand drivers' perception of road accident causes. The analysis is based on data collected in the third phase of the "Social Attitudes to Road Traffic Risk of car drivers in Europe"-project (SARTRE 3). The relevant question is presented in Figure 1. By emphasizing the analysis to this one variable, the aim is to answer the following questions:

1) How do European drivers perceive the importance of several causes of road accidents?

2) Are there important differences in perceptions between member states?

3) Do these perceptions reflect the real significance of road accident causes?

2. Methodology

Data were collected from 23 countries, based on representative national samples of at least 1,000 respondents each (n=24,372). Face-to-face interviews with fully licensed, active car drivers were conducted using a questionnaire containing closed answer questions. Respondents were asked to rate 15 causes of road accidents, each using a six-point ordinal scale (see Figure 1). Sampling took place between September 2002 (when the first survey was conducted in Spain) and April 2003 (when the last survey was conducted in Portugal). A detailed description of the sampling methodology per country is available at SARTRE Consortium (2003).

Multidimensional scaling (MDS) was used to analyze the data. This technique refers to a class of methods that is widely used especially in behavioral, econometric, and social sciences to analyze subjective evaluations of pair wise similarities of items. The first MDS for metric data was developed in the 1930s (for a review of or introduction to MDS see Kruskal, Wish, 1978; de Leeuw, Heiser, 1982; Wish, Carroll, 1982; or Young, 1985) and later generalized for analyzing non-metric data.

More precisely an INdividual Difference SCALing (INDSCAL) was performed, which is an extension of the basic MDS model. It is a methodology for the identification of weights of individual differences that each subject uses to evaluate the stimuli. The stimuli are identified in terms of a (small) set of underlying dimensions that are common to all subjects. Furthermore, in the individual differences analysis, a canonical decomposition is used to identify the perceptual dimensions underlying the stimulus space, resulting in a perceptual map. This model was originally developed by Carroll and Chang (1970).

When performing INDSCAL, input data generally consist of similarity or dissimilarity matrices (containing Euclidean distance, correlation or covariance measures). The INDSCAL solution identifies the underlying dimensions common to the stimuli. “Concisely, the INDSCAL-model provides an internal analysis of a three-way data matrix consisting of a set of (dis)similarity matrices, by a weighted distance model using a linear transformation of the data” (MDS(X) User Manual (TUM), 1981: p 4.1).

Considering the ordinal format of the concerned question (see Figure 1), Kendall’s tau has been chosen to calculate the relations between the different items. Therefore, the input matrices contain similarities rather than dissimilarities meaning that closer items in the solution are perceived as being more alike to each other than less closer items. Details on the calculation of Kendall's tau can be found in Conover (1980).

The data were analyzed by means of the New MDS(X) Series of Multidimensional Scaling Programs for Windows (www.newmdsx.com). Furthermore, Permap version 11.2a was used to evaluate the starting configuration, namely to assess the validity of the two-dimensional representation of the multidimensional data (http://www.ucs.louisiana.edu/~rbh8900/permap.html).

Sub-optimal solutions sometimes occur with INDSCAL. The first common approach to overcome this problem is to make several runs with different starting configurations. A series of similar (or identical) solutions would then indicate that a true "global" solution has been found. Alternatively, one can use an analysis in which the averaged judgments have been analyzed as an initial configuration. The second option has been used in this research; the MINISSA analysis software was used to obtain a reliable starting solution (program originator: E. E. Roskam, University of Nijmegen, The Netherlands).

3. Data analysis

3.1 Model hypothesis

Main steps to be taken in a MDS include deciding on the number of dimensions and interpreting these dimensions. A small number of dimensions is desirable, as it is both practical and easy to interpret. A large number of dimensions is impractical; difficult to interpret; and may also harbor over-fitting concerns.

While there are empirical ways to obtain some idea of the proper number of dimensions for a particular model, a qualitative assessment of the problem at hand can also be valuable. For the given problem of determining the social relevance of different phenomena with respect to traffic safety, one should always combine at least three different features:

1) Prevalence of the phenomenon;

2) Risk of accidents that comes with this particular phenomenon; and

3) Severity of the consequences of an accident, due to this particular phenomenon.

By combining these features it is possible to estimate the impact of a certain phenomenon on the society in a balanced and objective way. An illustrative example of how these three different factors apply to a particular phenomenon is driving under the influence of alcohol or other substances. Clearly, this phenomenon increases the probability of involvement in an accident (Borkenstein et al., 1974). Furthermore, there is evidence in the literature that intoxicated persons involved in accidents are likely to suffer more severe injuries than sober individuals involved in similar accidents. An explanation is the following: “Theoretically, a host of transient and sustained metabolic and organ dysfunction created by both acute and chronic alcohol abuse should increase morbidity and mortality among trauma patients.” (Soderstrom, Eastham, 1987: p. 80). It is generally accepted – at least amongst road safety experts – that drink driving is very risky and increases the potential for traffic accidents, but people often tend to overlook the fact that, once an accident happened, the severity of the consequences can vary substantially according to the level of intoxication.

Empirical data from the dataset back up the hypothesis that drivers discern at least two different dimensions when interpreting the question under consideration. Table 1 lists the frequencies of the item “Defective steering”, an item that illustrates this view quite clearly. “Defective steering” is a phenomenon with a rather low prevalence, but a very high risk. 3.3% of all the respondents answer that defective steering never is the cause of a road accident, while 9.5% answer always.

One way to explain this broad distribution is by defining a hypothesis reflecting a two-dimensional model: while the first group apparently interprets this question as a question about prevalence – they realize perhaps that it is very risky, but since the prevalence is so low, they estimate this cause as being negligible – the latter sees it more as a question on risk – they realize perhaps that the prevalence is very low, but since it is that risky, they estimate this cause as being highly important. Summarizing this, it could be argued that these two groups attribute all of the importance to only one dimension. This confirms the *a priori* postulation that drivers discern at least two dimensions when evaluating the question concerned: some drivers clearly interpret the question as being about prevalence while others clearly focus on risk.

Having established a two-dimensional space, the interpretation of the dimensions is an important outstanding issue. The distribution of responses to another question (“how often do you think other drivers break speed limits?”) served as an indication to decide which of these dimensions is to be interpreted as the prevalence dimension. 84.5% of all respondents answered other drivers break speed limits often, very often or always, while only 15.5% answer never, rarely or sometimes. It seems a majority of respondents perceive the prevalence of other drivers breaking speed limits to be high up to very high. The rationale supporting the use of this variable as a second reference to establishing the prevalence dimension, lies in the knowledge that the prevalence of accidents due to breaking speed limits will rise with a rising prevalence of breaking speed limits, irrespective of the risk that comes with breaking speed limits (except if there would be no risk involved at all in breaking speed limits, which is of course not true). Given the high perceived prevalence of "breaking speed limits", the dimension most clearly contrasting "defective steering" with a low prevalence to "driving too fast" with a high prevalence (derived from the perception of "breaking speed limits") should be interpreted as the prevalence dimension; the interpretation of the second dimension will then follow automatically.

Figure 2 presents the hypothesized two-dimensional space, where the two dimensions capture perceived risk and perceived prevalence. This two-dimensional space thus comprises four different quadrants of items in our interpretation:

1) High perceived risk/low perceived prevalence items;

2) High perceived risk/high perceived prevalence items;

3) Low perceived risk/high perceived prevalence items;

4) Low perceived risk/low perceived prevalence items.

3.2 Model application and model fit

In order to avoid reaching a sub-optimal solution, the first step consisted of the selection of an appropriate initial solution to be used as a starting point for the INDSCAL algorithm. The second of the two approaches discussed in the previous section was chosen; a MINISSA-analysis was run. A lower triangle similarity matrix of Kendall’s tau for all 23 participating European countries served as an input file for this MINISSA-analysis (stress dhat, stress1=0.257; stress1 based on approximation to random data=0.218 (Spence, 1979)). Permap was then used in a second step to facilitate finding numerous solutions, each starting from a new set of random positions, to be sure that a global minimum was found with MINISSA instead of a local minimum (Heady & Lucas, 2001). A model that fits the data well (as evidenced by a stress1 value equal to 0.172) was selected and its coordinates were used as an input file for the INDSCAL-analysis. This analysis produced a subject space (see Figure 3), enabling evaluation of the model fit and a group space (see Figure 4), enabling interpretation of the two-dimensional space.

The way to interpret the subject space is as follows (Coxon, 1982: p. 195). The line of equal weighting in Figure 3 is a 45-degree line passing through the origin of the subject space. Subjects lying on that line attribute an equal weight to both dimensions. Subjects lying on the unit circle in Figure 3 have a perfect fit: all their data are explained by the model. Most countries appear to attribute roughly equal weights to both dimensions (slightly favoring the horizontal dimension). Poland (PL) and Estonia (EE) attribute more weight to the vertical dimension while Austria (AT), France (FR), United Kingdom (UK) and the Netherlands (NL) give more weight to the horizontal dimension.

Table 2 summarizes the dimension weights and the overall explained variance by country. The proportion of explained variance is derived by taking the squared distance from the origin of the subject space to a subject's point in that space (Coxon, 1982). The proportion of explained variance ranges from 0.73 for Austria and France to 0.47 for Croatia. With the exception of Croatia and Estonia, all the other countries have a value well above 0.50.

The main conclusion is that the model fits the data well and that the private spaces (solution per country) of most countries do not differ a lot from the group space (solution for Europe). Therefore, an aggregate analysis of the entire group space reflects the perception of the drivers from most European countries.

3.3 Group space analysis

The solution for the group space – the perceptual map (Figure 4) – clearly supports a two-dimensional model since all the variance between the items is distributed over both dimensions. This confirms the hypothesis of a theoretical model with prevalence and risk as the two dimensions (Figure 2).

Remember that similarities (Kendall's tau) are used as the actual data, meaning that smaller distances between items correspond to a higher level of perceived similarity between these items. Defining the horizontal dimension (dimension 1) as the prevalence dimension most clearly contrasts defective steering from driving too fast as argued in the previous section. The contrast between both items would be much less clear if the other dimension would be defined as the prevalence dimension since other items like "following too closely to vehicle in front", "bad weather conditions", "poorly maintained roads", "hand held mobile phone", "hand free mobile phone” and “traffic congestion” would all be situated further away from “defective steering” than “driving too fast”. This would mean that respondents perceive the prevalence of accidents due to each of these items to be higher than the prevalence of accidents due to “driving too fast”, which seems unlikely in the view of the distribution of the question about “breaking speed limits”.

If the first dimension is defined as the prevalence dimension then the interpretation of the vertical dimension (second dimension) as the risk dimension follows automatically. This allows discerning 4 different groups in the two-dimensional space.

The first group in the left upper quadrant of the solution contains the items which respondents perceive having a high risk and a low prevalence. These items are “defective steering”, “poor brakes”, “bald tyres” and “faulty lights”.

The second group in the right upper quadrant of the solution comprises the items with a high-perceived risk and prevalence. These items are “taking drugs and driving”, “drinking and driving” and “taking medicines and driving”.

A third group is formed in the lower right quadrant by the items “driving when tired”, “driving too fast”, “following too closely to vehicle in front” and “hand held mobile phone”; all items with a high-perceived prevalence and low-perceived risk.

Finally, there is one group left in the lower left quadrant, containing the items which respondents perceive having a low prevalence and a low risk. These items are “bad weather conditions”, “poorly maintained roads”, “hand free mobile phone”[1] and “traffic congestion”.

[1] The position of the item “hand free mobile phone” is actually cumbersome since it is lying on the vertical axis. However, the debate about placing this item in quadrant 3 or 4 is irrelevant in this paper, since the focus in the discussion is on the risk dimension and not on the prevalence dimension.

4. Discussion

This paper is an attempt to gain insight in the topic of perception of accident causes. Recent data collected through a survey of drivers from 23 European countries and state-of-the-art techniques (MDS and perceptual maps) were exploited (both on an aggregated – European – level, as well as on an individual – national – level). A two-dimensional model was hypothesized with one dimension representing prevalence and the other representing risk. This structure is supported by the data analysis. Furthermore, the analysis suggests that drivers from most countries in general have similar perceptions regarding accident causes.

The model provides an answer for the first two research questions formulated at the outset of this paper: “What are Europeans’ perceptions regarding the importance of causes of road accidents?” and “Are there important differences in perceptions between member states?”. The answer to the first question can be found in the group space of the INDSCAL-model, i.e. the perceptual map, while the answer to the second question is given by the subject space. The subject space of the model showed that there are no relevant differences between the 23 countries involved meaning that the group space, i.e. the solution for Europe, summarizes all the information in to one model that holds for each country.

The possibilities of enhancing traffic safety by means of such a perceptual map lie in the comparison of respondents’ perceptions with objective data about prevalence and risk of certain accident causes. Such a comparison leads to an answer to the third research question: “Do these perceptions reflect the real significance of road accident causes?”. The answer to this question is highly relevant since the hypothesis stated that objective information about risk in traffic is a necessary (but insufficient) condition to influence the behavior of drivers. Consider for example driving under the influence of drugs or alcohol and driving using a handheld mobile phone or a hands-free mobile phone. Drugs and drinking are both considered as high-risk phenomena, while both forms of mobile phone use while driving are considered to be low risk phenomena. Drivers attribute a low risk level to mobile phone use while driving while there is a consensus that both items are related to an elevated risk (e.g., De Proft, et al., 1997, Hway-liem, 1998, and Patten et al., 2003). One study even found evidence that the elevated risk level is comparable to the risk related to driving under the influence of alcohol with a blood alcohol concentration (BAC) of 0.8g/l (Direct Line Motor Insurance, 2002). The resulting perceptual map indicates that drivers might underestimate the danger of using their mobile phone – either hand held or hand free – while driving.

To conclude multidimensional scaling offers some promising possibilities to compare respondents' perception of road accident causes with objective information about these causes. Such a comparison could serve as a meaningful basis to enhance traffic safety by means of certain interventions, defined as actions in the pre-crash phase (Haddon, 1972), focused on humans via education. To optimize this promising method, two main conditions must be fulfilled. First, the model has to be validated to place its interpretation beyond discussion and it should be extended to a three-dimensional model that includes perception of severity of consequences. An alternative approach could encompass linear property fitting after having the respondents sort the items similar to Rosenberg's studies of implicit personality theory (Rosenberg and Sedlak 1972a, 1972b). Second, more detailed crash prevalence and crash risk data have to be available.

Acknowledgements

We acknowledge the feedback formulated by professor Anthony P.M. Coxon of the University of Edinburgh when writing the detailed version of this paper. We are very grateful for his helpful comments.

References

Borkenstein, R.F., Crowther R.F., Shumate W.B., Ziel W.B., Zylman, R., 1974. The Role of the Drinking Driver in Traffic Accidents (the Grand Rapids Study). 2nd edition. Blutalcohol, Supp. 1.

Carroll, J.D., Chang, J.J., 1970. Analysis of Individual Differences in Multidimensional Scaling via an N-way generalisation of “Eckart-Young” Decomposition. Psychometrika, 35 (3), 283-319.

Christ, R., Delhomme, P., Kaba, A., Makinen, T., Sagberg, F., Schulze, H., Siegrist, S., 1999. GADGET. Guarding Automobile Drivers through Guidance Education and Technology. Final Report. Kuratorium für Verkehrssicherheit (KfV), Vienna.

Conover, W.J., 1980. Practical Non-Parametric Statistics. 2nd Edition. John Wiley and Sons, New York.

Coxon, A.P.M., 1982. The User’s Guide to Multidimensional Scaling with special reference to the MDS (X) library of computer programs. Heinemann Educational Books Ltd, London.

de Leeuw, J., Heiser, W., 1982. Theory of multidimensional scaling. In: Krishnaiah, P. R. and Kanal, L. N., editors, Handbook of Statistics, volume 2, Amsterdam, pp. 285-316.

De Proft, K., Pauwels, J., Beirinckx, M., 1997. Effecten van het rijdend telefoneren op het rijgedrag. Faculteit Lichamelijke Opvoeding en Kinesitherapie, Labo Motorisch Leren, KULeuven, Leuven.

Direct Line Motor Insurance, 2002. The Mobile Phone Report. Direct Line Insurance, Croydon.

Grayson, G.B., 2003. Risk, hazard perception and perceived control. TRL, UK (TRL Report TRL 560).

Haddon, W., 1972. A logical framework for categorizing highway safety phenomena and activity is. The Journal of Trauma, 12 (3), 193-207.

Heady, R.B., Lucas, J.L., 2001. Permap Operational Manual. (http://www.ucs.louisiana.edu/~rbh8900/permap.html).

Hway-liem, O., 1998. Telefoneren in de auto en verkeersveiligheid. SWOV, Leidschendam (R-98-41).

Homel, R., 1988. Policing and Punishing the Drinking Driver. A Study of General and Specific Deterrence. Springer-Verlag, New York.

Kruskal, J. B., Wish, M., 1978. Multidimensional Scaling. Sage University Paper series on Quantitative Applications in the Social Sciences, number 07-011. Sage Publications, Newbury Park, CA.

MDS(X) User Manual (TUM), 1981. The MDS(X) Series of Multidimensional Scaling Programs. Inter-University/Research Councils Series, Edinburgh (Report no 51).

Patten, C., Ceci, R., Malmström, T., Rhenberg, K., 2003. Mobiltelefonerande i trafiken (Vägverkets utredning om användning av mobiltelefoner och andra IT-system under körning). Vägverket, Borlänge.

Peltzer, K., Renner, W., 2003. Superstition, risk-taking and risk perception of accidents among South African taxi drivers. Accident Analysis and Prevention, 35, 619-623.

Rosenberg, S., Sedlak, A., 1972a. Structural representation of perceived personality trait relationships. In: Romney et al., editors, pp. 134-163.

Rosenberg, S., Sedlak, A., 1972b. Structural representation of implicit personality theory. In: Advances in experimental social psychology, vol. 6, Academic Press, Inc., New York & London, pp. 235-297.

SARTRE Consortium, 2003. European drivers and road risk. Part 1. Report on principle analyses. J.-P. Cauzard, editor, INRETS, Paris.

Soderstrom, C.A., Eastham, J.N.Jr., 1987. The effects of alcohol on outcome among vehicular crash victims admitted to a trauma center. In: American Association for Automotive Medicine, Proceedings of the 31st Annual Conference in New Orleans, Louisiana.

Spence, I., 1979. A Simple Approximation for Random Ranking Stress Value. Multivariate Behavioural Research, 14, 355-365.

van den Bossche, F., Wets, G., 2003. Macro Models in Traffic Safety and the DRAG Family: Literature Review. Rapport Steunpunt Verkeersveiligheid bij Stijgende Mobiliteit, Diepenbeek (RA-2003-08).

Weinstein, N.D., Nicolich, M., 1993. Correct and Incorrect Interpretations of Correlations Between Risk Perceptions and Risk Behaviours. Health Psychology, 12 (3), 235-245.

Wilde, G.J.S., 1988. Risk homeostasis theory and traffic accidents: propositions, deductions and discussions of dissension in recent reactions. Ergonomics, 31 (4), 441-468.

Wilde, G.J.S., 1994. Target Risk - Dealing with the danger of death, disease and damage in everyday decisions. PDE Publications.

Wish, M., Carroll, J. D., 1982. Multidimensional scaling and its applications. In: Krishnaiah, P. R. and Kanal, L. N., editors, Handbook of Statistics, volume 2, Amsterdam, pp. 317-345.

Young, F. W., 1985. Multidimensional scaling. In: Kotz, S., Johnson, N. L., and Read, C. B., editors, Encyclopedia of Statistical Sciences, volume 5, Wiley, New York, pp. 649-659.

Zhang, L., Prevedouros, P. 2005. Motorist Perceptions on the Impact of Rainy Conditions on Driver Behavior and Accident Risk. In: Proceedings of the 84th Annual Meeting of the Transportation Research Board, Washington, D.C.

Figures

Figure 1: The survey question

How often do you think each of the following factors are the cause of road accidents?

(1=Never, 6=Always)

a) Driving when tired	1	2	3	4	5	6
b) Drinking and driving	1	2	3	4	5	6
c) Following too closely to vehicle in front	1	2	3	4	5	6
d) Driving too fast	1	2	3	4	5	6
e) Taking medicines and driving	1	2	3	4	5	6
f) Taking drugs and driving	1	2	3	4	5	6
g) Poorly maintained roads	1	2	3	4	5	6
h) Using a mobile phone (handheld) and driving	1	2	3	4	5	6
i) Using a mobile phone (handfree) and driving	1	2	3	4	5	6
j) Traffic congestion	1	2	3	4	5	6
k) Bad weather conditions	1	2	3	4	5	6
l) Poor brakes	1	2	3	4	5	6
m) Bald tyres	1	2	3	4	5	6
n) Faulty lights	1	2	3	4	5	6
o) Defective steering	1	2	3	4	5	6

Figure 2. The hypothesized two-dimensional space

Quadrant 1: High perceived risk Low perceived prevalence	Quadrant 2: High perceived risk High perceived prevalence
Quadrant 4: Low perceived risk Low perceived prevalence	Quadrant 3: Low perceived risk High perceived prevalence

Figure 3: The subject space (consult Table 2 for country names)

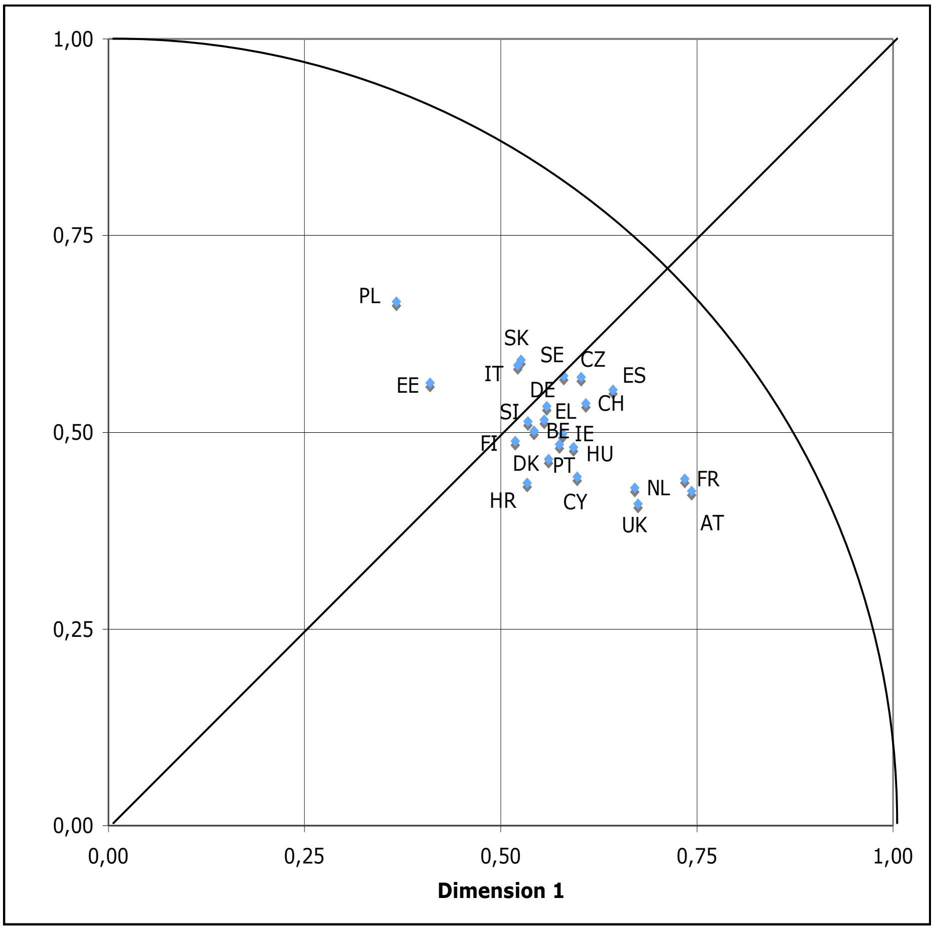
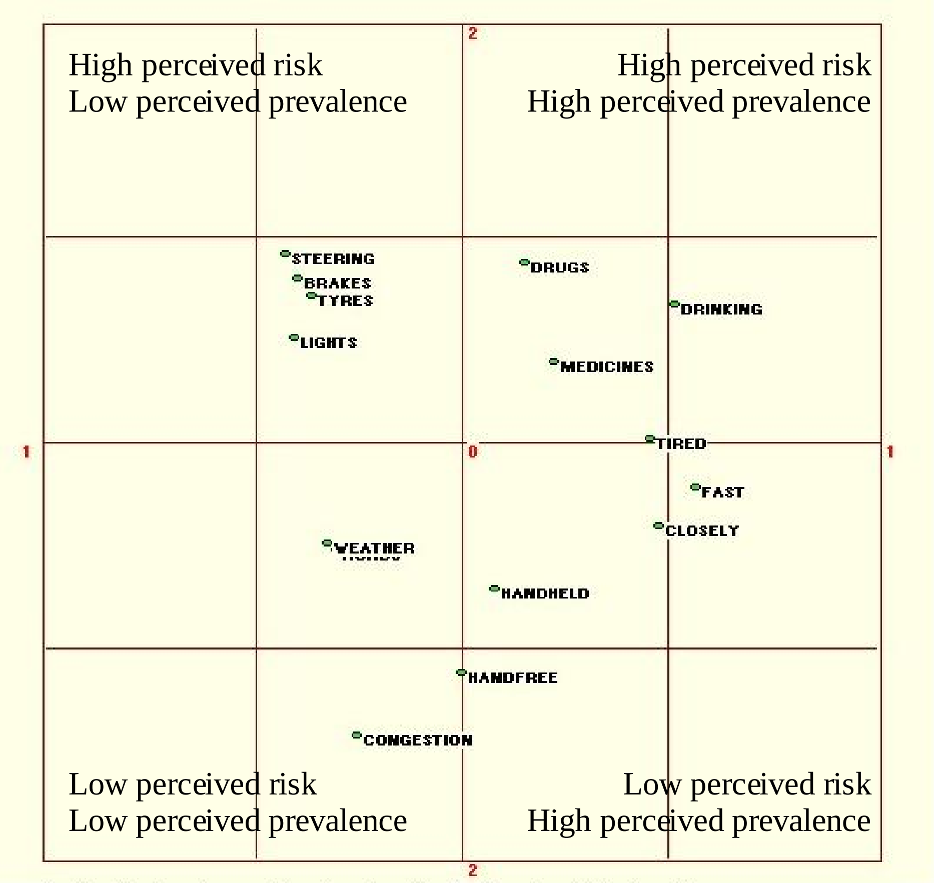


Figure 4. The two-dimensional group space



The item "bad weather conditions" overlays the item "poorly maintained roads".

Tables

Table 1: Percentage responses to the question: how often do you think defective steering is the cause of road accidents?

Answer	Percentage
Never	3.3
Rarely	26.5
Sometimes	27.5
Often	18.8
Very often	14.4
Always	9.5
Total	100.0

Table 2: Dimension weights and explained variance by country

Country	Subject's weight		Explained variance
	Dimension 1	Dimension 2	
Austria (AT)	0.743	0.425	0,73
France (FR)	0.734	0.441	0,73
Spain (ES)	0.643	0.554	0,72
Czech Rep. (CZ)	0.602	0.570	0,69
Switzerland (CH)	0.608	0.537	0,66
Hungary (HU)	0.580	0.572	0,66
Italy (IT)	0.525	0.592	0,63
Netherlands (NL)	0.671	0.430	0,63
United Kingdom (UK)	0.675	0.410	0,62
Slovakia (SK)	0.522	0.585	0,61
Germany (DE)	0.558	0.533	0,60
Ireland (IE)	0.579	0.498	0,58
Portugal (PT)	0.593	0.481	0,58
Poland (PL)	0.367	0.666	0,58
Greece (EL)	0.555	0.516	0,57
Sweden (SE)	0.575	0.485	0,57
Belgium (BE)	0.542	0.502	0,55
Slovenia (SI)	0.535	0.514	0,55
Cyprus (CY)	0.597	0.443	0,55
Denmark (DK)	0.561	0.466	0,53
Finland (FI)	0.519	0.489	0,51
Estonia (EE)	0.410	0.562	0,48
Croatia (HR)	0.534	0.436	0,47