



## Transport mode preferences, risk perception and worry in a Norwegian urban population

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### ARTICLE INFO

#### Article history:

Received 18 May 2011

Received in revised form 10 May 2012

Accepted 19 June 2012

#### Keywords:

Risk perception

Worry

Transportation mode preferences

Urban transport user

### ABSTRACT

The main aim of the present study was to compare risk perception among Norwegians ( $n = 512$ ) living in the region of Oslo. This study was part of an ERANET 13 project entitled PETRIS, Perception of transport risk in France and Norway. The data collection was carried out in January 2011. The response rate was 51 percent. The results showed that respondents, divided in two groups according to their transport mode preferences, assessed differently risk perception in public and private transportation. Respondents who preferred collective transportation assessed the probability of experiencing criminality in collective transport modes as higher than those who preferred private modes. They were also more worried of experiencing accidents, criminality, and terror attacks in collective transportation. The relationship between transport mode preferences and use, risk perception and worry are discussed.

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Risk perception related to accidents and incidents due to criminal acts and terrorism may be associated to transport mode use and preferences. These transport related events may have serious consequences and can be important for transport users when using and preferring means of transport. This study aims at examining relations between the perceived risk of experiencing such events and transport mode use and preferences. Other risk judgments such as technological and environmental risk judgments were not investigated in this research.

Risk perception is an important factor in transport safety and concerns all types of transport related risks, including accidental risks and other, non-accidental, such as risks related to criminality and terrorism.

The higher rate of accidents involving young male drivers could be explained by the fact that male drivers misjudge risks to be lower than women do and that less experienced drivers carry more risk than older ones. Previous studies show that the perceived probability and the judgment of the consequences are important in risk perception (Sjöberg et al., 2004). In this study it is assumed that the risk perception of experiencing an accident is represented by the subjective probability assessment times the judgment of the severity of consequences (Rundmo, 2002; Sjöberg et al., 2004). The majority of studies were carried out on risks in collective transportation where the severity of consequences is considered as catastrophic; an accident leading generally to a large number of

injuries and killed. The generalisation of these results to evaluate risk perception in types of transportation where the severity of consequences is more chronic than catastrophic must be taken with precaution (Rundmo et al., 2011). When the probability of experiencing an accident is low, transport users may not lay weight on consequences and therefore these variables may not have any influence on transport mode use or preferences. This is the case for airplane accidents where it is hypothesised that the severity of consequences has generally no influence on decisions about travelling by airplane. However in private transportation, the probability of experiencing an accident may be large enough to be associated with the use of transport modes. Rundmo et al. (2011) argued that if the probability is perceived as high enough, its assessment will be associated with decisions to use transport modes and a shift from a transport mode to another may occur, even if the severity of consequences is considered as minor. In that case, the judgment of consequences has no influence on decisions to use transport modes. In addition to perceived risk, worry may also be related to transportation mode use and choices.

Worry is defined as 'mental distress or agitation resulting from concern usually for something impending or anticipated' in the Merriam Webster dictionary. Rundmo (2002) implied that when concerned about a hazard, thinking about it may evoke worry, and hence thinking about a risk source was found to be an important variable. Specific affective reactions (anticipated worry) when thinking about probability and consequences related to specific risk sources may be caused by the cognitive evaluation, i.e. probability judgements as well as evaluations of consequences. This is consistent with studies carried out by Rundmo and Sjöberg (1996),

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Rundmo et al. (2011), and Baron et al. (2000) showing that worry may be affected by probability assessments and associated with decisions related to transport mode use (Rundmo and Moen, 2007). Males and females perceive risk differently and generally females evaluate risks to be higher than men (Rundmo and Jørgensen, 2009). Worry was found to be important for females whereas probability is more important for males (Rundmo et al., 2011). Women rely more on affective evaluations and they feel more vulnerable when facing criminality. They had a tendency to be more worried about experiencing accidents in both collective and private transportation (Rundmo et al., 2011). Other demographic variables, such as age and education, have also been found to influence risk assessment. Previous studies showed that young drivers had a tendency to underestimate their risk compared to older drivers (Moe, 1986). The risk is also evaluated as lower when subjects have higher education. Gender, age and education are therefore expected to have an influence on worry of expected negative events in transport. In conclusion, the affective response should be taken into consideration in studies about risk perception in transport.

Studying perceived risk and worry across the different types of transport modes is complex. Rundmo and Moen (2007) and Grøndahl-Backer et al. (2009) found that risk perception in transport may be divided into collective and private transport modes. In the present study, differences in perceived risk and worry for Norwegians living in the region of Oslo, who use and/or prefer either motorised (car and motorcycle) and non-motorised (bicycle and walking) private transport modes or public rail and road transport modes, were taken into consideration. The project was focused on the perception of risks associated with urban transportation modes (e.g. mode preferred to travel to work); therefore air transportation was not part of the study.

Three variables are presented in this article and were entered in this analysis: probability assessment, severity of consequences and worry.

The specific aims of the present study were to examine the following:

- To study differences in transport mode use and preferences in a Norwegian urban population.
- To study the perceived risk and worry of accident, violence and terrorism in transport.
- To study the relationship between transport mode preferences, risk perception and worry.

## 1. Methods

### 1.1. Procedure

The results are based on a telephone survey questionnaire carried out among a sample of the Norwegian population aged from 18 to 79 years ( $n = 512$ ). The representative sample, living in the region of Oslo was provided by the national registration office. The respondents received an informative letter about the project and an interviewer called the respondents in January 2011. The response rate was 51 percent.

### 1.2. Sample

A list of 3000 persons was provided by the national registration office, representing a minimum of 200 persons per age group for each gender. Of these 3000 respondents, 2047 were chosen after excluding professional drivers, persons who could not be reached, or not living anymore in the region of Oslo. The interviewers contacted 1007 persons and 512 responded positively. The response rate was in total 51 percent; the lowest score of 39 percent was

for women over 66 years old and the highest rate of 70 percent for women between 26 and 35 years old.

The data collection was carried out during the period 4–18 January 2011. Of the 512 respondents 255 (49.8%) were males and 257 (50.2%) were females and all the respondents were above 18 years old. The sample is formed of around 43 persons per age group and gender. The age of the respondents ranged from 18 to over 79 years (mean = 45.38, standard deviation = 17.56). A total of 4.9 percent ( $n = 170$ ) of the sample has primary or secondary school education as their highest completed education level. About 14 percent have a vocational or a general high school education as their highest completed education level. A high proportion of the sample (66.8%,  $n = 342$ ) has a higher education level from college or university. There are no significant differences regarding age, gender and education between the sample and the Norwegian population living in the capital of Norway, as the education level is higher in the Oslo region than overall in the country.

### 1.3. Questionnaire

The questionnaire was divided into seven parts related to accessibility of transport, transportation mode use, risk perception, worry, own experiences of accident and violence, perceived control and trust in the authorities.

The first part concerned the transport modes available where the respondents live and work. The respondents were then asked how often they used public (bus, train, subway, tramway and ferry) and private transport modes (car, motorcycle, bicycle and as a pedestrian) on a five-point evaluation scale ranging from “never” to “very often”. They were also asked which transport mode they would have preferred to travel to work. “If you could choose freely between all the transport modes, which one would you rather choose to travel to your workplace/school?”, and “How often do you use the following transport modes to travel to your workplace/school?” to find the groups using private or public transport modes to travel to work. Ferry and motorcycle/scooter were excluded of the analysis due to a small number of users. The third part of the questionnaire included the evaluation of risk perception related to each of nine transport modes. The respondents were asked to assess the probability that they could experience an accident or a physical assault when using transport modes. A five-point evaluation scale ranging from “very unlikely” to “very likely” was used for all the measurements. The respondents were asked to assess the severity of consequences if an accident happened for each of the nine transport modes on a five-point evaluation scale ranging from “not serious at all” to “very serious”. In addition the respondents were also asked to assess the probability of experiencing a terror attack when using public transport modes. In the fourth part of the questionnaire, worry was measured by asking how worried the respondents are, when thinking about the probability of an accident, a physical assault or a terror attack when using public and private transport modes. A five-point evaluation scale ranging from “not at all worried” to “very worried” was used. In addition in the fifth part of the questionnaire, the respondents were asked about their own experience and the experience of their family members related to accident and violence in transport. The likelihood, severity of consequences and worry about accident, criminality and terror were assessed separately in this study to avoid respondent confusion.

### 1.4. Statistical analysis

Cronbach's  $\alpha$ , as well as average corrected item – total correlations, were used to examine the reliability and internal consistency of measurement instruments and according to Nunnally criterion, an  $\alpha$  value over .70 should indicate a reliable scale (Nunnally, 1978;

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