

# Perceived Risk, Feelings of Safety and Worry Associated with Different Travel Modes

Pilot study

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**REFERAT (Syfte, Metod, Resultat)**

Det huvudsakliga syftet var att studera sambandet mellan upplevda olycks- och våldsrisker samt trygghet och oro i samband med olika transportsätt (bil, taxi, stadsbuss, fjärrbuss, tåg, färja och flyg). Ytterligare ett syfte var att studera hur individuella egenskaper (såsom ålder, kön, huruvida man använder ett visst transportmedel, personlig erfarenhet av olyckor och våldssituationer och hur man uppfattar sig själv i olika avseenden) påverkar dessa relationer. Ett frågeformulär konstruerades för dessa syften och fylldes i av 100 personer. Resultaten visade att det fanns skillnader mellan upplevelser av olycks- och våldsrisker och trygghet, liksom skillnader mellan olika transportmedel. Olycksrisken bedömdes vara störst för bilkörning, men den faktiska skillnaden jämfört med kollektiva transportmedel underskattades. Våldsrisker bedömdes vara störst för stadsbuss och färja. Det verkade inte finnas några större skillnader mellan upplevelser av trygghet och oro. Slutligen visades att upplevelserna av risker och trygghet kunde se delvis olika ut beroende på bland annat kön och ålder.

**ABSTRACT (Aim, Method, Results)**

The main objective was to study how perceived accident risk and risk of violence are related to feelings of safety and worry associated with different transport modes (car, taxi, city bus, regional bus, train, ferry and aeroplane). Another aim was to study how individual differences (such as age, sex, the extent to which individuals use different travel modes, personal experience of accidents and violence situations and how individuals perceive themselves) might affect these relationships. A questionnaire was constructed for these purposes and was filled out by 100 respondents. The results showed that there were differences between the respondents' perceptions of accident risk, risk of violence and feelings of safety, as well as differences between the different transport modes. Car received higher ratings of accident risk than the remaining transport modes, whereas city bus and ferry received the highest ratings of risk of violence. The participants seemed to have a fairly good idea of the internal rank order of the transport modes with respect to accident risk, whereas they seemed less aware of the actual size of the differences between the different transport modes. The ratings of feelings of safety and worry were found to be quite similar. Finally, individual differences, such as age and sex, seemed to have some effects on the perceptions of risks and feelings of safety.

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## Sammanfattning

Människors uppfattning om olycks- och våldsrisker, trygghet och oro i samband med olika transportsätt (bil, taxi, stadsbuss, fjärr-buss, tåg, färja och flyg) studerades med hjälp av ett frågeformulär. Formuläret fylldes i av 100 personer, 53 män och 47 kvinnor i åldrarna 13 till 81 år. Deltagarna skulle bedöma olycksrisk, våldsrisk och ett antal egenskaper hos risker förknippade med olika transportmedel (t ex möjligheten att påverka sannolikheten för en olycka och risken att dö i en sådan). De skulle också ange hur mycket som borde satsas på att minska riskerna och var de ansåg att ansvaret låg (både för olyckor och våld) för varje transport-medel. Dessutom skulle deltagarna bedöma upplevd trygghet samt hur ofta de hade upplevt rädsla och oro i samband med att de använt olika transportmedel. Vidare skulle de ange ålder, kön, utbildningsbakgrund, användning av olika transportsätt, personlig erfarenhet av olyckor och våld (både genom personliga upplevelser och genom att ha läst eller hört om olyckor/våldssituationer). De skulle också bedöma hur ofta de kände sig otrygga och oroliga på olika platser som har med resande att göra (parkeringsplatser, busshållplatser etc) samt när de går till och från sådana platser. De fick även bedöma i vilken utsträckning olika omständigheter (t ex belysning och tidpunkt på dygnet) bidrog till deras känslor av otrygghet. Slutligen fick deltagarna beskriva hur de uppfattade sig själva i några olika avseenden (blyghet, självförtroende, förmåga att ta vara på sig själv mm).

Transportmedel som ansågs ha hög olycksrisk ansågs oftast ha låg våldsrisk och tvärtom. Bilkörning ansågs medföra den största olycksrisken, medan våldsrisk upplevdes som störst för stads-buss och färja. Deltagarna verkade ha en ganska god uppfattning om rangordningen av transportslagen med avseende på olycksrisk, medan de verkade ha en mindre god uppfattning om den faktiska storleken på skillnaderna mellan olika transportmedel (skillnaden i olycksrisk mellan bilkörning och övriga transportsätt bedömdes oftast som mindre än den verkliga skillnaden).

Med några få undantag ansåg deltagarna att de vid bilkörning hade störst möjlighet att påverka sannolikheten för en olycka samt hur allvarligt de riskerade att skadas. De bedömde också att de hade störst kännedom om riskerna med bilkörning och att en större andel av Sveriges befolkning använde detta transportmedel en normal dag. Tanken på att råka ut för en olycka bedömdes vara mest skrämmande för flyg och risken att dö i en olycka ansågs också vara störst för detta transportmedel. Sambandet mellan bedömningarna av upplevd risk och bedömningarna av egenskaper hos riskerna med olika transportmedel var ganska svagt.

Deltagarna ansåg att ansvaret för en olycka och för våldssituationer i högre grad låg hos dem själva än hos t ex myndigheter vid bilkörning, medan det omvända gällde för övriga transportslag. De ansåg också att de hade rätt att kräva en större satsning på att minska riskerna för kollektiva transportmedel, särskilt flyg och färja, jämfört med bil.

Deltagarna angav att de hade upplevt mindre trygghet och oftare varit oroliga vid resor med färja och flyg än med övriga transportmedel. De angav även att de oftare hade upplevt rädsla vid resor med bil, färja och flyg. Sambanden mellan bedömningar av trygghet, upplevd risk och egenskaper hos risker förknippade med olika transportmedel var ganska svaga. Det kan diskuteras om dessa riskegenskaper, som har använts i tidigare studier där många olika typer av aktiviteter, händelser och teknologier har bedömts, är de mest passande beskrivningarna av risker förknippade med olika transportmedel.

De yngsta männen (under 30 år) tenderade att bedöma olycksrisker som lägre och upplevd trygghet som högre än kvinnorna i samma ålder. För de äldsta deltagarna (över 64 år) verkade denna tendens, i de flesta fall, vara omvänd. Det fanns inga större skillnader mellan grundskole-, gymnasie- och högskoleutbildade deltagare med avseende på deras bedömningar av upplevd risk och trygghet. Det fanns heller inga större skillnader mellan de som använde och de som inte använde olika transportmedel när det gällde dessa bedömningar. Deltagare som uppgav att de hade personlig erfarenhet av våldssituationer med stadsbuss tenderade att bedöma våldsriskerna som högre för det transportslaget. De som uppgav att de hade läst eller hört om fler våldssituationer med stadsbuss, fjärrbuss och färja angav också att risken för våld var större för dessa transportmedel. Sambanden mellan hur man uppfattade sig själv och bedömningarna av upplevd risk och trygghet var över lag ganska svaga. Det fanns dock en tendens för de som använde stadsbussar, fjärrbussar och tåg att beskriva sig själva som mer osäkra, ha mindre självförtroende, vara mindre medvetna om sin personliga säkerhet, ha mindre personlig kontroll över saker som händer dem och generellt vara mindre trygga än deltagare som inte använde dessa transportmedel. Skillnaderna mellan de som använde och de som inte använde de övriga transportslagen när det gällde dessa beskrivningar tenderade att vara i motsatt riktning.

Deltagarna uppgav att de oftare kände sig otrygga och oroliga när de gick till och från olika platser som har med resande att göra än när de vistades på dessa platser (parkeringsplatser, busshållplatser etc.). Kvinnorna hade upplevt otrygghet oftare än männen. Kvinnorna uppgav också i högre grad än männen att olika omständigheter såsom belysning, tidpunkt på dygnet, frånvaro av personal och att resa ensam bidrog till deras känslor av otrygghet. De yngsta deltagarna ansåg, å andra sidan, att sådana omständigheter bidrog i mindre utsträckning till deras känslor av otrygghet.

Resultaten från denna studie talar för att det finns viktiga skillnader mellan människors uppfattning om olycksrisk, våldsrisk och trygghet i samband med användningen av olika transportmedel. Resultaten visar också att dessa uppfattningar kan se delvis olika ut beroende på kön, ålder, huruvida man använder ett visst transportsätt, personlig erfarenhet av olyckor och våldssituationer samt hur man uppfattar sig själv i olika avseenden.

## Summary

Subjective perceptions of transport-related risks (both accidents and violence), feelings of safety and worry associated with different transport modes (car, taxi, city bus, regional bus, train, ferry and aeroplane) were studied by means of a questionnaire. Questionnaires were filled out by 100 respondents, 53 men and 47 women, aged between 13 and 81, who were recruited at local libraries in Linköping. The respondents were to rate the perceived accident risk, risk of violence and a number of characteristics of risks associated with different transport modes. They were further to evaluate risk reduction and rate the perceived locus of responsibility for accidents and violence for each transport mode. Also, ratings were made of feelings of safety, frequency of experienced fear and worry associated with the different transport modes. Further, the respondents were to state their age, sex, level of education, exposure to the transport modes, personal experience of accidents and violence (both by personal involvement in and through remembrance of mass media reports of accidents/violence situations). They were also to rate how often they felt unsafe and worried in connection with different travel-related places/situations (parking lots, bus stops etc.) and the extent to which different circumstances (e. g. lighting and time of day) contributed to their feelings of unsafety. Finally, the respondents were to rate themselves on a number of personality characteristics.

The mean ratings of accident risk and risk of violence correlated negatively across the different transport modes. Car received higher ratings of accident risk than the remaining transport modes, whereas city bus and ferry received the highest ratings of risk of violence. The participants seemed to have a fairly good idea of the internal rank order of the transport modes with respect to accident risk, whereas they seemed less aware of the actual size of the differences between the different transport modes.

Perceived control of both the probability and consequences of an accident, perceived degree of knowledge about the risks and the number of people exposed to the risks were, with a few exceptions, rated to be higher for car than for the remaining transport modes. Aeroplane was given higher ratings than the remaining transport modes on the risk of dying in an accident and dread. The relationship between perceived accident risk and the answers to the questions about risk characteristics was found to be rather weak.

The responsibility for accidents as well as violence/threat was perceived to lie with oneself to a much higher degree for car than for the other transport modes. As compared to private cars, risk reduction was generally valued higher for public transport modes, especially in the case of aeroplane and ferry.

The respondents reported feeling less safe and being more frequently worried when travelling with ferry and aeroplane than with the other transport modes. Ferry and aeroplane were also, together with car, the travel modes for which experiences of fear were reported to be most frequent. The relationships between feelings of safety, perceived risk and different risk characteristics found to correlate with perceived risk in previous studies were quite weak. It could be argued that risk characteristics used in previous studies, where many different types of hazards have been judged, may not be the most suitable descriptions of transport-related risks.

The youngest men tended to rate the perceived risk to be lower and feelings of safety to be higher than did the same aged women. For the oldest respondents this tendency seemed to be reversed in most cases. Level of education had no significant effects on perceived risk and feelings of safety.

There were no significant differences between the ratings of perceived risk and feelings of safety given by the participants who used and those who did not use different transport modes.

The respondents who had personal experience of violence with city bus tended to rate the risk of violence to be higher for that transport mode than did the remaining respondents. Also, the respondents who had more recollections of mass media reports of violence for regional bus and ferry gave higher ratings of risk of violence for those transport modes.

The relationship between different personality characteristics and the ratings of perceived risk and feelings of safety were generally quite weak. However, there was a tendency for users of city buses, regional buses and trains to rate themselves as being more insecure, less self-confident, having less safety awareness, less personal control over events and generally lower feelings of safety as compared to non-users. For the remaining transport modes, the differences between users and non-users tended to be in the reverse direction.

Feelings of unsafety and worry connected with different travel-related places/situations were rated to be more frequent for walking than for places connected to any specific travel mode (e. g. parking lots and railway stations). The women reported more frequent feelings of unsafety than did the men. The women also reported that different circumstances such as lighting, time of day, absence of personnel and travelling alone contributed to their feelings of unsafety to a higher degree than did the men. The youngest respondents, on the other hand, reported that such circumstances contributed less to their feelings of unsafety than did the remaining respondents.

The results of the present study suggest that there are important differences between perceived accident risk, risk of violence and feelings of safety associated with different transport modes. The present results also suggest that individual differences (i. e. sex, age, exposure to different transport modes, personal experience of accidents and violence situations and different personality characteristics) may have effects on perceived risk and feelings of safety associated with different transport modes. However, in order to make a more detailed assessment of the impact of these factors on the perceived attractiveness of different public transport modes, further studies are needed.

## Introduction

Efforts are made to offer public transports which are as safe as possible. In order for these efforts to have the intended effects, it is necessary that people's perceptions of the safety of different travel modes are in accordance with the actual risks. Otherwise, people might not, in the long run, choose the transportation modes connected with the smallest risks. Low risk of being involved in a traffic accident is however hardly enough for a transport mode to be considered safe. Drottz-Sjöberg and Sjöberg (1990a) draw attention to another aspect in risk judgement situations concerning traffic risks, namely the fear of violence or harassment. A perceived risk of being exposed to violence or threat of violence may at times make people refrain from using public transportation in favour of the car (which entails increasing risk of traffic accidents). Sheskin and Stopher (1988) found that 91% of their respondents stated that safety from crime was a very important aspect of transit service. How these two types of perceived risks (accident risk and risk of violence/harassment) are related to people's feelings of safety and worry when using different transportation modes, is the main focus of the present study. Another aim is to investigate how individual differences (e. g. sex, age, amount of exposure) might affect these relationships.

Perceived or subjective risk has been the subject of a large body of research. It has been suggested that risk judgements may vary depending on the context in which a particular hazard is presented, i. e. what types of other hazards that are judged at the same occasion. Drottz-Sjöberg and Sjöberg (1990b) argued that for example trains as a means of transportation might produce different perceptions of risks depending on whether a "train scenario" is judged together with only other travel scenarios than if it would be judged together with other types of technological risks. Kraus and Slovic (1988) had participants judge risks associated with 49 different accident scenarios concerning railroad traffic. They found a very large variation amongst these judgements. There is also certain evidence that not only judgements of the size of different risks but also the subjective evaluation of these risks is influenced by the context (Bäckman, 1999). Therefore, comparisons of different transportation modes with regard to perceived risks may be distorted if based on studies in which other types of hazards also have been judged.

Much previous research shows that the degree of perceived risk depends on what characteristics different activities, events and technologies are judged to possess (see e. g. Vlek and Stallen, 1981). Through the use of factor analysis these characteristics have been combined into a small number (usually between two and five) of so called risk dimensions. Slovic, Fischhoff and Lichtenstein (1980) put forth the following three dimensions or factors: (1) Uncontrollable risks, which are judged to be for example

dreaded, difficult to prevent and having potentially lethal consequences, (2) Unknown risks, where some examples of characteristics are postponed effects, novelty and being unknown to the sciences, and (3) Exposure, which largely corresponds to the number of people being exposed to the risks. For instance, Hendrickx, Vlek and Oppewal (1989) found that participants rated the perceived risk of different activities to be lower if these activities were judged to be controllable rather than uncontrollable.

In a study by Fischhoff, Slovic, Lichtenstein, Read and Combs (1978), 6 different means of transport (bicycle, railroad, commercial and private aeroplanes, motor vehicles and motorcycles), were judged together with a number of other activities and hazards. Participants were to judge if they considered the associated risks to be e. g. known and dreaded. The results showed that bicycles, as well as railroad, were judged to be well-known and less dreaded technologies, while commercial and private aeroplanes, motor vehicles and motorcycles were seen as less known and more dreaded technologies. However, Johnson and Tversky (1984) argued that the number of factors derived from a specific set of data as well as the interdependencies among the different items depend on the kinds of risks covered by the study. This means that the results obtained by Fischhoff *et al* (1978) might not be replicated when only different transport modes are compared.

In one study comparing only different modes of transportation, Bäckman (1999) found that participants thought that it would be worse to be involved in an accident with ferry than to be involved in a road accident. The most common explanation for this given by the respondents was a reference to the accident with M/S Estonia in 1994. It was not considered to be worse to have an accident with a bus than with a car, nor that it would be worse to be involved in a railway accident than in a road accident. It is however not entirely clear how the respondents in that study might have interpreted the concept "worse" when comparing different types of accidents (e. g. dread, controllability of consequences, or perhaps the probability of being killed).

Bäckman (1999) also hypothesised that risk reductions should be valued higher for certain transportation modes (i. e. railway and underground traffic) than for others (road traffic). The reason for this was supposed to be differences in e. g. perceived control and perceived locus of responsibility for the risks. Bäckman (1999) did however not explicitly discuss the possible relationships between valuation of risk reduction, perceived responsibility and perceived control. Slovic, Fischhoff and Lichtenstein (1980) showed that there seems to be a relationship between the risk factor dread and the wish for risk reduction when a broad spectrum of technological and other risks are studied.

Feelings of safety, fear and worry are also relevant in risk judgement situations concerning traffic risks (accident risk as well as risk of violence/harassment). Öhman (1991) and Rountree and Land (1996) have argued that fear (of crime) is an emotional reaction, whereas Levy and Guttman (1986) proposed that fear is cognitive and instrumental. Furthermore, Rountree and Land (1996) pointed out that there is a tendency in previous research on fear of crime to equalise perceived risk of a crime (i. e. the cognitive perceptions of the crime rate in e. g. a housing area) with fear of being exposed to a specific crime. Moreover, Johansson (1992) seemed to equalise absence of fear of crime with feelings of safety. However, Rountree and Land (1996) differentiated between these two concepts by showing that 39 % of their participants exhibited fear of burglary whereas only 24 % felt unsafe in their neighbourhoods. The degree of fear and personal ability to handle the consequences of a crime also seem to affect how serious a crime is judged to be (Tiby, 1991). Paterson and Neufeld (1987) proposed that the degree of perceived risk could affect the degree of perceived fear.

Worry has been defined as thoughts about uncertain events with unwanted consequences (MacGregor, 1991). Some researchers have argued that worry is a cognitive activity or reaction (Morris, Davis & Hutchings, 1981; Littlepage, Morris & Poole, 1991; MacGregor, 1991; Eysenck, 1992; Eysenck & Van Berkum, 1992), whereas others have claimed that worry should be described as an emotional reaction (Levy & Guttman, 1986; Sjöberg, 1998). Öhman (1994) characterised this type of emotionality as a somatic over-reactivity (which includes physiological symptoms, such as sweaty palms and increasing pulse).

Sjöberg (1991) argued that the following factors may contribute to over 60 % of the variance in worry over a specific risk: (1) *The availability of the risk* (Tversky & Kahneman, 1973), i. e. how easily the information about the risk can be retrieved from memory (depending on e. g. the degree of mass media coverage of the risk), (2) *General risk sensitivity*, i. e. some people are more risk sensitive than others and this may influence their worry over risks in general, and (3) *The category membership of a risk*, i. e. people react in a similar way towards risks which are judged to be members of the same group or category (e. g. nuclear power in general).

Svenson, Fischhoff and MacGregor (1985) argued that there might be a relationship between worry and actual safety, since those who worry more may act in a way which increases their safety. On the other hand, there may also be a relationship between strong feelings of safety and low degree of worry.

Individual differences also seem to have an impact on the degree of perceived risk, feelings of safety and worry. However, very little research seems to exist where such differences have been studied in relation to different travel modes. There are at least

four different types of individual differences which might be of interest here, (1) *Demographic variables* such as age, sex and education, (2) *Exposure*, i. e. the extent to which an individual uses different travel modes, (3) *Personal experience*, i. e. to what extent accidents or near accidents, harassment situations, etc. have been experienced either directly or through e. g. mass media reports, and (4) *Personality characteristics* such as e. g. anxiety, shyness and self-confidence.

People over 60 years of age seem to be more fearful than younger people (Box, Hale & Andrews, 1988) and men aged between 18 and 20 seem to be less risk averse than older men and women (Drottz-Sjöberg & Sjöberg, 1990a). Levy and Guttman (1986) showed that less educated persons tended to worry more and to express more fear than did better educated people. In studies of worry over different risks, e. g. nuclear power and traffic accidents, women seem to be more worried than men (Drottz-Sjöberg & Sjöberg, 1990a; 1990b). Lynch and Atkins (1988) studied women's worry and fear of being attacked or harassed when using different travel modes (walking, bus, train and car, including staying in related areas such as bus stops and parking lots). The results showed that the women felt more unsafe at night compared with daytime. Furthermore the parking lots, bus stops and the walking to and from these places were perceived as unsafe, while the trip itself by car or bus were experienced as substantially safer.

Lynch and Atkins (1988) also found that perceptions of safety seemed to be affected by the frequency with which the women in their study used different transport modes. Women who seldom travelled with a specific mode of transportation perceived it as being less safe than transport modes with which they travelled more frequently. Furthermore, Hendrickx, Vlek and Caljé (1992) showed that personal experience of a certain activity (e. g. to have travelled by air or by ferry/passenger vessel) affected the degree of perceived risk, i. e. made the risk seem lower.

Lynch and Atkins (1988) claimed that women's feeling of safety may be affected by personal experience, information obtained from media and conversations with other women who have been exposed to e. g. harassment or threat. More than one third of the women who claimed to have been exposed to harassment, threats or violence also stated that this had implications for their travel behaviour. However, Hendrickx *et al* (1989) found that participants who had personal experience of accidents (more than five times) with different risky activities rated the perceived risk of these activities to be lower than did participants who had no or little experience of accidents with the activities.

Hendrickx *et al* (1992) found that participants who had an internal locus of control (the belief that the participant can control certain events her-/himself) reported a lower degree of perceived risk than did participants with an external locus of control (the

participant believes that the control is positioned outside the individual). There also seems to be a relationship between trait anxiety and worry (Eysenck & Van Berkum, 1992), which means that those high in trait anxiety tend to worry more than those low in trait anxiety. Other personality variables such as for instance shyness (see e. g. Anderson & Arnoult, 1985; Alfano, Joiner & Perry, 1994; Bruch & Pearl, 1995; Alm & Lindberg, 1999) may also be expected to have an effect on perceived risk, feelings of safety and worry associated with different travel modes.

### ***Research questions***

The following research questions were investigated in the present study: (1) To what extent do different transport modes (car, taxi, city bus, regional bus, train, ferry/passenger vessel and aeroplane) differ with respect to perceived risk (traffic accidents and violence-/threat situations)?, (2) To what extent do the different transport modes differ on a number of risk characteristics which have been found to affect subjective perceptions of risks in previous research?, (3) How are subjective perceptions of the risks associated with different transport modes related to different risk characteristics?, (4) How is risk reduction valued and where is responsibility for accidents and violence/threat perceived to lie for the different transport modes?, (5) How does the valuation of risk reduction relate to perceived control, locus of responsibility and dread?, (6) What are the relations between feelings of safety, fear and worry and how do feelings of safety relate to perceived risk and different risk characteristics for different transport modes?, (7) How are individual differences (i. e. demographic variables, exposure, personal experience and personality characteristics) related to perceived risk and feelings of safety, and how are different personality characteristics related to exposure to different transport modes?, (8) How are feelings of unsafety and worry connected with different travel-related places/situations (e. g. parking lots and bus stops) and how do these feelings relate to sex, age, perceived risk and feelings of safety associated with different transport modes?, and (9) How do different circumstances (e. g. lighting and time of day) contribute to feelings of unsafety when travelling and how do these feelings relate to sex and age?

## Method

### *Questionnaire*

A questionnaire was constructed which contained two questions regarding perceived risk (of being involved in a serious accident and of being exposed to violence/threat, respectively) for seven different means of transportation: car (as a driver), taxi, city bus, regional bus, train, ferry/passenger vessel and aeroplane.

The questionnaire also contained six questions regarding different characteristics of risks associated with the different transport modes. Two of these questions asked for perceived control (of the probability of an accident and of the consequences of an accident, respectively). The third question asked for perceived risk of dying in an accident. One question asked about the perceived dreadfulness of being involved in an accident and one question asked about the perceived degree of knowledge about the risks involved. Finally, one question asked for the percentage of the population which could be expected to use each transport mode on a typical day (exposure).

Also, the questionnaire contained one question concerning valuation of risk reduction. This question asked for a comparison between the amount of money actually spent on safety for private car drivers and the amount of money which should be spent on safety for the other modes of transport.

Two questions concerned the perceived locus of responsibility (with the traveller her/himself or with the authorities/transport companies/others) with respect to accidents and violence/threat situations, respectively. Questions were also posed concerning perceived worry, perceived feelings of safety and frequency of fearful experiences when travelling with the different transport modes.

The respondents were also required to rate themselves with respect to a number of different personality characteristics. Ratings were given for safety awareness, personal control over events, ability to take care of oneself, nervousness, ability to handle new situations, shyness, self-confidence, insecurity and general feeling of safety (Spielberger, 1983; Alm & Lindberg, 1999).

Further, the questionnaire asked for ratings of how frequently feelings of unsafety and worry had been experienced in a number of travel-related places/situations (parking lots, bus stops, railway platforms and station buildings, ferry terminals, airports and walking to and from these places). Also, the respondents were asked to rate to what extent a number of different factors (lighting, time of day, absence of personnel,

travelling alone, damages, littering, time of year and weather) contributed to feelings of unsafety.

All questions described so far were to be answered by putting a mark on a 101 mm long line with the endpoints labelled (e. g. "no risk at all" to "very risky").

At the beginning of the questionnaire, the participants were to state their age, sex, educational level and occupation. They were also asked whether they had a driver's licence and if so, how many years they had been driving. Also, questions about how often the participants used the different modes of transport were posed. The answers to these questions were given by choosing one of five to six predefined alternatives.

The questionnaire also contained two questions assessing the participants' personal experience of serious accidents/near accidents and violence/threat, respectively. Another two questions were posed concerning the participants' recollections of mass media reports (or other kinds of knowledge than through mass media and personal experience) of accidents and violence/threat, respectively. These questions were to be answered by choosing one of four predefined alternatives.

### ***Pilot study***

The questionnaire was administered to five persons (3 women and 2 men) aged between 27 and 54 years. The purpose of the pilot study was to detect problematic wordings of sentences. Some minor changes were made, according to the comments offered by the participants in the pilot study.

### ***Participants***

Of 200 people (92 men and 108 women) asked to fill out the questionnaire, 100 (39 men and 61 women) declined to participate due to either lack of time (63 %), unwillingness to fill out the questionnaire (36 %) or problems involving comprehension of the language (1 %). Of the 100 participating persons 53 were men ( $M = 42.81$  years,  $SD = 18.58$  years, ages ranging from 14 to 81) and 47 were women ( $M = 41.79$  years,  $SD = 20.8$  years, ages ranging from 13 to 77). The mean age for the total group was 42.3 years ( $SD = 19.57$  years).

### ***Procedure***

The participants were recruited at local libraries and filled out the questionnaire in the presence of an interviewer. They were told that the purpose of the study was to find out how people perceive travelling with different transport modes. The participants were encouraged to ask questions whenever they felt a need to. Upon completion of the questionnaire the interviewer asked a few open questions concerning possible problems

associated with the questionnaire and whether the participants avoided certain travel modes for various reasons. The questionnaire along with the short interview took on average about 30 minutes (the time ranged from 10 to 78 minutes). The answers to the interview questions and the comments made by the participants were written down by the interviewer. The participants were not given any economical compensation, but were given the opportunity to say if they wanted to receive a copy of the report in the mail (71% of the participants took this opportunity, which required them to give their name and address).

## Results

### *Differences between transport modes with respect to perceived risk*

The ratings of the risk of being involved in a traffic accident and the risk of being exposed to violence/threat for the different transport modes were subjected to one-way repeated measures analyses of variance (ANOVAs). Highly significant effects of transport mode were found in both cases ( $F(6, 480) = 19.71, p < .001$ ) and ( $F(6, 462) = 14.6, p < .001$ ), respectively (see Table 1).

Table 1

*Mean estimates of perceived risk for different modes of transport*

Transport mode	Accident risk	Risk of violence
Car	41.50	17.71
Taxi	33.04	16.23
City bus	25.07	31.26
Regional bus	32.48	20.73
Train	20.19	21.60
Ferry	23.20	25.92
Aeroplane	26.61	16.92

As shown by Tukey pairwise comparisons, the participants rated the risk of accident to be significantly higher for car than for the rest of the modes of transport ( $p < .05$  or less). Furthermore, taxi received higher ratings than city bus, train and ferry and regional bus was given higher ratings than train and ferry.

The participants rated the risk of violence/threat to be significantly higher for city bus than for all other transport modes except ferry. Also, ferry was given higher ratings than car, taxi and aeroplane.

Across the seven transport modes, the correlation between the mean ratings of accident risk and risk of violence was negative ( $r = -.53$ ) but not significant.

### *Differences between transport modes with respect to risk characteristics*

Six one-way repeated measures analyses of variance were carried out on the responses to the questions about risk characteristics. The results revealed highly significant differences between the modes of transport regarding the degree of control of accident probabilities ( $F(6, 480) = 99.76, p < .001$ ), the degree of control of the consequences

of an accident ( $F(6, 486) = 88.81, p < .001$ ), risk of dying ( $F(6, 492) = 33.83, p < .001$ ), dread ( $F(6, 510) = 23.73, p < .001$ ), knowledge ( $F(6, 510) = 23.68, p < .001$ ) and exposure ( $F(6, 570) = 129.2, p < .001$ ).

As can be seen in Table 2, and as shown by Tukey pairwise comparisons ( $p < .05$  or less), the participants rated the degree of control of accident probability to be significantly higher for car than for the remaining transport modes. Further, taxi received significantly higher ratings than train and aeroplane.

Table 2  
*Mean answers to questions about risk characteristics for different modes of transport*

Transport mode	Risk characteristic					
	Control probability	Control consequence	Risk of dying	Dread	Knowledge	Exposure
Car	60.47	60.15	56.87	50.11	66.95	56.81
Taxi	20.71	31.34	51.67	44.14	48.06	22.98
City bus	14.81	18.45	34.92	38.84	39.40	52.09
Regional bus	14.75	19.75	42.99	43.15	40.48	30.86
Train	11.25	15.75	48.06	48.86	45.56	40.16
Ferry	14.18	21.09	55.15	56.45	48.11	17.01
Aeroplane	11.14	15.77	71.99	66.31	57.06	22.55

The degree of control of the consequences of an accident was rated to be significantly higher for car and taxi than for the remaining modes of transport. Also, car received significantly higher ratings than taxi. The participants rated the risk of dying in an accident to be significantly higher for aeroplane than for the remaining transport modes. Lower ratings were given for city bus than for car, taxi, train and ferry. Also, car and ferry were given higher ratings than regional bus. Dread was rated to be significantly higher for aeroplane than for the remaining transport modes. Car, train and ferry received higher ratings than city bus, and ferry was given higher ratings than taxi and regional bus. The participants rated their knowledge of the risks to be significantly higher for car than for the rest of the transport modes. Also, aeroplane received higher ratings than the remaining modes (except car). Ferry was given higher ratings than city bus. For the ratings of exposure, car and city bus were rated higher than the remaining transport modes. Train received higher ratings than taxi, regional bus, ferry and

aeroplane. Regional bus, finally, was rated higher than taxi, ferry and aeroplane concerning exposure.

***Relationship between perceived risk of accident and answers to questions about risk characteristics***

A stepwise multiple regression analysis was computed for each of the seven transport modes. In these analyses the perceived risk of accident served as the dependent variable, whereas the perceived risk characteristics served as predictors. As shown in Table 3, only one or a few of the characteristics entered the regression equations for the different transport modes. The multiple correlations were mostly quite modest.

Table 3

*Standardized beta coefficients for the risk characteristics which served as predictors for the perceived risk of accidents*

Transport mode	Risk characteristic						R
	Control probability	Control consequence	Risk of dying	Dread	Knowledge	Exposure	
Car			.30**				.30**
Taxi			.25*				.25*
City bus	.35***					.24*	.44***
Regional bus	.26**		.46***				.60***
Train						.32***	.32***
Ferry	.34***			.24**		.20*	.55***
Aeroplane		.38***					.38***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$

***Perceived locus of responsibility and valuation of risk reduction for different transport modes***

Higher ratings for locus of responsibility indicated that responsibility was perceived to lie with authorities/transport companies/etc. to a higher degree. Positive values for the desired valuations of risk reduction indicated that a larger amount of money should be spent for the transport mode in question than on car safety (note that the scale units are arbitrary). The mean ratings are shown in Table 4.

Table 4

*Mean locus of responsibility and mean valuation of risk reduction for different modes of transport as compared to private cars*

Transport mode	Responsibility (accidents)	Questions	
		Responsibility (violence)	Valuation
Car	35.27	48.45	---
Taxi	83.42	70.54	1.56
City bus	84.39	73.11	4.28
Regional bus	85.91	73.79	5.67
Train	87.39	74.02	6.68
Ferry	88.57	73.39	10.50
Aeroplane	88.98	75.78	14.43

The results of three one-way ANOVAs revealed that there were significant differences between the transport modes, ( $F(6, 522) = 357.62, p < .001$ ), ( $F(6, 522) = 45.16, p < .001$ ) and ( $F(5, 485) = 13.50, p < .001$ ) for the ratings of responsibility for accident risk, responsibility for risk of violence, and valuation of risk reduction, respectively.

As can be seen in Table 4, and as shown by Tukey pairwise comparisons, the responsibility for accident risk as well as risk of violence is perceived to lie with oneself to a much higher degree for car than for the other transport modes. For accident risk, the individual's own responsibility was also perceived to be somewhat higher for taxi than for ferry and aeroplane and higher for city bus than for aeroplane.

The participants valued risk reduction higher for aeroplanes than for taxi, city bus, regional bus and train. Risk reduction was also given a higher valuation for ferry than for taxi and city bus. Finally, risk reduction was valued higher for train than for taxi. The differences between private car and the other transport modes were tested by means of z-tests. The results revealed that, as compared to private cars, risk reduction was valued significantly higher for all transport modes except taxi ( $p < .05$ ).

***Relationship between valuation of risk reduction, perceived control, perceived locus of responsibility and perceived dread***

A stepwise multiple regression analysis was computed for each transport mode with the valuation of risk reduction as the dependent variable. The predictors were perceived control (of the probability of an accident and of the consequences of an accident), perceived locus of responsibility for accident risk and perceived dread. The only

transport mode for which a significant regression was obtained was regional bus. Moreover, only one predictor, perceived degree of control of the probability of accidents, entered the regression equation. Although statistically significant ( $p < .01$ ) the multiple correlation was only .30 for this regression model.

***Feelings of safety, fear and worry for different transport modes***

The results of three one-way ANOVAs showed that there were significant differences between the transport modes, ( $F(6, 468) = 13.86, p < .001$ ), ( $F(6, 486) = 14.24, p < .001$ ), and ( $F(6, 474) = 27.42, p < .001$ ) for the ratings of feelings of safety, fear and worry, respectively.

As can be seen in Table 5, and as shown by Tukey pairwise comparisons, feelings of safety were rated to be significantly higher for car, taxi, city bus and train than for ferry and aeroplane. Also, regional bus received higher ratings than aeroplane.

Table 5  
*Mean ratings of feelings of safety, fear and worry for different modes of transport*

Transport mode	<u>Questions</u>		
	Feelings of safety	Fear	Worry
Car	73.91	32.90	11.09
Taxi	71.10	19.84	10.34
City bus	72.28	18.99	11.25
Regional bus	70.44	19.29	13.08
Train	72.75	15.87	13.56
Ferry	63.11	27.98	23.59
Aeroplane	56.48	35.48	32.48

Fear was rated to be experienced more frequently for car, ferry and aeroplane than for the remaining transport modes. Worry was rated to be experienced more frequently for ferry and aeroplane than for the rest of the transport modes, and aeroplane received higher ratings than ferry.

A stepwise multiple regression analysis was computed for each of the seven transport modes with feelings of safety as the dependent variable and the ratings of perceived fear and worry as predictors (see Table 6).

Table 6  
*Standardized beta coefficients for predictors of feelings of safety*

Transport mode	<u>Predictor</u>		R
	Fear	Worry	
Car		-.51***	.51***
Taxi	-.25*	-.38***	.54***
City bus	-.32***	-.26**	.47***
Regional bus		-.43***	.43***
Train		-.43***	.43***
Ferry		-.69***	.69***
Aeroplane		-.51***	.51***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$

As can be seen in the table, worry entered the regression equations for all transport modes whereas fear did so only for taxi and city bus. All multiple regression coefficients were highly significant.

***Relationship between feelings of safety, perceived risk and risk characteristics***

A stepwise multiple regression analysis was computed for each of the seven modes of transport. In these analyses feelings of safety served as the dependent variable, and ratings of perceived risk and risk characteristics served as predictors. Accident risk entered the regression equations for car, ferry and aeroplane. Only three of the risk characteristics entered the equations for the different modes of transport. Control of the probabilities of accidents entered the equations for car, regional bus and train. Control of the consequences of an accident entered the equation for city bus, and dread entered those for taxi and ferry. Although the multiple correlations were significant for all transport modes, they were only of moderate size (explaining less than 20 % of the variance in feelings of safety for all modes of transport).

***Effects of age, sex and education on perceived risk and feelings of safety***

The respondents were divided into three age groups (13-29, 30-64 and over 64 years, respectively). The ratings were subjected to two-way ANOVAs (age x sex) for each transport mode (since the youngest participants could not give ratings for car, transport mode was not used as a factor in the analyses). The mean estimates of perceived risk of accidents and of violence, and the rated feelings of safety given by men and women in each age group for different transport modes are shown in Table 7.

Table 7

*Mean ratings of perceived risk and feelings of safety for different modes of transport given by men and women in three age groups*

Questions and trans- port modes	<u>Age groups</u>					
	13-29		30-64		65-	
	Men	Women	Men	Women	Men	Women
<b>Accident risk</b>						
Car	34.14	48.07	39.82	43.75	50.89	41.78
Taxi	22.13	40.95	34.78	28.94	23.00	33.60
City bus	14.20	31.58	21.21	24.00	25.13	29.30
Regional bus	23.27	39.44	27.38	26.61	41.86	36.70
Train	9.68	25.79	15.89	21.61	33.20	21.30
Ferry	22.87	24.39	21.44	23.39	38.00	19.80
Aeroplane	27.47	35.06	22.46	23.11	37.71	27.10
<b>Risk of violence</b>						
Car	14.64	25.79	18.63	18.77	21.67	11.00
Taxi	13.27	22.32	11.92	15.06	27.43	11.60
City bus	27.27	37.21	35.04	28.17	19.43	30.10
Regional bus	19.80	27.67	18.74	22.33	16.83	15.60
Train	20.87	25.42	19.68	23.83	17.50	19.20
Ferry	22.40	33.83	25.46	27.44	24.86	23.44
Aeroplane	13.87	19.06	16.75	22.18	18.67	14.00
<b>Feelings of safety</b>						
Car	85.08	73.73	73.00	69.56	65.33	69.38
Taxi	81.87	62.68	70.48	73.35	67.75	76.00
City bus	79.73	73.26	70.14	76.06	66.00	76.78
Regional bus	77.50	70.50	70.22	74.39	48.00	71.11
Train	82.67	75.05	71.74	74.50	55.71	74.44
Ferry	69.40	55.78	66.07	56.67	51.71	67.38
Aeroplane	63.53	59.44	56.93	57.81	58.50	56.67

The results of the ANOVAs revealed that the only significant effect was that of the interaction between age and sex for the question about perceived risk of accidents for train ( $F(2, 87) = 3.42, p < .05$ ). For the men, perceived accident risk increased with age, whereas this was not the case for the women. Although not reaching statistical significance, there was a general tendency for men in the youngest age group to rate perceived risk to be lower and feelings of safety to be higher than did the women in the same age group. Also, with a few exceptions, this tendency seemed to be reversed in the oldest age group.

The participants were also divided into three groups based on their level of education ("less than high school", "high school" and "university", respectively). The estimates of perceived risk of accidents and of violence, and the rated feelings of safety were subjected to one-way ANOVAs for each transport mode. The results of these analyses revealed no significant differences between the groups of participants. The reason for not carrying out two-way ANOVAs (education x transport mode) was that the youngest participants in the sample could have neither a driver's licence nor a university education and this would cause a confounding between age and education that would differ depending on transport mode.

***Effects of transport mode usage on perceived risk and feelings of safety***

The respondents were also divided into groups of users and non-users for each mode of transport. The numbers of non-users varied between 10-15 for car, city bus and ferry, was about 20 for aeroplane and about 30 for taxi, regional bus and train.

Table 8

*Mean ratings of perceived risk and feelings of safety given by users and non-users of different modes of transport*

Transport mode	Questions and transport mode usage					
	<u>Accident risk</u>		<u>Risk of violence</u>		<u>Feelings of safety</u>	
	Users	Non-users	Users	Non-users	Users	Non-users
Car	42.60	40.57	17.62	25.07	73.58	71.00
Taxi	32.12	30.89	16.10	16.04	70.19	74.30
City bus	23.60	24.70	32.54	20.80	74.45	64.27
Regional bus	31.45	30.17	20.39	22.18	69.69	71.85
Train	20.46	17.30	21.72	21.50	73.42	74.55
Ferry	22.46	32.58	26.51	28.60	61.43	66.40
Aeroplane	25.59	34.68	16.85	20.71	60.92	49.06

The mean ratings of perceived risk and feelings of safety given by users and non-users are shown in Table 8. As shown by *t*-tests for independent samples, the differences between users and non-users did not reach significance for any of the questions or transport modes. There were however a few slight tendencies ( $p < .25$ ), e. g. that users of ferry and aeroplane tended to rate the accident risk as lower than did non-users. For aeroplane and city bus, users gave somewhat higher ratings of feelings of safety than did non-users. For the latter transport mode, users tended to give higher ratings of risk of violence than did non-users, whereas the reverse tended to be the case for car.

***Effects of personal experience on perceived risk and feelings of safety***

The number of participants who stated that they had personal experience (either themselves or someone they knew) of accidents or violence with each of the transport modes were very few (between 4 and 16), except for car and city bus. Therefore analyses were computed only for the latter transport modes. The mean ratings of perceived risk and feelings of safety given by respondents with and without personal experience of accidents and violence, respectively, are shown in Table 9.

Table 9

*Mean ratings of perceived risk and feelings of safety given by participants with and without personal experience of accidents and violence with car and bus*

Experience	Question					
	<u>Accident risk</u>		<u>Risk of violence</u>		<u>Feelings of safety</u>	
	Car	City bus	Car	City bus	Car	City bus
<b>Accidents</b>						
Experience	43.48	26.60	19.78	38.70	76.42	65.60
No experience	41.49	23.49	17.86	30.45	70.94	74.53
<b>Violence</b>						
Experience	46.00	24.26	23.62	37.20	72.50	69.77
No experience	41.54	23.56	17.97	27.93	73.00	75.52

The only difference which approached significance was that respondents with personal experience of violence for city bus tended to give higher ratings of the risk of violence for that transport mode,  $t(94) = 1.81, p < .10$ .

***Effects of the recollection of reports from mass media on perceived risk and feelings of safety***

The respondents were divided into two groups based on the number of accidents and violence situations they remembered having read or heard about for each transport mode ("less than four" and "four or more"). The differences in responses concerning perceived risk and feelings of safety between respondents recalling different numbers of situations were tested by means of *t*-tests. Due to the large number of *t*-tests carried out on these data, only the most highly significant differences are commented here. The participants who reported having read or heard about fewer violence situations for regional bus and ferry also rated the risk of violence to be lower for these transport

modes,  $t(88) = -4.12, p < .001$  and  $t(90) = -3.82, p < .001$ , respectively. The mean ratings are shown in Table 10.

Table 10

*Mean ratings of perceived risk and feelings of safety given by participants recalling different numbers of accident and violence situations reported by mass media for different transport modes*

Situation and trans- port mode	Questions and number of recalled situations					
	<u>Accident risk</u>		<u>Risk of violence</u>		<u>Feelings of safety</u>	
	< four	four or more	< four	four or more	< four	four or more
<u>Accident</u>						
Car	47.81	41.04	21.19	18.32	67.65	73.97
Taxi	32.78	28.64	14.17	21.39	72.76	66.88
City bus	23.21	26.87	31.40	31.73	73.82	72.39
Regional bus	28.39	34.59	19.37	23.49	67.52	74.29
Train	17.33	20.70	16.83	23.76	72.13	74.28
Ferry	24.19	23.92	21.44	31.27	59.50	63.39
Aeroplane	25.96	28.19	14.65	18.86	62.20	57.24
<u>Violence</u>						
Car	43.94	36.33	17.19	24.63	73.66	70.57
Taxi	32.25	30.00	14.90	19.58	74.43	62.50
City bus	23.27	25.30	29.28	35.35	73.98	71.89
Regional bus	29.84	45.57	18.78	46.57	70.61	68.00
Train	19.53	19.67	20.13	29.60	75.09	66.60
Ferry	22.11	35.79	23.17	46.50	64.54	47.21
Aeroplane	24.51	36.43	15.07	25.81	57.46	62.43

***Effects of personality characteristics on perceived risk and feelings of safety***

Three stepwise multiple regression analyses were computed for each of the seven modes of transport. In these analyses the ratings of perceived risk (of accidents and violence) and feelings of safety, respectively, served as the dependent variables, and the nine personality characteristics served as predictors. The multiple correlations obtained in these analyses were generally quite low, not exceeding .45 in any single case, and no consistent pattern of impact of the different personality characteristics could be discerned. The characteristics entering the largest numbers of regression equations were nervousness (5 equations) followed by ability to take care of oneself, shyness, and general feeling of safety (3 equations each).

***Differences in personality characteristics between users and non-users of different transport modes***

The differences in ratings of personality characteristics were tested by means of *t*-tests. The mean ratings of personal characteristics where the differences reached statistical significance ( $p < .05$ ) are shown in Table 11.

Table 11

*Mean ratings of personality characteristics given by users and non-users of different modes of transport*

Transport mode	Characteristics	Users	Non-users	<i>t</i>
Car	Personal control	71.03	59.60	-2.07*
	Nervousness	17.68	38.85	3.70***
Taxi	Shyness	35.66	47.63	2.07*
City bus	Self-confidence	62.93	78.42	2.20*
Regional bus	Safety awareness	63.40	73.24	2.07*
	Personal control	62.89	76.42	2.98***
	General safety	69.12	81.21	2.91**
Train	Personal control	63.76	77.13	2.81**
	Insecurity	32.35	18.97	-2.76**
Ferry	Nervousness	20.70	34.27	2.01*
	Shyness	37.08	52.47	2.10*
Aeroplane	Handle situation	68.28	52.46	-2.85**

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$

Because of the large number of tests performed, the significant differences shown in the table should be interpreted with caution. The results indicated that participants who never drove a car tended to consider themselves to be more nervous and to have a lower degree of personal control over events than did the remaining participants. Taxi users rated themselves as being less shy than did non-users of that transport mode. Users of city bus, regional bus and train gave somewhat less positive ratings of themselves (e. g. lower self-confidence, lower ratings of personal control and more insecurity) than did non-users. Ferry users rated themselves to be less nervous and less shy than did non-users, whereas aeroplane users tended to give higher ratings of their own ability to handle new situations.

***Relationship between sex, age and feelings of unsafety and worry connected with different travel-related places/situations***

Two 2 x 3 x 7 ANOVAs (sex x age x place/situation, with repeated measures of the last factor) were carried out on the participants ratings of the frequency with which they had experienced feelings of unsafety and worry, respectively, in different travel-related places/situations (parking lots, bus stops, railway platforms and station buildings, ferry terminals, airports and when walking to and from these places).

The results of these ANOVAs revealed that there were highly significant main effects of place/situation on experienced feelings of unsafety ( $F(6, 528) = 4.92, p < .001$ ) and experienced worry ( $F(6, 522) = 3.55, p < .005$ ). Tukey tests revealed that both feelings of unsafety and worry were rated to be significantly more frequent for walking than for parking lots, railway stations, ferry terminals and airports. Mean ratings are shown in Table 12.

Table 12

*Mean ratings of frequency of experienced feelings of unsafety and worry for different travel-related places/situations*

Places/situations	Questions	
	Feelings of unsafety	Worry
Parking lot	19.69	20.64
Bus stop	23.19	25.07
Railway platform	21.35	22.97
Railway station	17.91	20.44
Ferry terminal	16.26	19.98
Airport	17.60	19.67
Walking	26.83	28.95

For the frequency of experienced feelings of unsafety, there was also a significant main effect of sex ( $F(1, 88) = 5.39, p < .05$ ). The women reported more frequent feelings of unsafety than the men ( $M = 24.49$  and  $16.32$ , respectively).

***Relationship between feelings of unsafety and worry connected with different travel-related places/situations and perceived risk and feelings of safety***

The participants' ratings of the frequency with which they had experienced feelings of unsafety and worry in different travel-related places/situations were correlated with perceived risk (of accidents and violence) and feelings of safety. In these computations each of the places in the latter questions were paired with their corresponding transport

mode (e. g. parking lot was paired with car, bus stop was paired with city bus and regional bus, etc.). Further, walking to and from different places was paired with all transport modes except taxi.

The correlations between the ratings of the frequency of experienced feelings of unsafety and worry connected with different places/situations and the ratings of accident risk for different transport modes did not exceed .42, although most of them were significant.

The corresponding correlations for rated risk of violence were all significant and generally slightly higher than for accident risk (between .24 and .49). For train, there were highly significant correlations (between .40 and .49) between perceived risk of violence and feelings of unsafety and worry at both platforms and in station buildings. The corresponding correlations with perceived accident risk were also high for platforms (.38 and .42) but lower for station buildings (.28 and .24).

For feelings of safety, the correlations were for the most part very small, and only a few of them were significant. For ferry, feelings of safety associated with travel correlated -.43 with feelings of unsafety at ferry terminals. The latter also correlated .41 with rated risk of violence.

### ***Relationship between sex, age and different circumstances which may contribute to feelings of unsafety when travelling***

A 2 x 3 x 8 ANOVA (sex x age x circumstances, with repeated measures of the third factor) was carried out on the participants' ratings of the extent to which different circumstances contribute to feelings of unsafety (lighting, time of day, absence of personnel, travelling alone, damages, littering, summer time and winter time or bad weather).

The ANOVA revealed that there was a highly significant main effect of the circumstances ( $F(7, 637) = 28.45, p < .005$ ). Tukey tests showed that travel during summer and littering were rated to contribute to feelings of unsafety to a significantly lower degree than the remaining items. Littering was rated to contribute to a significantly higher degree than travel during summer. There was also a highly significant effect of sex ( $F(1, 91) = 19.63, p < .001$ ). The women reported a significantly higher contribution of the different circumstances to their feelings of unsafety than did the men. There was also a significant effect of age ( $F(2, 91) = 4.54, p < .05$ ). Tukey-Kramer tests revealed that the youngest age group (between 13 and 29 years of age) reported a significantly lower contribution of the different circumstances to their feelings of unsafety than did the other participants. Finally, there was a highly significant interaction between circumstance and sex ( $F(7, 637) = 7.75, p < .001$ ).

Tests of simple effects revealed that the women gave significantly higher ratings to lighting, time of day, absence of personnel and travelling alone than did the men. The mean ratings given by men and women can be seen in Table 13.

Table 13

*Mean ratings of the extent to which different circumstances contribute to feelings of unsafety for men and women*

Circumstances	<u>Sex</u>	
	Men	Women
Lighting	35.63	66.53
Time of day	33.43	68.32
Absence of personnel	31.66	63.04
Travelling alone	36.86	58.44
Damages	41.07	51.76
Littering	27.15	37.12
Summer time	16.16	19.13
Winter time/bad weather	39.81	50.77

### ***Summary of the short interview***

After having filled out the questionnaire, the respondents were required to answer two open interview questions: "What circumstances, situations etc. do you think may have effects on your perceptions of risk or your feelings of safety?" and "Do you avoid travelling with any transport mode due to perceived risk and/or feelings of unsafety or perceived worry?". Almost half of the participants also made spontaneous comments about travel-related issues.

A little over twenty percent of the total group of participants reported that they avoided or that they were afraid of travelling with certain transport modes due to perceived accident risks. These risks were thought to be enhanced by certain circumstances such as the condition of roads, drivers (cars and buses) and vehicles/vessels (cars and ferries). Also bad weather, winter, autumn and evening were reported to have effects on travel behaviour (ferries, aeroplanes and cars). Further, some participants stated that they avoided travelling with ferries due to the accident with M/S Estonia. Finally, perceived lack of control was reported to have effects on the perceived accident risk (ferries and aeroplanes).

Almost one fourth of the total group of participants mentioned that they avoided or were afraid of travelling with certain transport modes due to perceived risks of violence and feelings of unsafety. For instance, this was the case when travelling alone (taxies, buses and subways), when disturbing passengers were present or if there were no personnel present (buses, trains, railway stations, bus stops or other waiting areas). Also, travelling during night, evening or dark hours with buses (as well as walking to and from buses and waiting at bus stops), trains and aeroplanes was mentioned. Reputation of the neighbourhood (buses) and outdoors lighting (buses and other public transports) might also have an impact on the travel behaviour. Finally, the risk of robbery when travelling with buses and trains was mentioned by a few of the participants.

Besides the risk of accidents and violence situations, other factors might also have effects on travel behaviour. One tenth of the total group of participants mentioned such aspects, e. g. economic reasons (trains), degree of comfort (buses and trains) and environmental concern (cars).

## Discussion

The present results revealed that there were significant differences both between ratings of accident risk and risk of violence/threat as well as between different transport modes. For accident risk, the ratings were higher for car than for the rest of the transport modes, whereas city bus received higher ratings of risk of violence than the remaining transport modes (except ferry). Also, the correlation across all seven transport modes between mean ratings of accident risk and risk of violence was negative. These results suggest that future research should make a distinction between these two concepts. The present results also suggest that the participants have a fairly good idea of the internal rank order of the transport modes with respect to accident risk, whereas they seem to be less aware of the actual size of the differences between different transport modes.

There were also significant differences between the transport modes concerning the answers to the questions about risk characteristics. To sum up, perceived control of the probability of an accident, perceived control of the consequences of an accident, perceived degree of knowledge and exposure were, with a few exceptions, rated to be higher for car than for the remaining transport modes. Aeroplane was given higher ratings than the remaining transport modes on the risk of dying and dread. The present results differed to some extent from results obtained in previous studies of differences between various transport modes with respect to different risk characteristics (e. g. Hendrickx *et al*, 1989; Fischhoff *et al*, 1978). One explanation might be that those studies also involved other types of risks than those connected with different transport modes (cf. Johnson and Tversky, 1984). Another possibility is that differences in the definitions of one or more transport modes might account for the differences (e. g. Fischhoff *et al*, 1978, used the concept "motor vehicles" instead of specifying different types of such vehicles).

The relationships between perceived accident risk and the risk characteristics were found to be rather weak for the different transport modes. This further strengthens the suggestion that previous research results on factors affecting perceived risk may be applicable merely to a limited extent if the purpose is to make comparisons only between different modes of transport. Further research clearly needs to isolate transport-related risks from other types of risks when attempts are made to establish the more detailed characteristics of the former.

Differences between the transport modes were also found in ratings of perceived locus of responsibility (for both accidents and violence) and the valuation of risk reduction. The responsibility for accident risk as well as risk of violence was perceived to lie with

oneself to a much higher degree for car than for the other transport modes. Risk reduction was generally valued higher for public transport modes than for private cars, especially in the case of aeroplane and ferry. Thus, the hypothesis by Bäckman (1999) that risk reduction should be valued higher for railway than for road traffic received at least partial support in the present study. However, the notion that this difference would derive from e. g. differences in perceived control and perceived locus of responsibility (Bäckman, 1999) was not supported. The present study also found little evidence for the relationship between the valuation of risk reduction and the risk factor dread proposed by Slovic, *et al* (1981).

Further, there were differences between different transport modes concerning the ratings of feelings of safety, fear and worry. Ferry and aeroplane received lower ratings of feelings of safety and higher ratings of frequency of experienced worry than the remaining transport modes. The participants rated their experiences of fear with car, ferry and aeroplane to be more frequent than with the remaining transport modes, but still rated their feelings of safety for car to be fairly high. There also seemed to be a much stronger relationship between ratings of feelings of safety and worry than between the former and fear. About one fifth of the respondents stated in the interview that they thought that the concepts "worry" and "feelings of safety" were too similar to be meaningfully distinguished.

The relationships between ratings of feelings of safety, perceived risk (both for accidents and for violence) and different risk characteristics were generally fairly weak. Perhaps it could be argued that the risk characteristics were not altogether suitable descriptions of different transport-related risks, since the latter may also to some extent pertain to violence/threat rather than accident risks.

The present study showed that some of the individual differences had an effect on risk ratings and feelings of safety. The men aged between 13 and 29 years tended to rate perceived risks to be lower and feelings of safety to be higher than did women of the same age. For the respondents 65 years of age or older this tendency seemed to be reversed in most cases. This result is in accordance with results obtained by Drott-Sjöberg and Sjöberg (1990a; 1990b). The previous finding that level of education had an impact on fear and worry (Levy & Guttman, 1986) was not replicated in the present study. The reason for this may be that level of education coincided to some degree with age.

Contrary to the finding of Lynch and Atkins (1988) and Hendrickx *et al* (1992), there were no significant differences between the ratings of perceived risk and feelings of safety given by the participants who used and those who did not use different transport

modes. However, a large proportion of the respondents still answered the final interview questions in a manner indicating that these factors had an effect on their travel behaviour under certain conditions. One possible reason why users and non-users did not seem to differ with respect to perceived risk and feelings of safety could be that other factors (e. g. economical) may also play an important role in determining whether or not a particular transport mode is actually used. Some respondents might also have found it difficult to perform the ratings in the questionnaire for modes of transport which they did not use (or used only very rarely).

The respondents who had personal experiences of violence situations with city bus tended to rate the risk of violence for that transport mode to be somewhat higher than did the remaining respondents. The same result was also found for the participants who had more recollections of mass media reports of violence situations with regional bus and ferry. In the latter case, it is of course difficult to tell about the causal direction of the relationship. It could for instance be the case that those who perceive a high risk of violence also are more attentive to mass media reports about violence. The present findings concerning the effects of personal experiences are in general agreement with the results of Lynch and Atkins (1988) but differ from what Hendrickx *et al* (1989) found for experiences of accidents.

The relationship between different personality characteristics and the ratings of perceived risk and feelings of safety were generally quite weak. However, there was a tendency for users of city buses, regional buses and trains to give lower ratings of their self-confidence, safety awareness, personal control over events and general feeling of safety and to rate themselves as more insecure as compared to non-users. For the remaining transport modes, the differences between users and non-users tended to be in the reverse direction, i. e. users rated themselves to have a higher degree of personal control, to be less nervous etc. These differences between users and non-users of different transport modes need to be investigated further, since they suggest that personality factors may have an impact on the perceived attractiveness of different modes of public transport.

Feelings of unsafety and worry connected with different travel-related places/situations were rated to be more frequent for walking than for places connected to any specific travel mode (parking lots, railway stations, etc.). Also, the women reported higher frequencies of feelings of unsafety connected with different transport-related places/situations than did the men (cf. Drottz-Sjöberg & Sjöberg, 1990a; 1990b). The correlations between the ratings of frequency of feelings of unsafety and worry connected with different places/situations and ratings of perceived risk associated with different transport modes reached significance in many cases but were only moderately

high. Further research is needed to shed light on how feelings and perceptions connected with travel-related places/situations contribute to the perception of risks associated with different travel modes.

For train, the perceived risk of violence was correlated with feelings of unsafety and worry both at platforms and in station buildings. The corresponding correlations for perceived accident risk were also high for platforms but lower for station buildings. Somewhat similar results were found by Lindberg and Eckert (1994a; 1994b) and Lindberg and Johansson (1995). Even though their respondents, who were passengers waiting for their trains at different platforms, did not consider the situation to be particularly risky with respect to accidents, close to half of them thought that the train passages were uncomfortable or frightening because of the speed of the trains. It could be speculated that the discomfort, feelings of unsafety or worry a person experiences in this type of situation might depend on an emotional component in the experience of risk (Lindberg & Eckert, 1994a; 1994b).

The women reported a higher mean contribution of different circumstances (e. g. lighting, time of day, absence of personnel and travelling alone) to their feelings of unsafety when travelling than did the men. Further, the youngest respondents reported a lower contribution of the different circumstances to their feelings of unsafety than did the other participants. When assessing perceived risk, feelings of safety and worry associated with different travel modes, further research may need to take the possible effects of these kinds of circumstances into account, for instance by including them in different travel scenarios.

To sum up, a main conclusion that can be drawn from the present study is that there seem to be clear differences between perceived accident risk, risk of violence and feelings of safety associated with different transport modes. Another conclusion is that results from risk perception research where many different kinds of hazards have been investigated in the same study may be difficult to generalise if the purpose is to make direct comparisons of different travel modes. Finally, the present results also suggest that individual differences (i. e. sex, age, exposure to different transport modes, personal experience of accidents and violence situations and different personality characteristics) may have an effect on perceived risk and feelings of safety associated with different transport modes. Further investigation is however clearly needed in order to assess the extent and kinds of impact these factors might have on the perceived attractiveness of different public transport modes.

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