



Transport priorities, risk perception and worry associated with mode use and preferences among Norwegian commuters



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ABSTRACT

There is currently scant research on the role of transport priorities, risk perception and worry for travel mode use and preferences. The present study aims to examine these factors in relation to mode use and preferences among Norwegian commuters. A web-based survey was conducted in a randomly obtained representative sample of daily commuters in the extended greater Oslo area ($n = 690$). The results showed that those who prioritized efficiency and flexibility tended to commute by car, while those who prioritized safety and comfort used public (e.g. metro, tram, and train) or active (e.g. walking and cycling) transport. In a free choice scenario, the respondents who prioritized flexibility reported a preference for using a car, whereas those who prioritized safety and comfort preferred public and active transport for their commuter travels. Risk perception of high impact events, such as terrorism and major accidents, as well as risk perception related to personal impact risks (theft, violence etc.) were related to car use on commuter travels. Transport-related worry exerted weak influences on mode use and preferences. Increased speed on rail transport and more frequent departures may be effective in reducing car use on commuter travels. Risk communication should focus on highlighting the low risk of experiencing security and safety issues in the public transport sector, and this message should be complemented by efforts to reduce the probability of negative events affecting public transport.

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1. Introduction

Compared to public transport, car use has negative consequences in terms of increased traffic congestion, reduced air quality, noise and a higher accident probability (Greene and Wegener, 1997; Sperling, 1995). One of the core challenges in future transport systems is therefore to promote the use of public (e.g. metro, tram and bus) and active transport, such as walking and cycling. This is complicated in sparsely populated countries, such as Norway, where large distances between districts and work-places in the cities often make daily commuting with a car necessary for many individuals. In urban regions it is often necessary to combine train journeys with other public (e.g. metro, tram) or private travel modes, such as a private motorized vehicle and walking.

Urban expansion has increased the need for effective transport over medium to large distances, both within urban areas and surrounding areas. Hence, there is a need for research examining factors associated with travel mode use for commuting.

A choice implies two or more available options. In some cases, however, a commuter may only have one transportation mode available (e.g. a car), for instance in areas with scant public transport options. Another example is when person lives in a peri-urban area without a driver's license (and thus having much more limited opportunity to use a car) and is dependent on train commuting. Therefore, in the present study we refer to *travel mode use* operationalized as how often the commuters use specific modes on commuting travels on a weekly basis, rather than *travel mode choice*, which would imply that all individuals have two or more transportation modes available. Although a commuter may use a specific transport mode most of the time, it is possible that this person would prefer to use an alternative mode of transportation. This preference could be instrumental in a future mode shift, if the preferred mode option becomes available. Therefore, in addition to

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the reported travel mode use, we also examined transport mode use preferences in the present study (i.e. the transport modes that people would use more frequently on a weekly basis if they could choose freely among all urban transportation modes).

Previous research on commuter travel mode use has mainly focused on the relative role of factors such as travel costs and distances between respondents' residences and the target destinations (Beirão and Cabral, 2007; Limtanakool et al., 2006) as well as land use and spatial factors (Badoe and Miller, 2000; Whalen et al., 2013). It could be argued that psychological factors also are important for travel mode use on commuting travels. Studies focusing on general urban travels (i.e. general leisure trips in cities related to shopping, visits, short work-related trips etc.) found that compared to frequent users of public transport, individuals who mainly use a car tend to be more concerned about unpleasant incidents (e.g. criminality) on public transport (Backer-Grøndahl et al., 2009; Roche-Cerasi et al., 2013). Also, how people prioritize safety and other factors, such as total travel time and travel comfort, may be relevant for transport mode use. Studies from occupational safety showed that priorities of safety among management and staff were associated with their commitment and involvement in safety and accident prevention behaviour (Cohen, 1977; Rundmo, 1996; Smith et al., 1978). There is a lack of studies that have examined a wide range of commuter transport priorities, such as priorities of costs, travel time, safety, travel flexibility and comfort with travel mode use and travel mode preferences. One study that focused on general urban travels showed that travel convenience, health and environmental issues were highly prioritized among public and active travel mode users, while frequent users of private motorized modes (e.g. cars) reported higher priority of flexibility and comfort (Rundmo et al., 2011b).

Protection Motivation Theory (Rogers, 1975) and the Health Belief Model (Rosenstock, 1974) argue that individual judgements of risk are important in behaviour and decisions involving uncertainty. In line with these theories one would expect people who rate a high risk of, for instance, security issues regarding theft on public transport to become motivated to initiate protective behaviour by, for instance, using a car more frequently to mitigate this perceived risk. Conversely, these theories would argue that a person who considers car accidents as a major source of risk would become motivated to reduce the risk by using public modes more frequently. In relation to this reasoning, transport risk perception (i.e. the subjective assessment of accident probability and their potential severity of consequences) is a relevant psychological construct. In the domain of transport it is important to take into account both the safety aspect (e.g. probability of accidents) and security aspect (e.g. probability of theft, violence etc.). Safety is usually a more salient aspect in car transport while security is more likely to be the main concern in public transport.

It is often argued that risk judgements influence individual-level decisions and actions as well as organizational decision making at the community and society level (Sjöberg et al., 2004). Consequently, one reason for studying risk perception is the assumption that it may relate to specific behaviours, such as travel mode use. This is also argued in theories highlighting that risk judgements are related to cognitive processes regarding probabilities of risks, such as Prospect Theory (Kahneman and Tversky, 1979). This theory suggests that people focus more on losses/negative impacts than gains/positive impacts during decisions involving uncertainty. This implies that when people perceive a high risk of negative events and impacts they tend to avoid choices with elevated perceived probability of such events or impacts. Moreover, people tend to overweight small negative probabilities, such as the likelihood of negative events in public transport.

Some previous studies (Fyhri and Backer-Grøndahl, 2012; Roche-Cerasi et al., 2013; Rundmo et al., 2011a) examined risk

perception in relation to travel mode use on general urban travels. Fyhri and Backer-Grøndahl (2012) reported that risk perception of accidents was correlated with behavioural adaptations (e.g. avoiding travelling or use of alternative modes) when travelling with a car, whereas risk perception of security incidents (e.g. theft) was more relevant when using modes such as walking, metros and buses. Roche-Cerasi et al. (2013) reported that there were no strong associations between transport mode use, transport preferences and risk perception. Although very few studies have examined the role of probability and consequence estimates for travel mode use, one study found that probability estimates were more important for mode use (Rundmo et al., 2011a). This is also in line with theoretical assumptions regarding subjective probability estimates and behaviour under uncertainty (e.g. Kahneman and Tversky, 1979). In the present study, we focused solely on probability estimates of safety and security issues in the operationalization of risk perception.

An issue in previous work (e.g. Backer-Grøndahl et al., 2009; Fyhri and Backer-Grøndahl, 2012) was that risk perception and worry were referred to as a single coherent construct. Risk perception is a cognitive concept, but it is also related to worry and concern and, consequently, affect is involved in risk judgements (Rundmo and Nordfjærn, 2013). However, risk perception and worry should theoretically be considered as two separate constructs, needing their own dedicated operational definitions. During the recent years, the role of affect in subjective assessments of risk has received increased attention. There are two main assumptions about the role of affect in risk judgements: The first is that affect may determine the strength of cognitive beliefs about a risk source, while the alternative assumption is that affect is a causal factor forming the attitude, i.e. a "mental image", which is different from beliefs, but still able to influence what a person believes. Rundmo and Sjöberg (1998) argued that affect could both precede (pre-cognitive worry) and be a consequence of the cognitive beliefs about the risk source and how the cognitive beliefs are evaluated (post-cognitive worry) (see also Finucane et al., 2000; Zajonc, 1980). The present study focuses on post-cognitive rather than pre-cognitive worry reflecting the view that worry is a consequence of risk cognitions (Loewenstein et al., 2001). Affect such as worry is then assumed to be evoked every time a person thinks about a risk source. When the source is a concern a person may also think about it frequently, and this may ultimately relate to mode use and preferences on commuter travels.

Previous studies that examined the link between transport priorities, risk perception and transport-related worry (i.e. level of concern experienced by thinking about security and safety issues in transport) mainly focused on travel in the general population (e.g. Rundmo et al., 2011a) or general urban travel, which rather than commuter travel implies leisure travels, shopping, visits, recreational trips, short work trips etc. (e.g. Backer-Grøndahl et al., 2009; Roche-Cerasi et al., 2013). To our knowledge, no studies have examined these psychological constructs in relation to mode use and preferences among commuters. Compared to other samples, the associations may differ among commuters who usually repeat their travels frequently causing a more chronic exposure to transport risk (Limtanakool et al., 2006) which potentially relate to elevated perceptions of transport risk. On the other hand, an alternative possibility is that commuters habituate to risks because of the frequent exposure, therefore, risk perception and worry may become less relevant for travel mode use on these travels. The demand for timely arrival is also usually higher on commuting travels than leisure travels (Noland et al., 1998; Polak, 1987), which may make the priorities of travel time and reliability more important for commuter mode use than on other travels. Also, commuter travels often have a repeated nature and are usually conducted over medium to long distances (e.g. across municipalities) (Limtanakool et al., 2006). It

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