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Personality, Risk Cognitions and Motivation Related to Demand of Risk Mitigation in Transport among Norwegians

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Abstract

There is insufficient knowledge regarding the role of personality traits, transport-related risk cognitions and safety motivation for demand for transport risk mitigation. The aim of this study is to test a model aimed to predict public demand for transport risk mitigation by these psychological risk constructs. A mailed self-completion questionnaire survey was conducted in a random sample of the Norwegian population aged 18-65 years obtained from the Norwegian population registry (n = 1947). Results from structural equation modeling supported the hypothesis that sensation seeking, normlessness, risk cognitions and transport-related worry had mediated associations with demand for transport risk mitigation through safety motivation. There were no differences in the strength of associations related to gender and age. The findings are discussed in relation to personality-entailed measures as well as the link between cognitive and emotional approaches to transport risk.

Key Words: Sensation seeking, normlessness, worry, risk perception, safety

1 Introduction

One of the major challenges in current transport systems is to reduce the use of private motorized travel modes (e.g. car) and facilitate use of more environmentally sound public transport (e.g. metro, tram and train). Several contextual factors may influence use of transport modes, such as the availability of private motorized modes and public transportation modes, economic costs, and travel time (Beirão & Cabral, 2007; Limtanakool et al., 2006). However, recent research has shown that psychological considerations of safety and security factors in private motorized and public transport also predict mode use (e.g. Backer-Grøndahl et al., 2009; Rundmo et al., 2011). People who tend to use motorized private transportation modes more frequently than public transportation modes tend to be more worried about unpleasant incidents (e.g. criminality) in public transport compared to people who use public transportation modes more often (Backer-Grøndahl et al., 2009; Roche-Cerasi et al., 2013). Rundmo et al. (2011) also showed that individuals who focus on personal control and those who do not trust the ability of the transport authorities to mitigate the risk in public transport tend to use motorized private transportation modes. As such, it is relevant to establish more knowledge about psychological factors related to the demands of risk-reducing transport measures exerted by the general public upon decision-makers, policy makers and safety experts (i.e. demand for transport risk mitigation). An improved understanding of factors underlying such demands may guide policy efforts to improve the safety by the authorities. The present study will provide insights into how personality factors, risk cognitions and safety motivation relate to demands for risk mitigation in transport in a population-based sample.

1.1. Literature review

Previous studies of demand for transport risk mitigation have mainly been preoccupied with cognitions and emotions, such as risk perception and worry regarding accidents (e.g. Moen &

Rundmo, 2006; Moen, 2007). While these are important approaches, we are not familiar with studies that have investigated the role of risk taking propensity traits for safety motivation and demands of transport risk mitigation in the public. Moen (2007) found that sensation seeking traits were negatively associated with priorities of safety, but did not integrate safety motivation and demand for risk mitigation into the model.

A possibility is that risk taking propensity personality traits, such as sensation seeking (individuals' cravings for stimulation and to act out spontaneously) (Zuckerman, 1994) and normlessness (a tendency to violate norms in order to obtain individual social goals) (Kohn & Schooler, 1983) could reduce transport safety motivation (i.e. the commitment, efforts and drive people have in regard of transport safety). The assumption that risk taking personality traits could relate to a reduced drive for safety is in line with trait theory (Costa & McRae, 1992) and research within the road traffic sector (Iversen & Rundmo, 2002; Ulleberg & Rundmo, 2003). These studies have shown that risk taking personality traits relate to unsafe attitudes towards traffic safety, lower traffic-related risk perception and unsafe driver behaviour. If personality factors are related to safety motivation it may be possible to predict which trait markers that are associated with a lower motivation for transport safety and reduced demands for mitigation efforts in transport. Given that people with risk propensity traits have lower motivation for safety, it may more efficient to focus on other countermeasures than safety in order to change transport mode use among these individuals.

Safety cognitions, such as risk perception (i.e. cognitive probability estimates of accidents * the perceived potential severity of consequences if accidents occur) (Sjöberg, 2002), may also be relevant for the demand for transport risk mitigation. Although the majority of previous studies reported that the consequence-component of risk perception is a stronger predictor of

risk mitigation demands than the probability-component (Sjöberg,1999; Sjöberg, 2000), these studies examined probability and severity of consequences at a rather broad level ranging from trivial low-consequence hazards (e.g. to catch a cold) to high impact risks (e.g. nuclear accidents). Studies that have examined the consequence-component of risk perception in relation to transport risks have called into question whether the consequence-component is more important than the probability component (Rundmo et al., 2011). Hence, an important contribution of the present study is that both the probability and consequence components of risk perception were included.

Previous studies reported that risk perception primarily is important for demand for risk mitigation because a high risk perception influences emotions and increases the concern that people experience in relation to accident risk (i.e. transport-related worry), which in turn may predict demand for transport risk mitigation (Moen, 2007). Previous longitudinal studies also found that increased risk perception had a temporal relation to increased worry (Kobbeltved et al., 2005). Thus far, studies have not investigated the assumption that transport-related risk perception and worry may be mediated through increased safety motivation. A mediating role of safety motivation for safety cognitions and emotions on demands for transport risk mitigation is in line with drive-reduction approaches to motivation and the protection motivation theory (Rogers, 1975). When the individuals experience negative cognitions and emotions in relation to a stimulus, a motivation may be shaped to reduce the arousal and tension (Feldman, 2010). Although some previous studies found a direct link between risk cognitions, emotions and demands for risk mitigation, it is possible that these constructs are primarily important because they facilitate a tension-reducing drive that in turn increases motivation for demanding risk mitigating activities from the authorities.

Several previous studies within the domain of occupational safety have shown that employee motivation of safety is important for employee risk and accident-preventing behaviour (Cohen, 1977; Probst & Brubaker, 2001; Rundmo, 1996; Rundmo & Iversen, 2007; Smith et al., 1978). However, efforts to link safety motivation to policy demands within the transport domain remain scant. On the basis of studies conducted within occupational safety one may expect that a strong motivation for safety increases the demand for transport risk mitigation. Based on the cited theories and empirical work it can be hypothesized that personality factors as well as risk cognitions and emotions may influence the drive and 'push' for risk mitigation demands (i.e. an indirect mediating role of safety motivation on demand for risk mitigation).

1.2. Aims of the study

The present study aims to examine the role of personality traits (i.e. sensation seeking and normlessness), risk perception, worry and safety motivation for demands of transport risk mitigation in a Norwegian population sample. The working model of the study is shown in Figure 1. We hypothesize that both the risk taking personality traits are negatively related to motivation for safety in transport and also negatively related to risk perception. Risk perception is hypothesized to be directly positively associated with safety motivation as well as indirectly positively related to such motivation through worry. Worry is hypothesized to be positively related to safety motivation, which in turn is expected to be positively associated with demand for transport risk mitigation.

Insert Figure 1 approx here

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2 Method and materials

2.1. Sampling and data collection procedure

A mailed self-completion cross-sectional questionnaire survey was conducted in a random sample of the Norwegian population aged 18-65 years (n = 6203). Potential respondents were randomly selected from the Norwegian population registry by a firm which has access to this registry holding household addresses of all living individuals in Norway. The study obtained ethical approval from the Norwegian Social Science Data Services (NSD) before the data collection commenced. All subjects were informed that participation was voluntary, that they could withdraw from the study at any time and about methods used to secure their confidentiality. Incentives of a response were two tickets to a lottery with a total prize of about 4000 Euro. A reminder letter accompanied with a questionnaire was distributed to non-respondents three weeks after the initial distribution. The data collection was conducted during October-December 2008.

A total of 1947 individuals (31%) responded to the survey, a common response rate in transportation surveys (e.g. Castanier et al., 2012). The sample included 786 (49.60%) females and 799 (50.40%) males (n = 362 with missing data on the gender variable). The age of the respondents ranged from 18 to 65 years (M = 46.34, SD = 11.76). A total of 8.8 per cent (*n* = 151) of the respondents had primary or secondary school as their highest completed education. About 29.7 per cent (*n* = 512) had a work-related high school education, and 235 (13.6%) had senior high school as their highest completed education. A relatively high proportion of the sample (47.9%, *n* = 824) had high education from a college or university. In previous work the present sample was compared with population demographic characteristics in the Norwegian Statistics Database (Nordfjærn et al., 2010). This analysis reflected that our

sample did not deviate substantially from the Norwegian population in gender, age, geographic spread and education.

2.2. Measurement instruments

The measure of personality traits included scales of sensation seeking and normlessness. Eight sensation seeking items were obtained from the Norwegian version of the Revised NEO Personality Inventory (Costa & McRae, 1992). This measure contained statements such as 'I often seek excitement' and 'I like to be in locations where there is action'. Normlessness was measured by four items obtained from the Normlessness Scale (Kohn & Schooler, 1983). This instrument contained statements such as ' It is acceptable to do what you want as long as you do not get into trouble'. The items in both these scales consisted of statements and were scored on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. Items were direction-coded to make higher scores reflect a higher extent of the measured traits. Both scales have been used in a number of previous studies (e.g. Iversen & Rundmo, 2002; Ulleberg & Rundmo, 2003).

A four-item measure of safety motivation (Rundmo et al., 2011) was used to record the commitment, efforts and drive the respondents had in regard of transport safety. The instrument included statements such as ' I always take responsibility for my own safety when I am travelling'. The items were scored on a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. The items were direction-coded to make higher scores reflect stronger safety motivation in transport.

Based on the theoretical assumption that risk perception is defined as cognitive probability estimates of accidents * the perceived severity of consequences by potential accidents (Sjöberg, 2002), the respondents reported their perceived probabilities of obtaining a personal

injury by a total of 11 transportation modes (i.e. plane, train, bus, ferry, car, motorcycle, moped/scooter, bicycle, pedestrian, tram and metro). This instrument was scored on a seven-point Likert scale ranging from 'Very low probability' to 'Very probable'. The respondents were also asked to judge the severity of consequences of potential accidents by the same 11 transportation modes. This scale ranged from 'very low severity' to 'very severe/fatal'. This scale has been applied in several previous empirical accounts (e.g. Moen, 2007; Rundmo et al., 2011).

Previous research (Moen, 2007) found that worry regarding specific transportation mode-items segmented into two general dimensions termed 'worry in motorized private transport' and 'worry in public transport'. Therefore, transport-related worry was measured by two items regarding how concerned the respondents felt when they were thinking about the risk of an accident in public and motorized private transport, respectively. A seven-point evaluation scale was used ranging from 'not at all concerned' to 'very concerned' (higher scores reflecting more worry). Demand for risk mitigation was also measured by two items. The respondents were asked: 'How important do you think it is that the Norwegian authorities establish measures to reduce the risk in public transport' and 'How important do you think it is that the Norwegian authorities establish measures to reduce the risk in motorized private transport'. A seven-point scale ranging from 'not important' to 'very important' was used for this instrument. Means and standard deviations of all the items used in the present study are reported in Table 1.

The questionnaire also included a demographic form related to gender, age and educational level among the respondents.

Insert Table 1 approx here

2.3. Statistical procedures

Descriptive statistics were used to describe the characteristics of the sample and to obtain means and standard deviations on the relevant psychological constructs. In order to determine patterns of missing data we visually inspected frequency distributions on each variable to examine the extent of missing data, which ranged from 0.6 to 1.5%. We also examined the full percentage of missing data and the overall summary showed that this did not exceed the 5% borderline (1.3%). Little's MCAR test showed that the data was not missing completely at random ($\chi^2 = 245.38$, df = 146, $p < .001$). Hence, list wise deletion of missing values and single imputation of missing values were considered inadequate. Finally, we conducted t-tests between respondents with and without missing data for each variable on the other variables (see also Hair et al., 1998 for detailed procedure). This analysis revealed no significant differences between the two groups, suggesting that the values were missing at random. Also, the overall small number of missing data on the variables reduces the concern related to missing values in the sample. Multiple imputation of missing data on the psychological constructs was conducted using the expectation maximation (EM) algorithm with a maximum likelihood method. This algorithm maintained the relationships between the imputed items and other items in the measures, because the missing values of the specific items were estimated by the values of other items within the relevant measures.

Cronbach's alpha coefficients were calculated in order to examine the internal consistency of the scales. Bi-variate correlations were estimated to examine correlations between the variables. PASW Statistics 18.0.0 was used for all of these analyses. Structural Equation Modelling (SEM) was carried out with the AMOS 20.0.0 software to test the fit of the

hypothesized working model. Although the dimensionality of the instruments used in the present study has been tested previously (e.g. Moen, 2007; Nordfjærn & Rundmo, 2010; Ulleberg & Rundmo, 2003), these studies were conducted in different samples. Therefore, we included all item-indicators for the latent constructs in the model (i.e. a measurement model and structural model). First, we tested the fit of the measurement model (Confirmatory Factor Analysis) and thereafter we specified a full structural model with associations between the latent constructs. The fit indices used both for the measurement model and the structural model included the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA with Confidence interval (CI) 90%). The chi-square and corresponding significance level was also reported. Conventionally, a CFI around .90 or above and a RMSEA of .08 or less have been considered to indicate close fit between the model and the data (Kim & Bentler, 2006). We also tested unconstrained and constrained models across gender and age in order to examine whether the strength of structural relations differed across these demographic characteristics. Because of the large sample size a conservative significance level of .001 was applied to reduce the probability of type I error in all analyses.

3 Results

The multi-indicator instruments were entered into dimensions on the basis of previous studies which examined the factor structures and the psychometric properties of these instruments in the Norwegian population (e.g. Moen, 2007; Nordfjærn & Rundmo, 2010; Ulleberg & Rundmo, 2003). The specific dimensions of the multi-indicator measures of personality, risk perception and safety motivation are shown in Table 2. As shown by the Cronbach's alpha coefficients all scales had satisfactory internal consistency.

Insert Table 2 approx here

Table 3 shows correlations between the variables of interest in the present study. In order to facilitate the interpretation of the correlation matrix the latent variable scores of multi-indicator measures shown in Table 2 were used in this analysis. As shown, sensation seeking had a negative correlation with safety motivation, demand for risk mitigation and worry in public transport. Normlessness was negatively correlated with the consequence component of risk perception and safety motivation. Risk perception was merely positively associated with worry by motorized private and public transport, whereas safety motivation was positively associated with both types of demand for transport risk mitigation and worry in motorized private transport. The demand for risk mitigation in public and motorized private transport was positively correlated with the two corresponding dimensions of worry. However, the correlation coefficients should be interpreted with caution because of the large sample size and possibility of type I error. As seen in Table 3, the correlations between the predictor variables were moderate, which suggests that multicollinearity was not a major issue in the study.

Insert Table 3 approx here

The next step was to test the fit of the hypothesized working model. First, we specified the measurement model (Confirmatory Factor Analysis) using dimensions derived from previous work (Moen, 2007; Nordfjærn & Rundmo, 2010; Ulleberg & Rundmo, 2003). This model had unsatisfactory fit to the data (χ^2 = 5074.79, df = 642, p <. 001, RMSEA = .142 (CI 90% = .098; .193), CFI = .74). The measurement model indicated that four items failed to load on the sensation seeking latent factor ('I would not thrive on a holiday in Las Vegas', 'I usually avoid shocking or scary movies', 'I am attracted to strong colours and styles' and 'I enjoy being among the spectators at big sports events'). In addition, one item did not load on the normlessness latent factor ('Some acts are wrong, even if they are legal'). Consequently, these items were excluded from the final measurement model. When the measurement model was specified and re-estimated without these items the fit of the model to the data was satisfactory (χ^2 = 5070.79, df = 633, p <. 001, RMSEA = .064 (CI 90% = .063; .066), CFI = .92).

After establishing the measurement model, a full structural model was specified with associations between the latent constructs (Figure 2).As shown, the final structural model explained 21% of the variance in demand for transport risk mitigation and had acceptable fit to the data (χ^2 = 4412.77, df = 638, p <. 001, RMSEA = .059 (CI 90% = .057; .061), CFI = .94). Both personality traits had a negative relation to safety motivation, but normlessness (β = -.21, p < .001) had a slightly stronger relation than sensation seeking (β = -.18, p < .001). Both the probability component (β = .01, n.s.) and the consequence component of risk perception (β = -.09, n.s.) were unrelated to safety motivation. However, the probability component of risk perception had a strong positive relation to worry (β = .45, p < .001) and

the relation between the consequence component and worry also reached significance (β = .12, p < .001).

Worry had, in turn, a positive relation to safety motivation (β = .20, p < .001), while safety motivation was positively related to demand for transport risk mitigation (β = .35, p < .001). In sum, the structural model shows that personality factors and worry are the primary factors that facilitate drive to mitigate transport risk through transport safety motivation. We also tested this model with direct relations between risk perception, personality and worry on demand for transport risk mitigation. However, this resulted in non-significant path coefficients between these constructs and demand for risk mitigation. We did not find any differences in the structural relations across gender and age.

4 Discussion

The aim of the present study was to test a prediction model where risk taking propensity personality traits, risk perception, worry, and safety motivation were hypothesized to predict demands for transport risk mitigation. In the model, safety motivation was a mediating factor for personality factors, risk perception and worry. The fit of the model to the data was satisfactory and the model explained 21% of the variance in demand for transport risk mitigation among Norwegian transport users.

The current study is to our knowledge one of the first to examine several risk propensity personality traits in relation to demands for transport risk mitigation. As hypothesized, both normlessness and sensation seeking were associated with a reduced motivation for safety in transport and also had a negative indirect effect on demands for risk mitigation. An implication is that individual attributes and personality markers should be considered when the authorities aim to communicate risks to the public. Countermeasures aimed to improve safety and security in public transport may not have appeal and may not be suitable for changing transport habits among individuals scoring high on the normlessness and sensation seeking personality traits. Sensation seeking is, for instance, negatively correlated with age and the prevalence of this trait tends to be higher in the younger segments of the population (Nordfjærn et al., 2010). As such, communication aimed at facilitating use of public transport may benefit by focusing on additional aspects to safety among these individuals. A promising approach to facilitate public transport use in this group could be to focus on their need for stimulation and entertainment by, for instance, offering entertainment systems, movie services etc. in planes, buses, trains and metro.

Contrary to our hypothesis and the protection motivation theory, risk perception was not directly related to safety motivation. Meanwhile, risk perception could still be relevant for transport safety because it was a strong predictor of worry, which is in line with both longitudinal (Kobbeltved et al., 2005) and cross-sectional studies (Moen, 2007). In line with our data, it is possible that emotions create a stronger drive for safety and a stronger focus on risk-reducing countermeasures than safety cognitions. An implication for risk communication programmes is that a mere focus on the probability of accidents in transport may not be as efficient as intended. Safety programmes also need to take the worry that travellers experience into account. This is in line with the risk-as-feelings hypothesis (Loewenstein, 2001) which argued that cognitions regarding consequences and probabilities of undesirable events give rise to emotions such as worry. Further, it may be argued that the majority of human factor risk models focus too much on human cognition, without considering the impact of emotions on risk decisions. It is possible that emotions mediate the relations between risk cognitions, safety motivation and demand for risk mitigation. Human factor transport risk decision models could as such benefit by integrating emotions into the theoretical taxonomy.

The finding which showed that risk perception was not directly related to safety motivation, but mediated through worry, also supports the assumption that a mere analytical and rational reasoning of probabilities and potential severity of consequences are not efficient in guiding behaviour if they do not include emotions (Slovic et al., 2004). This is in line with the affect heuristic (Finucane et al., 2000) which argues that affect is an essential component creating drive for behaviour in uncertain decisions. According to the theory, people hold a ‘pool’ of different positive and negative affect associated with certain events and objects. The objects or events are hypothesized to provide cues for specific affective responses and people tend to automatically label certain stimuli with a specific affective state. This process is assumed to

occur at an automatic and unconscious level. Studies on driving also reported that negative emotions have stronger impact on motivation to drive safely than positive emotions (Hu et al., 2013). This could be related to the fact that worry regarding accidents is 'affect rich' and mainly provides negative emotional cues. Stimuli which hold attributes that provide strong negative cues may facilitate and enhance the use of the affect heuristic to a larger extent than less affect-prevalent stimuli (Wilson & Arvai, 2006). In this way, negative emotions, such as worry regarding accidents in public and private motorized transport, may increase the motivation for safety according to an emotional 'algorithm'. The motivation for reducing the tension arising from worry may in turn shape demands for risk mitigating efforts from the authorities, which is in line with our findings. Emotions may as such be the most important component mobilising the responses of people to transport risks.

Previous work has shown that individuals in the general public tend to rely more on emotions when confronted with transport risks, while safety experts and policy makers tend to have a more analytical approach to such risks and also demand less risk mitigation efforts than the general public (Rundmo & Moen, 2006). Therefore, there may be a potential conflict in the risk focus among safety experts and the general public. However, to base transport risk management in the assumption that the general public generally holds misinformed, emotional and irrational beliefs about transport risks is problematic from a democratic perspective and could also cause public health issues in terms of increased stress and anxiety over time (Loewenstein, 2007). Therefore, it is paramount that the authorities seriously consider and accommodate the risk mitigation demands from the public, also when the motivation underlying the demands is based on emotions such as worry.

Although both the probability- and consequence-components of risk perception had significant relations to worry in the present study, the probability component had a stronger relation to worry than the consequence component. This is inconsistent with previous work which mainly reported that the severity of consequences of potential accidents is more important for worry than the probability estimates (e.g. Sjöberg, 2006). However, the evidence regarding the role of consequences and probability is not consistent. Moen and Rundmo (2005) reported that the subjective probability-component of risk perception loaded more strongly on the latent risk perception factor. Rundmo et al. (2011) also concluded that the role of severity of consequences for transport risk mitigation demands may be less prominent than in other types of risks. A possibility is that people do not focus on consequences when the risk of an accident is low. This may be particularly relevant for public modes, such as plane and train. For instance, a person who travels with plane may consider the consequences of the worst case scenario of a crash as highly severe, but the extent of worry deriving from this cognition could be moderated by the low perceived probability of such an event. It should also be noted that people in general seem to be well-informed about transport risks and tend to estimate the probabilities of accidents in transport fairly in line with the statistical 'objective' risks of different modes (see e.g. Rundmo & Nordfjærn, 2013). These risks may as such not represent the same level of 'novelty' as hazards such as, for instance, natural disasters and nuclear risks.

The empirical data supported the hypothesised positive association between safety motivation and demand for risk mitigation. Although causality cannot be inferred from this cross-sectional study, the mediated path coefficients on demand for transport risk mitigation of the remaining psychological constructs were stronger than the non-significant direct path coefficients between these constructs and risk mitigation demands. This suggests a mediating

role of safety motivation for personality traits, safety cognitions and emotions on the demand for transport risk mitigation. Studies in work-related settings have shown that safety motivation mediated the association between the 'safety climate/culture' at the management level and safety behaviours among workers (Griffin & Neal, 2000). A hypothesis for further research is that safety motivation in the general public may operate in a similar manner and may yield a reflection of how well the authorities communicate safe practice in transport. This is in line with social exchange theory (Blau, 1964) which argued that when individuals perceive that their surroundings are concerned and preoccupied with safety, they may feel obligated to create reciprocity and become motivated to conduct safety-compliant behaviours.

The potential association between demand for transport risk mitigation and transportation mode use warrants discussion. Although we did specifically target to examine this relation in the present study, one may speculate that demand for transport risk mitigation has weak immediate consequences for individual mode use. This is likely because political decisions to mitigate risk is taken during bureaucratic information processing on the society level and as such opinions at the individual level may not have immediate consequences for individual transportation mode use behaviour (see also Rundmo et al., 2011). On the other hand, if demands for transport risk mitigation in, for instance, public transport are not accommodated over time by interventions and countermeasures at the society level, individuals may start to consider a shift from public to private motorized transport in order to reduce tension and an uncomfortable psychological state. Also, an hypothesis for further research is that individuals demand more risk mitigation for the specific modes that they use more frequently, simply because the risk mitigation measures would be more relevant for their specific transport behaviour (e.g. a person who uses train more frequently may demand a stronger risk mitigation in the rail sector, while a person using a car more frequently would demand more

risk mitigation from the road authorities etc.). As such, demand for risk mitigation could be an important variable to consider in relation to the strategy of pushing and pulling individuals to use more public transport.

The present study has some limitations that should be considered when the results are interpreted. The study used a cross-sectional method which do not allow for decisive conclusions about causality. Meanwhile, personality factors are relatively stable over time (Costa & McRae, 1992) and the suggested model was developed on the basis of theory and on previous evidence from longitudinal work (e.g. Kobbeltved et al., 2005). The response rate of 31% is common in transportation surveys, but also warrants cautious interpretations of the ecological validity of the results (i.e. whether or not the results are possible to generalise to the target population). However, it is more important to consider whether or not the sample yields a decent reflection of the target population. Comparisons of the present sample with demographic characteristics in the Norwegian population registry reflected few differences (see e.g. Nordfjærn et al., 2010). The measure of worry in the present study may also be debatable. Ideally, emotional arousal should be measured without involving cognitive evaluations. However, this may be complicated to achieve in a questionnaire survey because the respondents have more time to cognitively evaluate the items than in a sudden real-life hazard situation provoking an immediate emotional activation (Moen, 2008). Studies to come should, therefore, aim to test the associations between worry and demand for risk mitigation in experimental settings.

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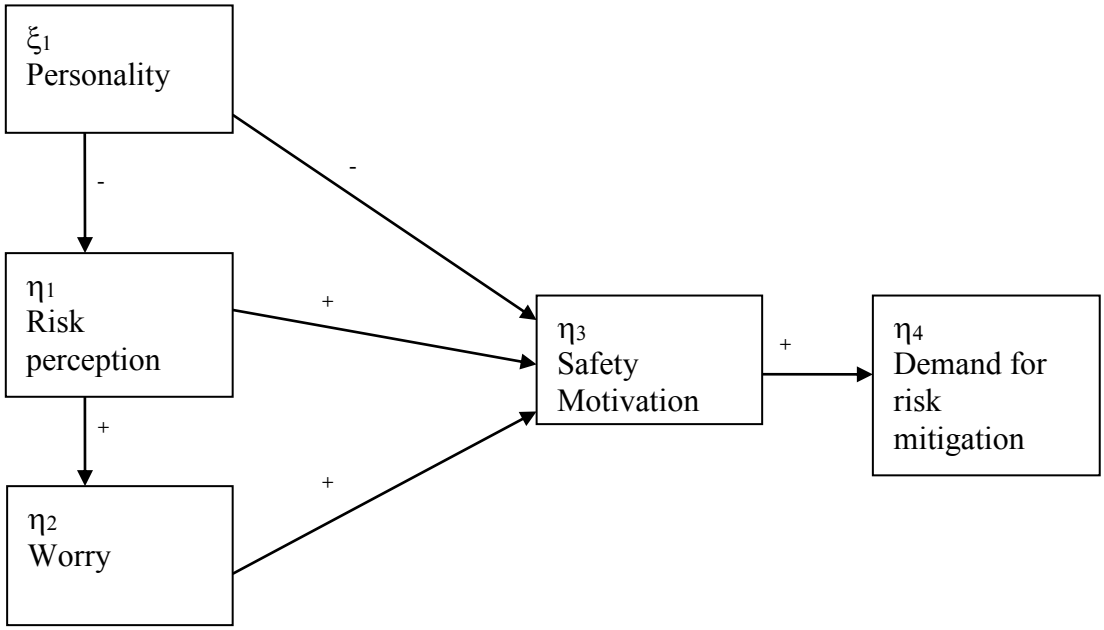


ξ = Exogenous variable

η = Endogenous variable

- = Hypothesized negative association

+ = Hypothesized positive association

Figure 1. Working model of the study

Table 1. Means and standard deviations of personality, safety motivation, risk perception, worry and demand for risk mitigation

Indicator	Mean	SD
Personality		
Sensation seeking		
I often seek excitement	2.22	.97
I would not thrive on a holiday in Las Vegas	2.93	1.31
Sometimes I do things just to get excitement and 'kicks'	2.52	1.25
I usually avoid shocking or scary movies	2.92	1.23
I like to be in locations where there is action	3.07	.96
I love the thrill at rollercoasters	2.48	1.30
I am attracted to strong colours and styles	2.70	.96
I enjoy being among the spectators in big sports events	2.86	1.19
Normlessness		
It is acceptable to do what you want as long as you do not get into trouble	2.53	1.07
It is acceptable to circumvent the law as long as you do not violate it directly	2.33	.98
If something works it does not matter whether it is right or wrong	2.13	.84
Some things are wrong to do, even if they are legal	2.38	.95
Worry		
How worried do you become when thinking about the risk of an accident with personal injury by private motorized transport	3.76	1.79
How worried do you become when thinking about the risk of an accident with personal injury by public transport	2.80	1.79
Risk perception		
How probable do you think it is that you personally experience an injury by the following modes of transportation:		
Plane	1.64	1.14
Train	1.88	1.20
Bus	2.75	1.40
Ferry	2.08	1.22
Car	4.53	1.61
Motorcycle	5.38	1.45
Moped/scooter	5.18	1.47
Bicycle	4.38	1.53

Pedestrian	3.81	1.67
Tram	2.39	1.36
Metro	2.33	1.35
Were you to experience an accident with personal injury, how severe do you think the consequences would be by the following modes of transportation:		
Plane	6.04	1.83
Train	5.03	1.73
Bus	4.71	1.52
Ferry	4.66	1.74
Car	5.44	1.47
Motorcycle	5.81	1.87
Moped/scooter	5.58	1.88
Bicycle	5.02	1.68
Pedestrian	5.04	1.74
Tram	3.95	1.75
Metro	4.11	1.80
Safety motivation		
I prioritize safety for my life and health above all other matters when I travel	4.10	.81
I always take responsibility for my own safety when I am travelling	4.26	.67
I am highly motivated to seek out information about transport safety	3.31	.90
I motivate others to focus on safety in transport	3.36	.91
Demand for risk mitigation		
How important do you think it is that Norwegian authorities establish measures to reduce the risk in:		
Public transportation	6.37	1.21
Private motorized transportation	6.40	1.10

Translated Norwegian items were used in the questionnaire

Items were direction-coded to make higher scores yield more of the psychological constructs

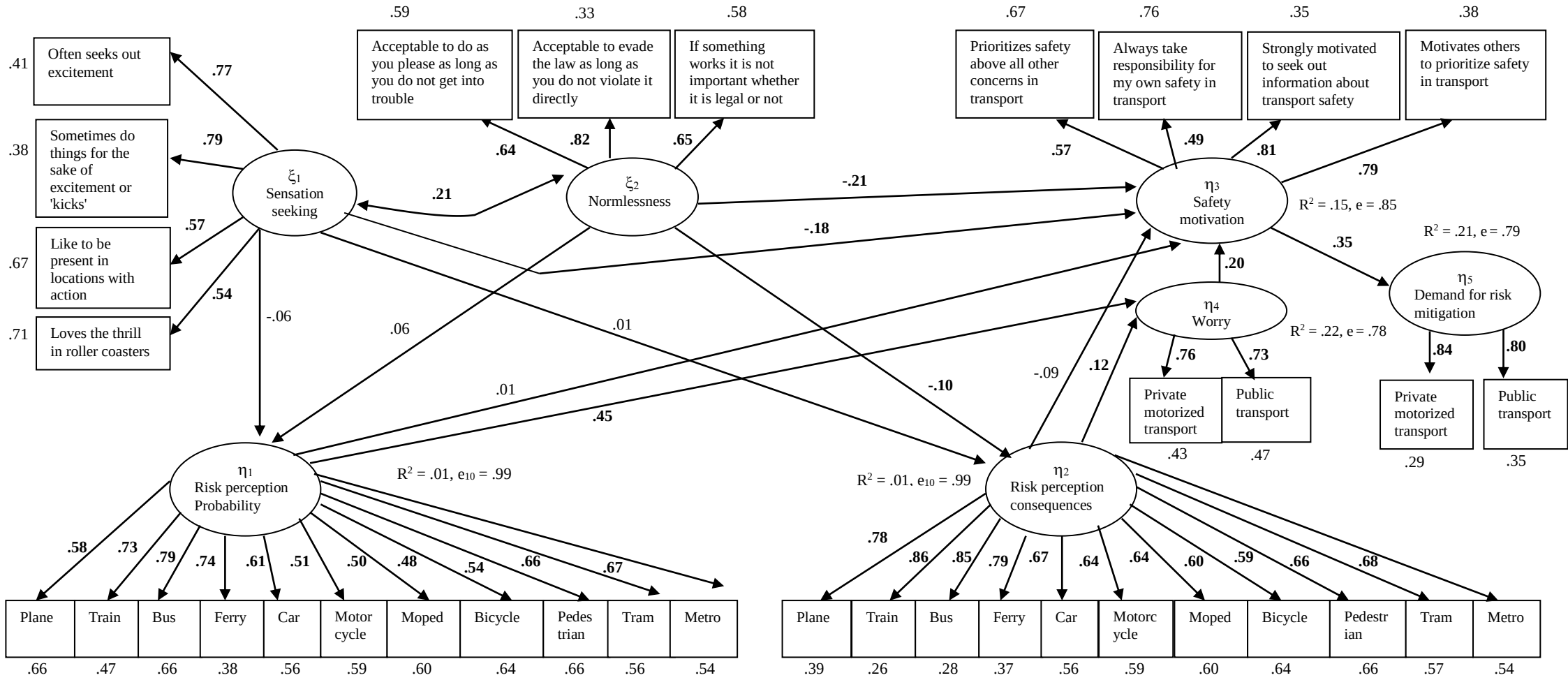
Table 2. Alpha coefficients, mean scores and number of items for multi-indicator measures

Dimensions	Number of items	Mean (SD)	Cronbach's alpha
Sensation seeking	8	2.71 (.50)	.82
Normlessness	4	2.34 (.65)	.69
Risk perception – probability	11	3.24 (.98	.87
Risk perception – Consequences	11	5.03 (1.33)	.93
Safety motivation	4	3.76 (.65)	.79

Table 3. Correlations between social cognitive risk constructs, safety motivation, personality and demand for risk mitigation

Dimension	1	2	3	4	5	6	7	8	9
1 .Sensation seeking	-	**.21**	-.02	.00	**-.12**	**-.10**	-.07	-.06	**-.10**
2. Normlessness		-	.05	**-.10**	**-.13**	-.09	-.09	-.02	.05
3. Risk perception – probability			-	**.17**	.07	.03	.06	**.34**	**.30**
4. Risk perception - consequences				-	-.05	.06	.05	**.12**	**.14**
5. Safety motivation					-	**.25**	**.25**	**.25**	.08
6. Demand for risk mitigation – private motorized transport						-	**.67**	**.10**	.08
7. Demand for risk mitigation – public transport							-	.07	**.10**
8. Worry – private motorized transport								-	**.54**
9. Worry – public transport									-

Significant path coefficients ($p < .001$) in bold



$\chi^2 = 4412.77$, df = 638, p <. 001, RMSEA = .059 (CI 90% = .057; .061), CFI = .94

Significant standardized coefficients (p < .001) in bold

Figure 2. Personality, social cognition and safety motivation predicting demand for risk mitigation in transport