# Transport risk evaluations associated with past exposure to adverse security events in public transport

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# Abstract

The current study aims to examine differences in risk evaluations according to whether individuals have been exposed to adverse security events in transport during the last five years. In addition, a path model is tested where risk evaluations predict intentions to use public transport and use of such transport in these groups. The results are based on a survey conducted in a randomly obtained representative sample of the Norwegian urban public (n = 1043). The results showed that individuals who had been exposed to adverse security events in public transport reported substantially higher risk perception of experiencing security issues in such transport than those who were not exposed. Exposed individuals also reported higher probability judgements and more worry of experiencing injury in public transport. The path model showed that high probability judgements of experiencing injury in public transport were related to a lower intention of using such transport, whereas corresponding worry in the private motorized sector predicted a stronger intention to use public transport. Demand for risk mitigation in the public transport sector was found to be more relevant for intentions to use public transport than similar demands in the private motorized sector. The path model and cofficients were not found to differ significantly according to exposure to security events in public transport. The findings are discussed in relation to the role of negative risk experiences for risk evaluations in transport.

Key words: risk perception; experience; worry; public transport; demand

# 1. Introduction

The role of previous exposure to adverse security events in public transport (e.g. theft and harressment onboard metro, tram or bus or at a waiting point for these modes) for risk evaluations is insufficiently understood. More knowledge of how previous exposure influences concurrent risk evaluations in transport are important because risk evaluations could influence travel mode use behaviour ( Roche-Cerasi et al., 2013; Rundmo et al., 2011a). Elevated risk evaluations in public transport could ultimately be a barrier for using public modes of transport and may be instrumental in promoting car use. It is therefore important to analyse associations between previous exposure to adverse security events and concurrent risk evaluations in order to increase use of public transport.

One of the more important constructs in risk research is risk perception (i.e. perceived probability that a negative event may occur times the perceived severity of consequences if such events occur) (Rundmo & Sjöberg, 1998; Sjöberg, 1999). The psychometric paradigm (Fischhoff et al., 1978) is an important approach within the domain of risk perception. This tradition argues that characteristics of the hazards or risk sources determine individual risk perception. This approach to risk perception has received critique (see e.g. Sjöberg et al., 2004), partly because risk perception was analysed on an aggregate level and no attempt was undertaken to explain why different groups and individuals report diverging levels of risk (e.g. Englander et al., 1986; Teigen et al., 1988). An alternative approach to risk perception is the social amplification of risk framework (Kasperson et al., 1988), which emphasises the role of individual processing of risk stimuli. Here, personal negative experience with a risk source is considered important for risk perception. For instance, negative experiences with specific risk sources are assumed to increase the availability and retrieval potential of the source in memory and thereby causing risk perception to increase. This is in accord with the experience

hypothesis which postulates that risk perception increases when the public experience more occurences of specific risk events (Rogers, 1997).

An additional reason of increased risk perception due to previous exposure may be that the risk source becomes more personally relevant for the individual. This is strongly linked to the availability heuristic (Tversky & Kahneman, 1973) which argues that probability and consequence judgements may be influenced by the possibility to remember specific examples (i.e. prototypes) of events in which are relevant in the environment where the individual operates. However, the ease of retrieval may also be related to the time period between the negative risk experience and evaluation (Loftus, 1993), which is why the time period for exposure was delimited to five years in the current study.

The assumption that previous negative experiences with risk elevate concurrent risk perception has also received empirical support. Milman et al. (1999) reported that tourists who had previously been exposed to crime reported an overall lower level of security and generally felt more unsafe on holiday than individuals who had not been previously exposed to crime. Barnett and Breakwell (2001) also reported that negative experiences with various risk sources were associated with high risk judgements, particularily in terms of involunatary risks. Another study conducted among 915 employees at offshore platforms showed that individuals who had experienced a personal work-related injury reported more risk perception, a stronger dissatisfaction with safety and also more job stress than those who had not experienced a work-related injury (Rundmo, 1995). Knuth et al. (2014) showed that individuals in different countries reported more perceived risk for hazard events (e.g. fire, earthquakes and floods) when the individuals personally had experienced the risk sources in

question. Hence, the assumption that negative risk experience and perception are related has received both theoretical and empirical support.

Previous work that examined associations between negative risk experiences/exposure and risk evaluations did not focus specifically on the transport domain. To our knowledge there are no studies which have investigated relations between experiences of adverse security events in public transport and transport risk evaluations. Findings from studies of hazards in high risk environments, such as offshore installations, nuclear industry and earthquake prone areas, are not necessarily generalizable to the transport domain. Nuclear and earthquake risks are novel and usually more catastrophic (i.e. influences many people simultanously) than security risks in transport which are more likely to influence a delimited number of individuals, i.e. chronic risk (Rundmo et al., 2011a).

A further limitation in previous work was that the studies solelyfocused on risk perception. Examinations of potential differences in additonal risk evaluations were not integrated into the empirical framework. Two of the most central risk evaluations reported in the literature are transport-related worry (i.e. the level of concern that people experience when thinking about negative events in transport) and demand for risk mitigation (i.e. the demand from the public directed towards the authorities for introducing risk-reducing measures in private motorized and public transport) (Rundmo et al., 2011a). It may be relevant to also include these risk evaluations because worry has been found to have an important role in risk evaluations and may also influence behavioural decisions. This is argued in the risk-as-feelings hypothesis (Loewenstein et al., 2001) which postulated that behaviours deriving from risk situations are partly caused by anticipated worry (i.e. worry deriving post cognition). Worry has also been found to be a strong predictor of other risk evaluations such as demand

for risk mitigation (Rundmo & Nordfjærn, 2013). It is likely that individuals who have recently experienced an adverse security event in public transport may demand more risk mitigating activities in the public transport sector than those who have not been recently exposed. In the current study risk evaluations cover transport risk perception, transport-related worry and demand for risk mitigation in transport.

Risk evaluations are primarily interesting because they may influence behaviour (Rundmo et al., 2011a). This is argued in theories such as the Protection Motivation Theory (Rogers, 1975) and the Health Belief Model (Rosenstock, 1974). Generally, these theories argue that people are risk-aversive such that they tend to avoid stimuli associated with elevated risk. In the transport domain this could imply that people who report the risk in public transport to be high may reduce their intention to use public transport and could seek out alternative private motorized transportation modes (e.g. their own car). Consequently, this study also focuses on the associations between risk evaluations, intentions to use public transport and public transportation mode use. A possibility is that the relevance of risk evaluations is more profound among people who have experienced adverse security issues in public transport due to their rather recent exposure to the hazard. This may cause stronger associations between risk evaluations, intentions to use public transportation and use of such modes among these individuals. Therefore, it is relevant to test differences in the associations between the exposed and non-exposed groups.

The current study will focus on specific security risk evaluations in public transport as well as risk evaluations of injuries in public and private motorized transport. This is because one could assume that injuries may occur when individuals are exposed to negative security events. For instance, an individual may be subjected to violence causing physical injury

during a theft episode. Also, when individuals have experienced a negative security event in public transport it may cause an amplification in other transport risk-domains, reflecting risk amplification attenuation (see Sjöberg et al., 2004). Studies have reported cross-over effects in risk evaluations, for instance that negative experience with one hazard may increase risk perception in other related hazard domains (Knuth et al., 2014). Rundmo (1995) also showed that individuals who have experienced injury in one domain at the work-place, do not solely change their perceptions in one risk domain but generally become less optimistic in terms of their overall work environment.

### 1.1 Aims of the study

The main aim of the current study is to investigate risk evaluations according to whether the individuals had been exposed to adverse security events. In addition, it was tested whether the risk evaluations predict intentions to use public transport and use of such transport (see Figure 1). Previous work has mainly tested the relations between risk evaluations and demand for risk mitigation (e.g. Rundmo & Nordfjærn, 2013). As shown in Figure 1, the present study focused on the direct associations between risk evaluations and intentions to use public transport and use of public transportation modes. The model adjusted for respondents' gender, age and educational level. We also tested whether the structural path coefficients in the heuristic working model differed according to recent exposure to adverse security events in public transport. This was conducted in order to investigate whether risk evaluations were more important for public mode use intentions as well as public transportation mode use among individuals who had been exposed to adverse security events the last five years.

It was hypothesised that individuals who had been exposed to adverse security events would report more risk perception, more worry and stronger demand for risk mitigation in public

transport than those who had not been exposed to such events. It was also hypothesised that a high risk perception and worry regarding private transportation mode use would relate to a strong intention of using public transport. Conversely, we assumed that more risk perception and worry related to the public transportation sector would reduce the intention of using such transport.

Insert Figure 1 about here

# 2. Methods

## 2.1. Sampling

The results are based on a randomly obtained urban population-based sample aged 18 years and above established from the Norwegian population registry. An urban population was chosen because individuals in urban regions are more likely to have different public transportation modes available than those in more remote districts. The respondents were recruited from the six largest urban areas with substantial geographic spread in Norway and completed a survey during June and August 2013. The study received ethical approval from the Norwegian Social Science Data Services (NSD) before data were collected. A total of 6200 individuals received a questionnaire by surface mail and 1043 responded (17%).

The current sample included 579 females (56%) and 463 (44%) males. The mean age was 41.39 years (range = 18-74 years) with a standard deviance of 12.05. A total of 673 individuals (65%) reported a high education reflected by a completed university or college education, whereas 369 (35%) reported a basic education reflected by completed high school or less. The sample was compared with the target population in regard of age and gender. This

comparison showed that the current sample resembled the population characteristics in the six urban areas (see also Nordfjærn et al., 2014). The sample was also rather similar to samples in other Norwegian urban population studies which obtained higher response rates around 50% (e.g. Roche-Cerasi et al., 2013).

In order to group individuals according to whether or not they had been exposed to adverse security events the last five years a no/yes item in the questionnaire was used: 'During the past five years have you been subjected to harassment, bullying or other adverse behavior while you traveled with or was waiting for public transportation?' The measure was delimited to the last five years in order to reduce memory bias and also because the influences of the event were likely to decline over longer temporal periods (see e.g. Loftus, 1993; Maycock et al., 1996). As adverse security events are relatively rare events, a five-year time frame was also considered adequate in order to reduce the probability of Type II error. The 150 (15%) individuals who provided a yes-response to this item were segmented into the group which had experienced adverse security events the least five years, while those who provided a negative response (n = 885, 85%) were entered into the non-exposed group. As shown in Table 1, individuals who belonged to the group that had been exposed to adverse security events the last five years were more likely to be of young age ($t = -6.52$, $p < .001$) and slightly more likely to be female ($\chi^2 = 6.85$, $p < .01$). The exposed group reported more use of public transportation during the last two weeks ($t = 4.76$, $p < .001$). There were no significant differences in educational levels between the exposed and non-exposed groups.

Insert Table 1 approx here

## 2.2. Measures

Transport risk perception was measured by several indicators. Risk perception of security factors in public transport was recorded by four items asking about perceived personal probability of experiencing security issues, such as theft, sexual harassment and bullying, when using public transport. The instrument used a scale from (1) 'very low probability' to (7) 'very probable' (Roche-Cerasi et al., 2013). The instrument has been found to be uni-dimensional in the current sample (Nordfjærn et al., 2014). In addition, we also measured risk perception in terms of overall probability and severity of consequences regarding injury in public transport and private motorized transport. The items connected to probability asked the respondents: 'How probable do you think it is that you will experience an injury when you use the following travel modes: public transport (e.g. metro, tram, bus); private motorized transport (e.g. car, moped/scooter)'. Responses were recorded on a scale ranging from (1) 'very low probability' to (7) 'very probable'. The measure regarding severity of consequences asked: 'If an injury did occur, how serious do you think the consequences would be for yourself by the following travel modes' (public transport; private motorized transport)'. This measure was also scored on a seven-point scale: (1)'no consequences at all' to (7) 'very severe consequences' (see also Moen, 2007; Rundmo et al., 2011b).

In order to measure worry the following item was used: 'How concerned are you about the risk of injuries by the following travel modes' (private motorized transport; public transport). The measure used a scale ranging from (1) 'not at all concerned' to (7) 'very concerned'. We also included a measure of demand for risk mitigation, which was phrased: 'In your opinion, how important is it that the Norwegian authorities introduce measures to reduce the risk when you use the following travel modes:' (private motorized transport; public transport)'. The measure was scored on a scale ranging from (1) 'very low importance' to (7) 'very

important'. This measure has been applied in several previous studies (e.g. Roche-Cerasi et al., 2013; Rundmo et al., 2011a).

An instrument was obtained from Bamberg et al. (2003) to measure intentions to use public transport. This item was phrased: 'My intention to use public transport on daily travels from where I live is': (1) very weak to (5) very strong. We also included a measure of public transportation mode use the last 14 days: 'Think about the last two weeks (the last 14 days). During this period how often have you used public transport (e.g. metro, bus, train, and tram). Please note that one trip fourth and back counts as two times'. This measure was delimited to a temporal period of two weeks in order to reduce memory bias and to obtain more precise estimates.

We also included measures of respondents' gender, age and education (basic = high school or below, high = completed university degree).

2.3. Statistical procedures

Descriptive statistics were used to reveal characteristics of the sample and Pearson's correlation coefficients were estimated to investigate associations between the test indices. Chi-square ($\chi^2$) tests and independent samples t-tests were conducted as appropriate to examine whether exposed and non-exposed individuals differed in gender, age, education and public transportation mode use. A multivariate analysis of covariance (MANCOVA) was carried out to investigate differences in risk evaluations between the two groups, while adjusting for the independent main effects of gender, age, education and public transportation mode use. Cohen's d values were calculated in order to provide effect sizes. Cohen (1977) argued that a d-value around .20 represents a small effect, .50 is a mediocre effect and .80 is a

strong effect. Structural Equation Modelling (SEM) was used to test the path model. The Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI) were used as fit indices. It has been argued that a RMSEA around .05 or below indicates close fit between the data and the model, whereas a RMSEA around .08 or below suggests fair fit. A CFI exceeding .95 reflects good fit of a model (Kim & Bentler, 2006). Finally, to test whether the structural path coefficients in the model differed significantly between the exposed and non-exposed adverse security event groups we carried out a multi-group analysis. In this analysis we compared one model where the path coefficients were set to be equal across the two groups (constrained model) and a model where the path coefficients were set to vary across the groups (unconstrained model). The models were compared with a chi-square difference test. When the constrained model is supported one can argue that the model and coefficients apply across the two groups, whereas when the unconstrained model is supported the model applies to both groups but the path coefficients are substantially different.

# 3. Results

Descriptive statistics and correlations between the test indices are reported in Table 2. The respondents perceived the risk to be higher and reported overall more worry related to the private motorized sector than modes in the public transportation sector. They also tended to demand more risk mitigation within the private motorized transport sector. As expected, the different risk evaluations were positively associated. Risk perception and worry were also associated with the demand for risk mitigation in each of the two transportation sectors. All components of risk perception and worry were related to exposure of adverse security events the last five years. Public transportation mode use was also associated with such exposure. Increased risk perception and worry regarding injuries in the private motorized sector was associated with more public transportation mode use and a stronger intention to use such

transport. Risk perception and worry regarding injury in the public transport sector was not very relevant for intentions to use public transport or reported use of such transport. As expected, intentions and use of public transport were strongly correlated. Older age was related to an overall lower risk perception and worry, whereas males reported less risk perception and worry. There was also a tendency for individuals with high education to report low risk perception and worry, particularly related to the public transportation sector.

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Insert Table 2 about here

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A MANCOVA was carried out to investigate differences in risk evaluations between the exposed and non-exposed groups. The main effect of adverse security event exposure was significant (Wilks' $\lambda = .95$, $F = 5.73$, $p < .001$). All covariates including gender (Wilks' $\lambda = .91$, $F = 11.42$, $p < .001$), age (Wilks' $\lambda = .93$, $F = 8.71$, $p < .001$), education (Wilks' $\lambda = .97$, $F = 3.76$, $p < .001$) and public transportation mode use (Wilks' $\lambda = .96$, $F = 4.97$, $p < .001$) had unique significant main effects. As displayed in Table 3, those who had been exposed to adverse security events the last five years perceived significantly more risk of security issues in public transport than those who were not exposed ($F = 43.53$, $p < .001$, $\underline{d} = .70$). These individuals also reported stronger probability of experiencing injury in public transport ($F = 14.50$, $p < .001$, $\underline{d} = .42$) and somewhat higher probability of injury in private motorized transport ($F = 6.21$, $p < .05$) than those who had not been exposed. Individuals who had been exposed also reported more risk perception in regard of severity of consequences of injuries in public transport ($F = 4.69$, $p < .05$, $\underline{d} = .26$). Worry regarding injuries in public transport was also found to be stronger among individuals who had been exposed to a negative security event ($F = 8.23$, $p < .005$, $\underline{d} = .35$).

Insert Table 3 about here

The final step was to test the path model using the risk evaluations to predict intentions to use public transportation mode use as well as use of such modes. The model (Figure 2) was found to have acceptable fit to the data ($\chi^2 = 75.57$, df = 13, $p < .001$, RMSEA = .068, CFI = .99). The risk evaluations explained a relatively low proportion of the variance in intentions to use public transport (9%) and the model explained about 31% of the variance in public transportation mode use. Worry regarding injuries in the private motorized transport sector was significantly associated with a strong intention to use public transport ($\beta = .18$, $p < .001$). High probability judgements of injuries in public transport were related to a reduced intention to use public transport ($\beta = -.10$, $p < .01$). Demand for risk mitigation in public transport was associated with a strong intention to use public transport ($\beta = .18$, $p < .001$), whereas this relation was rather weak for risk mitigating demands in private motorized transport ($\beta = -.09$, n.s.). Exposure to adverse security events at public transportation mode use was slightly related to an increased intention to use public transport ($\beta = .08$, $p < .05$). Intention to use public transport was a substantial predictor of public transportation mode use ($\beta = .56$, $p < .001$).

A multi-group analysis was also conducted to test whether the path coefficients differed among individuals who had been exposed to adverse security issues in public transport the last five years and those who had not experienced such events in this period. The analysis supported the assumption that the coefficients were similar across the two groups ($\chi^2$ difference = 26.25, df = 13, n.s.).

Insert Figure 2 about here

# 4. Discussion

The current study has shown that individuals who had been exposed to adverse security events in public transport the last five years perceive more risk of such events than those who had not been exposed. Individuals who had been exposed to adverse security events also reported higher probability and more worry of experiencing a personal injury in public transport than those who had not been exposed. A path model aimed to predict intentions to use public transportation modes and use of such modes was not found to differ significantly across exposed and non-exposed groups. Within the model, high probability judgements of experiencing injury in public transport were associated with a reduced intention of using such transport. Worry of injury in the private motorized sector predicted a strong intention to use public transport. Demand for risk mitigation in public transport was positively associated with use of public transportation modes. Intentions to use public transport was associated with use of such transport, as could be expected.

The current findings expand previous research (e.g. Barnett & Breakwell, 2001; Knuth et al., 2014; Milman et al.,1999; Rundmo, 1995) and show associations between individual negative risk experience and risk perception in the transport domain. This is not in accordance with the psychometric paradigm, which argued that risk perception is merely a consequence of hazard characteristics. In addition, the results suggest that negative transport risk experiences also relate to additional risk evaluations of importance, such as worry regarding injury in public transport. Meanwhile, people who had been exposed to an adverse security event seemed to continue to use public transport as there was a slight positive association between exposure and public transportation mode use. It is important that authorities seriously consider the detected differences in risk perception, because elevated risk of security and injury in public

transport coupled with strong worry regarding injury may be instrumental in a future mode shift.

Individuals who had been exposed to adverse security events in public transportation also reported the probability of experiencing injury in public transport to be high and also more worry related to injury in this transport sector than individuals who had not been exposed. Adverse security events may be experienced as physically threatening and may also in some cases cause physical injury to an individual. It may be that this finding manifests a cross-over effect where individuals who are exposed to an adverse event in a specific sector become more pessimistic also in regard of other safety and security aspects within the sector, i.e. risk amplification attenuation (see also Knuth et al., 2014; Rundmo, 1995; Sjöberg et al., 2004).

An alternative explanation, however, is that demographic composition within the exposed and non-exposed groups influenced the results. There were more females and young individuals in the exposed group, and these factors were found to be associated with the dependent risk evaluation variables. While this explanation cannot be entirely excluded, differences in gender composition in the two groups were not very strong and also the standard deviance in age was relatively high in the exposed group. This reflects a substantial variation both in age and gender in both groups. Also, exposure to adverse security events reached significance related to the risk evaluations while we accounted for the unique main effects of age and gender in multivariate analysis.

A rather robust finding in risk research is that young individuals tend to report less risk than older individuals (Deery, 1999; Jonah, 1986). The present findings challenge this assumption as we found an overall association between young age and elevated transport-related risk

perception and worry. This may partly be explained by exposure to public transportation as there was a slight, but significant, relation between older age and less use of public transportation as well as a lower intention to use such modes. Countermeasures may benefit by focusing on young individuals and females as these demographic groups seem to be more likely to experience adverse security events in public transport and also to perceive the risk of experiencing such events as high. On a more general level, efforts aimed to promote public transportation mode use should be targeted to older individuals.

We did not find support for the assumption that risk evaluations were more relevant for mode use in the exposed group. The model and strength of path coefficients did not significantly differ across the two groups. Overall, the risk constructs were not very strongly associated with public mode use and they explained a relatively meager proportion of the variance in intentions to use public transport. Worry regarding injury in private motorized transport was found to be the strongest predictor of increased intentions to use public transport. The stronger relation between worry in regards of the private motorized sector and intentions to use public transport could be that the majority living in urban areas have an option to use public transport, whereas switching to car use requires certain conditions (e.g. owning a car, having a driver's license). Thereby, many people who worry about negative incidents in public transport have to continue to use this type of transport in order to maintain their mobility, whereas those who worry when using private motorized transport may consider the alternatives.

On the other hand, increased probability judgements of injury in public transport were associated with a reduced intention to use public transport. This implies that risk communication aimed to promote public transportation mode use should focus on both the

public and private motorized transport sectors. The risk of experiencing injury is relatively high in the latter sector and it may be relevant to also focus on this aspect rather than merely focusing on safety and security in the public sector when communicating risk. The two transport sectors in question should be considered as interrelated and risk communication within one sector may influence individual behaviour in the other sector. It is also theoretically interesting that the perceived severity of consequences were found to be rather unimportant for public mode use. This is in line with a recent population-based transport study conducted in Norway (Rundmo et al., 2011a) and opposes the assumption that severity of consequences is more important than probability judgements in relation to decisions and behaviour promoted by risk perception (e.g. Sjöberg, 1999).

In regards of demand for risk mitigation people seem to focus on mitigation within the transport domain they use the most. The current results showed that solely demand for risk mitigation in the public sector was associated with intentions to use public transport. The authorities may have a more important role in the public transport sector where the individual experiences a low perceived control compared to, for instance, when driving. The private motorized sector (e.g. car) is more self-paced and the individual is more capable of regulating the desired level of risk than in public transport. Consequently, external demands of risk-reduction may not be that relevant in the private motorized sector because the individual may adjust the behaviour in line with the experienced levels of risk. In the public transport sector the individual has little or no control and therefore considers external authorities to have more responsibility for safety and security. This may yield transport risk-mitigating efforts from the authorities more important for individual use intentions within the public transport sector. The demand for risk mitigation was found to be associated with risk perception and worry in the current study, and these demands could be facilitated by these risk evaluations. This

assumption has also received support in previous empirical studies (e.g. Rundmo & Nordfjærn, 2013).

On a more general level, the present sample reported a relatively high prevalence of adverse security events experienced the last five years (15%). This equals to an average of 30 adverse security events on a yearly basis in the sample. It is therefore important that the authorities continue to improve and invest in the security within the Norwegian public transport sector, by, for instance, installing more light at stations and by deploying more visible security personnel. Other promising prevention efforts could be information which stresses that individuals should not take seating alone in the back of metro wagons, and oral information about areas known to be prone to pick pocketing as well as reminders to look after valuables when travelling.

### 4.1. Limitations of the study

The study is cross-sectional which does not allow for causal inferences. As such, we cannot conclude that exposure to adverse security events caused the differences in risk perception and worry. We do not have any information about risk evaluations before the adverse security events took place, and the individuals may have perceived strong risk in public transport also before the events occurred. However, this interpretation was somewhat reduced by adjusting for demographic characteristics which may be associated with the risk evaluations. It could also be that the differences between the groups are somewhat underestimated as there may be individuals in the non-exposed group that have experienced adverse security events outside the five-year time window used in the current study. However, the influences of such events are reduced over long periods of time (Loftus, 1993) and we do not believe that this had a substantial impact on the results. The current study underlines the need for further

longitudinal population-based studies designed to investigate changes in risk perception, worry, demand for risk mitigation and public transportation mode use before and after exposure to adverse security events in the public sector. Such studies should be conducted over a substantial time period in large samples, as these events are relatively rare occurrences. Finally, the associations between reported behavioural intentions and behaviour may be somewhat tautological, and the causal bindings between these variables remain unclear. However, the suggested relation between these two constructs has both strong empirical (e.g.Bamberg et al., 2003; Donald et al., 2014) and theoretical traditions (Ajzen, 1991).

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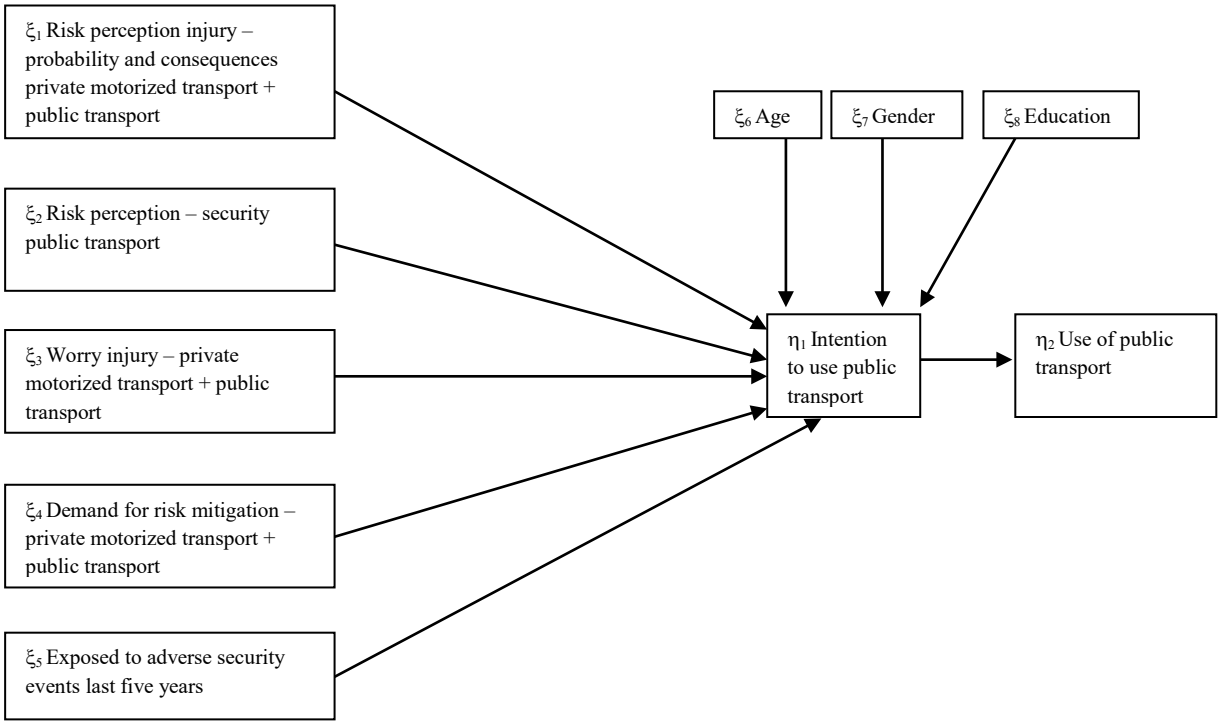
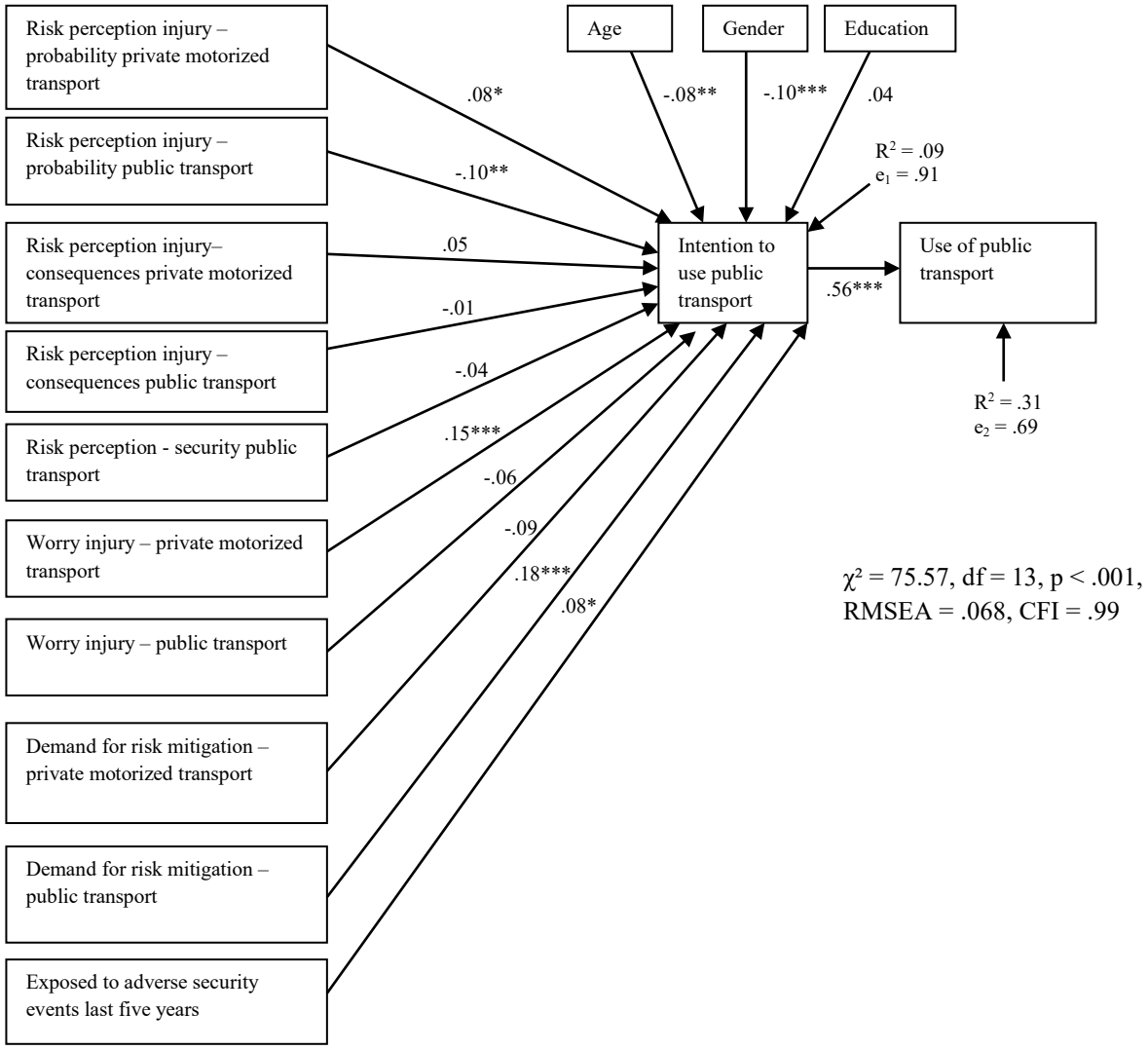



Figure 1. Heuristic working model of the study




Model was specified to adjust for all co-variances between predictors

Standardized path coefficients

*** p < .001, ** p < .01, * p < .05

Figure 2. Predictors of public transportation mode use

Table 1. Distribution of demographic characteristics in the exposed and non-exposed groups

| Indicator | Experienced adverse security events the last five years<br><br>Count/M (SD) | Exp count | Not experienced adverse security events the last five years<br><br>Count/M (SD) | Exp count | $\chi^2$/t-value |
|---|---|---|---|---|---|
| Age | 35.57 (13.14) | | 42.39 (11.58) | | -6.52*** |
| Use of public transport the last two weeks | 9.91 (9.82) | | 6.05 (9.02) | | 4.76*** |
| **Gender** | | | | | |
| Males | 52 | 67 | 408 | 393 | 6.85** |
| Females | 98 | 83 | 476 | 491 | |
| **Education** | | | | | |
| Basic | 57 | 53 | 308 | 312 | .56 |
| High | 93 | 97 | 576 | 572 | |

*** = $p < .001$, ** $p < .01$

Table 2. Means and correlations of adverse security risk exposure, risk evaluations, demographics and public transportation mode use

| Indicator | M (SD) /% | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Risk perception security public transport | 2.94 (1.08) | - | **.51** | **.40** | **.37** | **.30** | **.49** | **.38** | **.28** | **.25** | **.24** | **.09** | **-.19** | **-.14** | -.05 | .05 |
| 2. Risk perception probability injury – public transport | 2.34 (1.40) | | - | **.47** | **.41** | **.21** | **.51** | **.26** | **.20** | **.13** | **.16** | .08 | -.07 | **-.17** | **-.11** | -.02 |
| 3. Risk perception probability injury – private motorized transport | 3.25 (1.46) | | | - | **.24** | **.38** | **.30** | **.49** | **.19** | **.23** | **.12** | **.15** | **-.16** | -.08 | -.03 | **.13** |
| 4. Risk perception consequences injury – public transport | 3.85 (1.56) | | | | - | **.51** | **.46** | **.24** | **.29** | **.19** | **.09** | **.09** | **-.08** | **-.12** | **-.09** | .04 |
| 5. Risk perception consequences injury – private motorized transport | 4.76 (1.37) | | | | | - | **.27** | **.45** | **.23** | **.27** | **.10** | **.16** | **-.19** | **-.13** | -.01 | **.15** |
| 6. Worry injury– public transport | 2.37 (1.64) | | | | | | - | **.66** | **.32** | **.21** | **.12** | **.09** | **-.10** | **-.15** | **-.14** | .07 |
| 7. Worry injury – private motorized transport | 3.16 (1.79) | | | | | | | - | **.29** | **.30** | **.10** | **.16** | **-.19** | **-.15** | **-.09** | **.19** |
| 8. Demand for risk mitigation – public transport | 4.97 (1.90) | | | | | | | | - | **.64** | -.02 | .06 | **-.23** | **.10** | **-.11** | **.14** |
| 9. Demand for risk mitigation – private transport | 5.36 (1.70) | | | | | | | | | - | .00 | .01 | **-.22** | .06 | -.07 | **.10** |
| 10. Exposure to adverse security events last five years (ref. no) | 86% no | | | | | | | | | | - | **.15** | **-.09** | **-.20** | -.02 | **.10** |
| 11. Transportation mode use the last two weeks | 6.61 (9.29) | | | | | | | | | | | - | **-.08** | **-.22** | -.01 | **.56** |

| | | | | | |
|---|---|---|---|---|---|
| 12. Gender (ref. female) | 56% females | - | .01 | -.03 | **-.16** |
| 13. Age | 41.39 (12.05) | | - | .06 | **-.08** |
| 14. Education (ref. basic) | 35% basic | | | - | .03 |
| 15. Intention to use public transport | 3.08 (1.25) | | | | - |

Significant ($p < .001$) correlations in bold

High scores reflect strong risk evaluations, strong intentions and more use of public transportation modes

Table 3. Differences in risk evaluations between exposed and non-exposed individuals

| Dimension | Experienced adverse security events the last five years (n = 149) | Not experienced adverse security events the last five years (n = 862) | *F*-value | *d*-value |
|---|---|---|---|---|
| | M (SD) | M (SD) | | |
| Risk perception security public transport | 3.56 (1.05) | 2.83 (1.05) | 43.53*** | .70 |
| Risk perception probability of injury – public transport | 2.87 (1.64) | 2.25 (1.32) | 14.50*** | .42 |
| Risk perception probability of injury – private motorized transport | 3.64 (1.42) | 3.18 (1.44) | 6.21* | .32 |
| Risk perception consequences of injury - public transport | 4.21 (1.65) | 3.79 (1.52) | 4.69* | .26 |
| Risk perception consequences of injury– private motorized transport | 5.11 (1.26) | 4.70 (1.37) | 3.68 | .31 |
| Worry injury – public transport | 2.87 (1.81) | 2.28 (1.59) | 8.43** | .35 |
| Worry injury – private motorized transport | 3.59 (1.84) | 3.08 (1.77) | 3.51 | .28 |
| Demand for risk mitigation – public transport | 4.90 (1.85) | 4.97 (1.91) | .18 | -.04 |
| Demand for risk mitigation – private motorized transport | 5.38 (1.55) | 5.36 (1.72) | .01 | .01 |

*** p < .001, ** p < .005, * p < .05

Wilks' $\lambda = .95$ $F = 5.73$, $p < .001$

High scores reflect stronger risk perception, worry and demand for risk mitigation

Gender, age, educational level and public transportation mode use included as covariates