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Abstract

This study investigated the psychometric risk perception between lay people and security practitioners towards terrorist attack against Singaporean educational institutions. Being located in Southeast Asia, Singapore is not immune to terrorist attacks from rebels found in the region. To promote fear and chaos, terrorists have begun to attack private and neutral institutions in order to promote their cause. Mosques, hospitals and other such institutions are no longer immune from terrorist attacks. The psychometric risk paradigm offers a basis for examining empirical views towards potential terrorist attack against such institutions. Survey data in comparing terrorist attack against Singapore's educational institutions with five other criminal activities were collected from two cohorts of 100 college students (considered as lay people) and 100 security practitioners. The study demonstrated that the students had a higher risk perception when compared to the security practitioners that terrorist attack against educational institutions in Singapore could occur, resulting in increased levels of dread and reduced feelings of control. Findings from the study supported previous studies that, in particular, there are differences between lay and practitioners views of risk, with practitioners' generally rating risk lower than lay people.

Keywords
Security, risk perception, psychometric, terrorist, educational institutions

INTRODUCTION

The terrorist attacks on the World Trade Centre Twin Towers in New York on the 11th September, 2001, indicates that today terrorists' strategies, motivations, objectives, modus operandi and targeting have radically changed. In particular, the pervasive use of suicide bombings against innocent civilians, in advancing their multifaceted cause. Soft sites appear to be targets of attacks, as seen in recent years educational institutions are not spared from these attacks. From day-care centres to universities, all have the potential to be targeted by terrorist (Dorn & Dorn, 2006, p. 31).

In order for policy makers to apply appropriate security mitigation strategies, understanding risk perception is important. Everyone in their daily lives is exposed to risk and how people perceive risk, results to some degree in their decisions-making. People are generally less acceptable of risk if it is imposed by external factors over which they have no control. Several studies (Siegrist, Cvetkovich & Roth, 2000; Siegrist, 2000) have shown that understanding of people's perceptions of risk is important in order to make sound policy decisions.

The study analysed the understanding of the public's risk perception on terrorist attack against educational institutions located in Singapore, with the use of the psychometric risk as the theoretical framework. The study observed whether risk perception differed between the two selected cohorts, defined as lay people and security practitioners. Such information may assist government, security industry and academia to better understand the risk perception of their citizens, resulting in more suitable communication to the public.

In the study, the following Research Questions were considered:

1. What are the risk perceptions of Singaporeans regarding terrorist attack against educational institution?
2. Are there any significant differences in risk perceptions between the students and security personnel?

PERCEPTION OF TERRORISM

There have been a number of international surveys involving perceptions of terrorism risk. Burns (2007) presented eight US studies relevant to the threat of terrorism. One of these asked respondents how likely and serious certain types of terrorist attacks may appear, for example airline hijacking, attack on public transportation, deliberate contamination of the food supply and release of a chemical or biological agent. The findings revealed that the respondents have substantial concerns about future terrorist attacks and that they would be willing to support policies that commit considerable resources to prevent future attack.

Holmberg and Weibull (2002) surveyed the Swedish population, finding that terrorism was the third most worrying threat. Another Swedish study by Bennulf (cited in Sjöberg, 2004) asked about *worry* and found terrorism ranked third. In that study, all the threats and hazards were concerned with violence and various life-threatening hazards, with no economic risks or other social risks mentioned. Nevertheless, Sjöberg (2004) found that in a study by Stutz (2002) demonstrated that the high level of perceived threat from terrorism among the Swedish public a year earlier had faded.

On 7th May 2009, the Singapore *Today* newspaper (Yeo, 2009) published a poll of 100 Singaporeans on "how concerned are you that a terrorist attack ... will happen in Singapore." The Poll revealed that 52% expressed extreme concern or concern, while 33% expressed unconcerned or were extremely unconcerned that a terrorist attack will happen in Singapore. Such results appeared to indicate that Singaporeans were aware that they could be exposed to a terrorist attack. In the same news article it was highlighted that although Singaporeans had not experienced any major incidents, they were aware of the security threats around them due to the awareness instilled in them by Government (Yeo, 2009). It is important to note that terrorism's future orientation highlights the importance of understanding how people respond to threats, as well as to actual incidents. The psychological study of risk provides insight into how people may react to the threat of terrorism (Jenkin, 2006).

PSYCHOMETRIC RISK

Psychometric theory of risk is a quantitative methodology of the study of human behaviour (Brooks, 2003, p. 20). It was Slovic (1992) who developed a method, which was termed the *psychometric paradigm* to study the risk perception of risk to certain activities and technologies. The origin of the psychometric paradigm is the expressed preferences approach developed by Starr (1969), which was developed as a method of weighting technological risks against benefits.

Fischhoff, Slovic, Lichtenstein, Read and Combs (1978) proposed a psychometric model of risk perception that initiated the psychometric risk paradigm. The authors compiled nine dimensions and asked people to rate the risk of 30 activities on each of the two dimensions. The nine dimensions were (1) voluntariness, (2) immediacy, (3) know to exposed, (4) known to science, (5) controllability, (6) newness, (7) chronic, (8) common/dread, and (9) severity of consequences. This psychometric research approach "has been used to study a broad range of hazards, including technological risks, activities, and food hazards" (Siegrist, Keller, Kastenholz, Frey & Wiek, 2007, p. 60).

As explained by Brooks (2003, p. 40), the construct of risk perception may be measured by two risk factors, being the *sense of dread* and the *sense of familiarity*. The measure of each factor defined the perceived level of perceived risk towards certain activities or technologies (Figure 1).

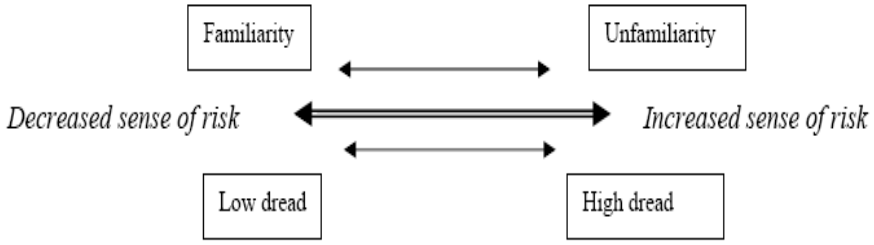

Figure 1 Psychometric risk perception factor model
(Brooks, 2003, p. 40)

Through factor analysis, the two factors *familiarity of risk* and *dread risk* presented the underlying pattern of inter-correlations among the judged variables (Figure 2). Such studies (Slovic & Webb, 2002) exhibited the two factor analytical representation of 81 different activities and technologies, with factor one axis being defined as low dread risk to high dread risk while factor two axes being defined as unfamiliar risk to familiar risk.

Figure 2 Psychometric paradigm: spatial locality of 81 hazards
(Revised from Slovic & Weber, 2002, p. 11)

The two risk factors can be further expanded into the 18 characteristics of risk; however, for the purpose of this study, only nine of the 18 risk characteristics were tested (Table 1).

Factor 2 – Dread risk		Factor 2 – Familiar risk	
Low dread	Dread	Familiar	Unfamiliar
Controllable	Uncontrollable	Know to those exposed	Unknown to those exposed
Increasing	Decreasing	Old risk	New risk
Individual	Catastrophic	Effect immediate	Effect delay
Voluntary	Involuntary		

Table 1 The study's nine measured characteristics
(Revised from Slovic, Fischhoff & Lichtenstein, 2000, p. 142)

Although psychometric risk has been successfully applied to single hazards, Slovic (1987) cautioned against representing complex events as a single homogenous data point. While terrorism has been considered as a single hazard in previous psychometric studies, the complexity and relevance of terrorism in today's society merits an empirical exploration of terrorism (Jenkin, 2006).

Layman and expert differences

Psychometric studies have shown that "perceived risk is quantifiable and predictable" and the "psychometric techniques seem well suited for identifying similarities and differences among groups with regard to perception and attitudes" (Slovic, 2000, p. 223). Therefore, the concept of risk is subjective and means different things to different people. One of the most significant findings within the psychometric paradigm is how lay people and experts distinguish between perceived and actual risk. "There is a mismatch in perception between the layperson and the industry expert" (Brooks,

2003, p. 21). *Experts* — and, consequently the policymakers who ask for expert advice — based their risk ratings on the expected number of fatalities. *Lay people*, in contrast, have a richer definition of risk (Marris, Langford, Saunderson & O'Riordan, 1997, p. 303) and consider a heuristic approach.

"The way people perceive risk, or risk perception, can be characterized as a battleground of strong and conflicting views" (Slovic, 1992, p. 54). As a result, conflicts may occur over the different definitions of risk concepts held by lay people and experts. Slovic (cited in Jenkin, 2006) explained such a discrepancy by concluding that experts view risk as the likelihood of actual harm based on mortality estimates, whereas lay perceptions of risk are based on a number of qualitative (and subjective) characteristics (p. 2).

STUDY DESIGN

A convenience sampling of students (n=100) and security practitioners (n=100) participated in the survey, which comprised of two parts. In the first part, the participants were asked to provide some demographic information, such as age, gender and occupation. In the second part, the nine risk perception characteristics (Table 1) were developed into questions and the participants asked to indicate their risk perceptions, based on the seven-point semantic differential scale (Figure 3). Five criminal activities, namely murder, kidnapping, armed robbery, rioting and burglary, together with *terrorist attack* against an educational institution were listed. Participants were asked to indicate their level of risk perception by marking the scale position.

Criminal Activity 1 - Murder								
Low Dread	1	2	3	4	5	6	7	High Dread
Criminal Activity 2 - Kidnapping								
Low Dread	1	2	3	4	5	6	7	High Dread
Criminal Activity 3 - Armed Robbery								
Low Dread	1	2	3	4	5	6	7	High Dread
Criminal Activity 4 - Rioting								
Low Dread	1	2	3	4	5	6	7	High Dread
Criminal Activity 5 - Burglary (house breaking)								
Low Dread	1	2	3	4	5	6	7	High Dread
Criminal Activity 6 - Terrorist attack against educational institution								
Low Dread	1	2	3	4	5	6	7	High Dread

Figure 3 Survey questionnaire using the risk characteristics

Target population

For this study, the study considered lay people and security practitioners who lived in Singapore and were ≥16 years old at the time of the survey. The sample population of lay people (n=100) were junior college students. Junior college students are post secondary students mainly in the age group of 18 to 19 years old preparing for the GCE 'A' levels examinations after two years of pre-university studies. The sample for security practitioners (n=100) consisted of full time qualified security personnel from local security agencies. Security personnel were chosen, as they have some cognisance and training in the area of terrorism and criminal activities. A particular security agency was selected for data collection, as all security personnel in Singapore have to undergo the Singapore Workforce Skills Qualification in security and thus there is some confidence that the sample accurately represented the security population.

DATA ANALYSIS

Data were analysed using the Statistical Package for the Social Sciences (SPSS) package. Descriptive statistics were generated to provide a risk profile for each of the sample cohorts, with independent t-test conducted to determine significance of the various risk perceptions.

Risk characteristics

The mean (M) and standard deviation (SD) for each of the risk characteristics were calculated (Table 2) by averaging all respondents (N=200) for the six criminal activities.

Characteristic	Murder		Kidnapping		Armed Robbery		Rioting		Burglary		Terrorist Attack	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dread	5.19	1.69	4.92	1.77	4.65	1.51	4.19	1.65	4.32	1.59	5.33	1.82
Control	4.63	1.86	4.16	1.77	3.93	1.73	3.71	1.78	3.17	1.75	4.77	1.78
Decrease of risk	4.30	1.49	3.62	1.48	4.20	1.42	3.62	1.64	4.24	1.42	4.20	1.81
Catastrophic	2.84	1.87	2.81	1.77	3.20	1.77	5.06	1.63	2.87	1.48	6.09	1.43

Voluntary	3.92	2.08	3.67	2.03	3.50	1.94	3.34	1.84	3.20	1.79	3.16	2.01
Risk knowledge	3.04	1.80	3.21	1.61	3.00	1.57	3.21	1.77	2.95	1.57	3.45	1.81
Severity conseq	5.51	1.65	4.71	1.58	4.34	1.56	4.31	1.63	3.56	1.65	5.70	1.56
Oldness/newness	2.54	1.88	2.80	1.83	2.58	1.59	3.04	1.83	2.49	1.46	5.28	1.80
Impact	2.63	1.63	3.28	1.82	2.70	1.51	3.27	1.77	3.24	1.67	2.56	2.00
Perceived risk	5.43	1.63	5.23	1.58	5.11	1.47	4.59	1.75	4.48	1.66	5.21	1.68

Table 2 Mean and standard deviation of the risk characteristics for each activity

These results (Table 2) revealed that the respondents perceived that a terrorist attack against an educational institution would make them experience the greatest amount of dread (M=5.33) when compared to the other activities. Rioting, however, would lead to the least amount of dread (M=4.19). As for the control over risk, the respondents indicated that during a terrorist attack, they would not be able to avoid death or injuries (M=4.77). Burglary (M = 3.17), on the other hand, were comparatively more controllable.

The respondents felt that the risk of all six criminal activities were in the neutral range (3.62 <M<4.30); however, a terrorist attack (M=6.09) was found to be catastrophic. Terrorist attack (M=5.70) and murder (M=5.51) were considered as having very severe consequence, while burglary (M=3.56) was seen as having the least consequence. Murder, kidnapping, armed robbery, rioting and burglary were considered old types of risk (2.49<M<3.04), while terrorist attack against an educational institution was considered a newer type of risk (M=5.28).

Two-dimensional spatial factor representation

A two-factor space *dread* and *familiarity* graph for the two participating cohorts (Figure 4) was plotted by averaging the means of the risk characteristics. Factor 1 dread are risks which are increasingly judged to be less controllable, increasing, more catastrophic and more involuntarily as you move from left to right of the graph. Factor 2 familiarity risks judged to be known, an old risk and having immediate effect.

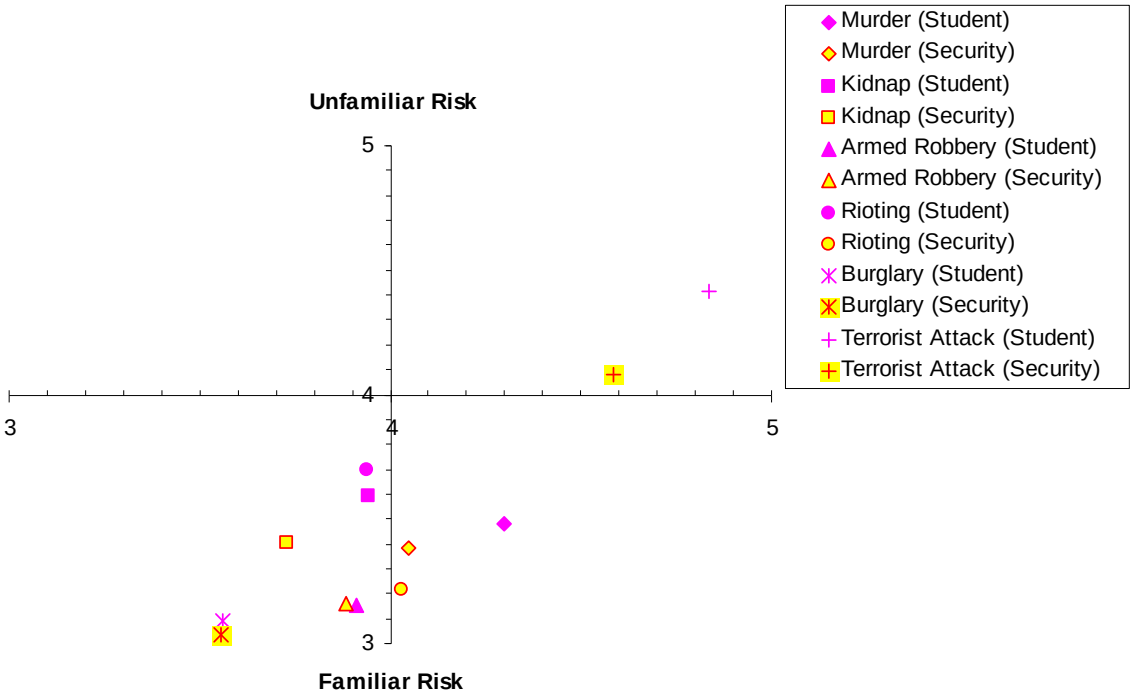

Figure 4 Risk perception map for student and security personnel

Both cohorts indicated similar spatial results, with the students showing slightly higher unfamiliarity of risk and higher dread risk for each of the activities than the security personnel. Nevertheless for terrorism, students indicated a significant higher dread and greater unfamiliarity to risk when compared to the security practitioners. For example, students had a significantly higher mean control over risk score (M=4.45) than the security personnel (M=3.67; $t(198)=4.226$, $p=.000$) and a significantly higher mean severity of consequences score (M= 4.93) than the security

personnel (*M*=4.45; *t*(198)=2.844, *p*=.005). On the other hand, the students had a significantly lower mean of risk score (M=3.81) than the security personnel (*M*=4.25; *t*(198)=-2.773, *p*=.006).

The findings (Table 3) indicated that the students had significantly higher mean scores than the security personnel in all activities. The student score for Murder (M=4.12) was higher than the security personnel (*M*=3.88; *t*(198)=2.374, *p*=.019). Students also had a significantly higher mean kidnapping score (M=3.96) than the group of security personnel (*M*=3.73; *t*(198)=2.044, *p*=.042). As for the terrorist attack, the students had a significantly higher mean terrorist attack score (M=4.70) than the security personnel (*M*=4.45; *t*(198)=2.725, *p*=.007).

Activity	Student (N = 100)		Security practitioner (N = 100)	
	Mean	SD	Mean	SD
Murder	4.12	.57	3.88	.83
Kidnapping	3.96	.70	3.73	.88
Armed robbery	3.77	.59	3.67	.77
Rioting	3.90	.75	3.76	.66
Burglary (house breaking)	3.46	.69	3.45	.67
Terrorist attack	4.70	.57	4.45	.73

Table 3 Activity ratings across cohorts

The alpha coefficient for the 10 risk characteristics (Table 4) were moderate (0.695 to 0.886). According to Cohen, et al. (2007, p. 506), these values indicated that the questionnaire was reliable and within the context of the study, for measuring the risk characteristics and the overall perceived risk.

Risk Characteristic	Alpha
Dread	0.886
Control over risk	0.855
Decrease vs. increase of risk	0.818
Individual vs. catastrophic	0.695
Voluntary vs. involuntary	0.897
Knowledge about risk	0.897
Severity of consequences	0.834
Old vs. new risk	0.812
Impact of risk	0.818
Perceived risk	0.822

Table 4 Internal coefficient Alpha for risk characteristics (n=200)

THE PSYCHOMETRIC RISK MEASURE OF TERRORISM

The investigation describes the risk perceptions of lay people (student) and security practitioners (security personnel working in the security fraternity) regarding terrorist attack against Singaporean educational institutions. This measure was achieved by comparing the perceived risk of a terrorist attack against five other criminal activities, namely murder, kidnapping, armed robbery, rioting and burglary (house breaking).

Risk perception of terrorist attack against educational institution

The first Research Question was designed to determine the risk perceptions of Singaporeans regarding terrorist attack against educational institution. The findings of this study suggested that risk was perceived differently among the six selected criminal activities. Therefore the participants perceived each criminal activity differently, perhaps as expected that some criminal activities were perceived as riskier than others.

In the two-dimensional spatial factor representation (Figure 4), two factors labelled as factor 1 dread risk and factor 2 familiar risk were used to describe the perceptions of the whole sample regarding a terrorist attack against educational institution against the other five criminal activities. For terrorist attacks dread risk was measured as *high*, resulting in a perceived dread, lack of control, more catastrophic outcome and that exposure to such attacks mat perceived as involuntarily. In addition, the perceived risk of terror attacks in the factor unfamiliar risk was measured as *high*, judged to be an unfamiliar risk, unknown and a new risk, and that any effect may be delayed. Terrorist attack against an educational institution was the only activity that scored higher than the neutral rating. It can thus be interpreted that Singaporeans judged the risk of a terrorist attack against educational institution as a high dread risk and an unfamiliar risk.

Differences in the risk perception of terrorist attacks

The second Research Question was designed to determine whether there were any significant differences in the risk perceptions between student (laypeople) and security personnel. Based on the findings (see Table 3), the study concluded that risk perceptions differed significantly across students and security personnel in the area of risk control, knowledge about the risk and the severity of risk consequences. However, risk perceptions did not differ significantly across the two occupations for the dread or voluntariness of risk and whether the risk was old or new risk.

The study was able to conclude that the student perceived that the risk of a terrorist attack against an educational institution was greater than that felt by the security personnel. This result concludes that the practitioners, in general, rate risk lower than lay people, a view supported by past studies (Krause, Malmfors & Slovic, 1992; Barke & Jenkins-Smith, 1993; Slovic, Malmfors, Krewski, Mertz, Neil & Bartlett, 1995; Lazo, Kinnell & Fisher, 2000; Gutteling & Kuttschreuter, 2002). As Breakwell (2007, p. 71) concludes, there are substantial differences between lay and expert views of risk, with experts generally rating risks lower.

The key result in this study indicated that although terrorist attacks against educational institution fall in the high dread and unfamiliar risk quadrant, the mean score remained fairly close to the neutral point. This suggests that Singaporeans perceived a fairly neutral sense of riskiness and concern that an attack by terrorist on educational institution could occur. Such mentality could be due to the perception that Singapore is a relatively safe and orderly country, with low crime rates when compared to the other neighbouring countries. Singapore has also been spared from the direct experiences of terrorism that neighbouring countries like Indonesia and Philippines have had. In addition, that the Singapore Government is perceived to be highly regarded as efficient and capable with various law enforcement agencies having high trust level from the members of the public in preventing such incidents.

CONCLUSION

The study has demonstrated that the perception of a terrorist attack in Singapore is *high*, when compared against the other measured risks. It is therefore pertinent to derive an effective risk communication strategy, devoting resources in engaging the public in risk dialogue so that they are more aware of such risks. Government agencies dealing with security risk management must know that they cannot properly reduce risk without first understanding how risk may be perceived. For the terrorists, mass killings and damage to property are only one-part of a larger plan to intimidate and paralyse the populace. Although each terrorist attack instils fear and intimidation, terrorists achieve some of their goals of psychological impact through the threat of future attacks, rather than solely through attacks that have already occurred. Although there has not been any terrorist attack against Singaporean educational institutions, it is still important to understand how people perceived the threat of terrorism, so that policy-makers are better able to develop national multi-layered defences against such risk.

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