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Contents

Articles

Water Critical Infrastructure Security and Its Dependencies

by David Michael Birkett

Abstract

Water critical infrastructure (CI) is considered one of the most important CI on a global basis. Indeed, the average person is only able to survive for 3 days without water. Water CI has been consistently targeted across history since 3000 BC, with a significant increase in those attacks documented in the early 2010s. The aim of this paper is to review security and dependencies of water CI in relation to adverse human intervention. In particular, the paper analyses water as a 'soft' target, and provides an insight into terrorist attack planning and perceived threat levels. It is concluded that the lack of clear understanding of dependencies and interdependencies can lead to an increase of water CI vulnerability, which could, in case of external attack, result in a sudden and protracted cascading failure. Development of future partnerships and linkages across the supply chains could increase awareness of potential failures, which may assist in a reduction of any future potential impacts. Finally, water CI is recognised as a terrorist target. Hardening water CI protection is necessary, and is required to be regularly assessed and hardened against external adverse human intervention, such as terrorism, in order to inhibit its future selection as a target of a terrorist attack.

Keywords: *Water critical infrastructure; security; terrorist attack; dependency; water contamination*

1 Introduction

Water and wastewater critical infrastructure (CI) (further referred to only as water CI) is considered essential for contemporary social human existence (Cohen, 2010, Lee, 2009b). Water CI, with the technology required to run and operate on a daily basis, is considered to be amongst the most critical of CIs. The importance and criticality of water CI is validated, as it is generally agreed that water is (just after air) the most precious commodity for humankind to survive (Cohen, 2010, Lee, 2009b). Cohen and Lee confirm that the average person is only able to survive three days without the intake of water to maintain the human body systems health and functionality. Moreover, modern society relies heavily on the unseen operation of the removal and disposal of human waste through the wastewater systems as a form of essential CI that ensures the separation of treated drinking water and faecal contamination from human waste. This separation reduces the potential for community outbreaks of waterborne diseases, as occurred in the cholera outbreak in London prior to 1857 (Snow, 1857). Consequently, adequately treated water supplies and wastewater services are essential for society expectations, global development and human health.

The demand for water resources is increasing relative to the demographic pressures of population growth, with the primary water resources remaining static or diminishing across multiple countries (Wolf, 2007). The identified reduced per capita water availability is based on predictive population increases, combined with an anticipated increase in living standards within the individual countries, resulting in an increase in water

consumption (Pimentel et al., 1997). (Wolf, 2007) advises further that due to resource neglect, on a global basis, both water quantity and quality have deteriorated to the point of catastrophe, with:

- A billion people, or more, globally, lacking access to safe water supplies

- Almost three billion lack access to adequate sanitation

- An estimated five to ten billion people die each year from water related disease or inadequate sanitation

- Twenty percent of the world's irrigated lands have become salt laden, affecting agricultural production

The criticality of water infrastructure in relation to a potential terrorist attack has become increasingly significant with the growth of world population in the 20th and 21st centuries (Gilbert et al., 2003) placing increased demands on water sources. This criticality, coupled with the complexity and extension of water supply chains within an environment of climate change and the phenomena of extreme weather fluctuations, again highlights future water scarcity, and potentially further impacts the precarious global food-water nexus balance (Khan and Hanjra, 2009).

Water is predicted to be in shorter supply by 2025, in consideration of the projected global population increases, coupled with forecasted increases in water consumption by individual countries (Gleick, 1993). Glieck also advises that hydrologists have identified that the minimum water requirement for each person residing in an efficient, modern, industrialised nation is 1,000 cubic metres of water per day, or 50 litres of water, per person, per day (Gleick, 1996). There are 32 countries identified by Gleick to be deficient in water resources, requiring some future innovative water sustainability initiatives (Gleick, 1993). This anticipated deficiency raises the profile of water as a more valuable resource, and increases the likelihood of potential adverse human intervention to drinking water supplies. Furthermore, this designated deficiency tends to elevate the value of water to a terrorist group (Gleick, 1993), identifying water as a vulnerable target for potential terrorist attacks (Gleick, 2006) (Kroll, 2006) (Brockett, 2015).

This paper discusses the security of water CI in relation to adverse human interventions. It also additionally discusses the dependencies of water CI, relative to other CI, which may potentially, create a cascading series of failures across industry within the broader industrial economy. Furthermore, how in a water industry context these dependencies may affect the water service delivery, subject to any unplanned interruptions in the existing supply chain. The paper has the following structure. Section 2 provides a background containing the history of attacks on water CI and conflicts in water supply, as well as contamination of water supply. Section 3 reviews dependencies of water CI, including dependencies of other CIs on water and risks of those dependencies. Section 4 analyses the security of water CI and its perceived threats in relation to a terrorist attack. This section represents the main contribution of this paper in the areas of assessing water CI as a 'soft' target and a description of terrorist attack planning on water CI. Section 5 concludes the paper.

2 Background

2.1 History of attacks on water CI

There are many historical examples of attacks and attempted attacks on water CI (Haimes et al., 1998) (Hickman, 1999) (Dick, 2001) (Dreazen, 2001). As indicated in Figure 1, (Gleick and Heberger, 2014) advises that there were 162 documented attacks on water CI from 1980 to 2012, with a measured increase from 1970

to 2000. Gleick et al (2014) documents a sudden rise up to 31 attacks in a 12 month period in 2012 (Gleick and Heberger, 2014). Although (Gleick and Heberger, 2014) documents attacks on water since 3000 BC there is an observed increase in attacks since 1998. However, it may be considered that in the perspective of increased modern media technology and improved monitoring systems in contrast with the lack of communications historically, that there may well have been a higher number of incidents in earlier history than is apparent from the records currently available.
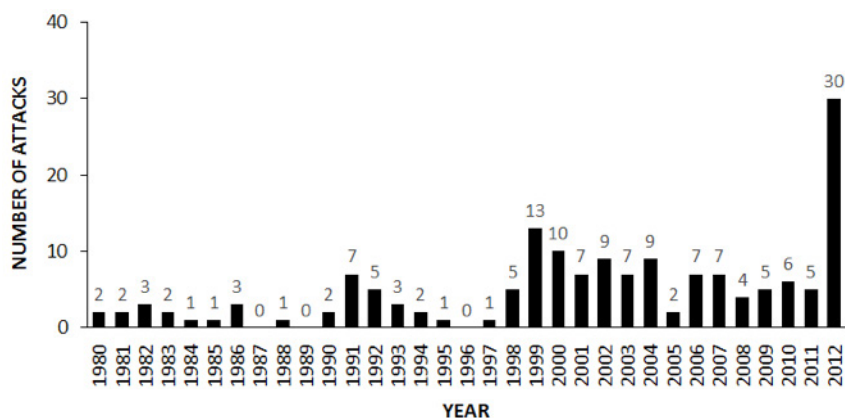

Figure 1: Recorded attacks on water critical infrastructure (adapted from (Abrams and Weiss, 2008, Gleick and Heberger, 2014, Kroll, 2010, Weiss, 2011)

Furthermore, in recent times, there is an observed increased level of interest in attacks on water CI displayed by Jihadist terrorist groups, such as al Qaeda and others. This interest is evident from documents and computer records retrieved by Western Intelligence Agencies and Law Enforcement (Kroll, 2012b) (Brockett, 2015). Amongst documented examples are the attempted terrorist contamination of drinking water in Rome (Kroll, 2012b) (Balmer, 2004), Cyber hackers attacking U.S. water systems (Weiss, 2011), an attempted water poisoning in Spain linked to al-Qaeda (Silva, 2011) and Iraq insurgents using water as a weapon (Coles, 2014) . Recorded examples from Australia in 1984 (Noble and Schrembi, 1984) and in 2012 (ABC, 2003) are two separate incidents connected with a terrorist act. associated with threats to poison water supplies (Cooper, 2013).

2.2 History of conflict in water supply

The application of deliberate adverse human contamination of water, as a form of military or aggressive attack by nation States or disparate terrorist groups is not a new or modern phenomena, and is evident over a long historical timeline (Kroll, 2006). Indeed (Wolf et al., 2005) documents that rivalries over shared use of water has existed since the Neolithic revolution with the human race settling to cultivate food between 8000 and 6000 BC. The term 'rivalry' originates from the Latin word '*rivalis*' meaning "one using the same river as another" (Wolf et al., 2005). Inter country disputes and rivalry over water is evident today between downstream and upstream users, such as Syria about Turkey; Pakistan about India and Egypt regarding Ethiopia (Wolf et al., 2005). Examples and case studies of water conflicts are many since 3000 BC, with Gleick et al detailing 265 incidents to 2012 (Gleick and Heberger, 2014), and Kroll documenting 63 incidents selected between 1000 BC and 2005 (Kroll, 2006). A few selected incidents of the use of water as a weapon between nations and external groups, as distinct to deliberate contamination by an internal terrorist group, are as follows:

- In 1939 The Japanese military poisoned Soviet water sources with intestinal typhoid bacteria in an area near the former Mongolian border (Kroll, 2010).

- In the period 1939 to 1942 the Japanese military 'Unit 731' poisoned Chinese water sources, wells and bulk water storages with typhoid and other Chemical and biological pathogens (Gleick and Heberger, 2014).

- In November 1944, Soviet troops flooded the area south of the Istra Reservoir near Moscow, Russia. This was a strategy to slow the German advance on Moscow. A few weeks later, German troops used the same tactic to create a water barrier to halt advances by the Soviet 16th Army (Gleick and Heberger, 2014).

- In 1945 The Desperate and retreating German Army poisoned a large reservoir in Bohemia with raw sewage (Kroll, 2010).

- In 1965 Yasir Arafat's Fatah movement orchestrated several bombing attacks on Israeli water infrastructure. The Fatah movement was also responsible for additional attacks on Israeli water pipes (Kroll, 2010).

- In July 2002 U.S. Federal officials, in Denver, arrested two al Qaeda operatives in possession of documents detailing how to poison the country's water supplies (Kroll, 2010).

- In 2004, In the U.S. 50 unwanted water system intrusion incidents were identified by10 federal agencies involving SCADA computer systems that control water supply and wastewater systems (Gleick and Heberger, 2014) (Kroll, 2006).

- In 2002, Italian Police arrested 4 Moroccans, with links to al-Qaeda, allegedly planning to contaminate a section of the Rome, Italy, drinking water supply with a cyanide – based chemical ; (Gleick and Heberger, 2014, Kroll, 2006).

As indicated water is a historically regarded as a useful weapon to terrorise populations and kill large numbers of populations for various political and strategic motivations. As (Gleick, 1993) indicates,

> "As we approach the twenty-first century, water and water-supply systems are increasingly likely to be both objectives of military action and instruments of war as human populations grow, as improving standards of living increase the demand for fresh water, and as global climatic changes make water supply and demand more problematic and uncertain" [1]

Indeed, the future global availability of drinking waters are considered at risk and furthermore is considered a significant international problem, with competition between countries and regions continuing to grow. This places political pressures on the future supply of water (Pimentel et al., 1997) and increases the potential risk exposure of future water of acts of terrorism.

The potential for terrorism was also recognised in 1941, during the Second World War, when Federal Bureau of Investigation (FBI) Director J. Edgar Hoover wrote,

> "It has long been recognized that among public utilities, water supply facilities offer a particularly vulnerable point of attack to the foreign agent, due to the strategic position they occupy in keeping the wheels of industry turning and in preserving the health and morale of the American populace" (Copeland and Cody, 2003).

In consideration of the easy access to the required technical knowledge of water single points of failure (SPOF) and the availability of relevant toxins, with additional considerations of the ease of global internet

access, water contamination incidents affecting large populations may well increase as a future form of terrorism targeting, and selection transference, as other current popular targets harden. The chance or likelihood of terrorists targeting water is certainly very real (Gleick, 2006) (Dreazen, 2001) (Beering, 2002) (Cameron, 2002) (AAP, 2003). Water infrastructure may be targeted directly to damage water processing or delivery systems, or alternatively water may be contaminated through the introduction of poison or disease causing pathogens or chemicals within the water distribution systems as a form of 'backflow' (Kroll et al., 2010b).

2.3 Contamination of water supply and response

Many current instances of water related incidents indicate that the primary first notifications of any deliberate (or even accidental) water contamination would probably originate from the health sector, such as occurred in May 2015 in Prague, Czech Republic, which is discussed in more detail further within this paper (Willoughby, 2015) & (Lazarova, 2015). Furthermore, Meinhardt suggests that medical training and education for this type of event may well be deficient (Meinhardt, 2006) . Internationally, most historically based water security measures are primarily concerned with detecting and responding to water quality, subsequent to variations in water parameters, such as pressure of supply, filtration and chlorination as effective treatment techniques for protecting water supplies (Cook and Bakker, 2012, CRC, 2008, E.P.A., 2000, Ireland, 2011, Schutte, 2006). Furthermore, (Palaniappan et al., 2010) considers that on an international basis, contamination by natural pathogenic organisms, trace metals, industrial toxic chemicals and changes in the acidity, temperature and salinity of water are more significant issues of concern. These traditional measurements of water quality monitoring may not be effective in identifying deliberate adverse human intervention with the introduction of harmful pathogens or chemicals. Detection sensors have been developed to detect this form of contamination (Kroll, 2008) & (Brockett, 2015) by various international groups. However, sensor detectors are not installed in all locations across water systems, and are potentially expensive for water entities to install on all parts of the water network.

A medically reported example of contamination by human error in 1988 was the accidental discharge of 20 tonnes of aluminium sulphate into the treated water reservoir that supplied treated water to the Camelford area of Cornwall in the United Kingdom. The water was heavily contaminated with aluminium with a low ph. With an extensive delay in identifying the contamination from testing, a significant community increase of rashes and gastrointestinal disturbances occurred within a few days, and later cases of musculoskeletal pains, malaise and impairment of concentration and memory. Subsequent to the medical alert of this incident, two years later approximately 400 persons were reported as still suffering from symptoms that they attribute to this incident (Altman et al., 2006, BBC and Rose, 2012, Morris, 2012, Reid, 2007).

As previously mentioned, an example which supports Meinhardt's medical hypothesis related to water contamination, is the reported contamination in the city of Prague, Czech Republic (Willoughby, 2015). This incident was initially reported by the Prague health services on Friday 22 May 2015 (Lazarova, 2015). Public notification was advised by the utility on Sunday 24th May 2015 (Willoughby, 2015), as 250 people were admitted to hospital with severe symptoms as a consequence of contamination from coliform bacteria and norovirus in the water distribution system (Monitor, 2015a, Monitor, 2015b). In consideration of the nominal 2-3 days bacterial incubation period of coliform bacteria, the water distribution system would possibly have been contaminated on Tuesday 19th May, or Wednesday 20th May 2015 (Turcios et al., 2006). The 320,000 inhabitants were advised to not drink the water and water tanks were supplied for people to

safely drink (Willoughby, 2015). The pathogen was identified as 'e-coli' and 'Norovirus', and believed be to be a naturally occurring pathogen contaminating the water system (Monitor, 2015a). The primary identification of the water born pathogen appeared to be from the health services, prior to water contamination monitoring from regulatory sources. The May 2015 Prague contamination incident is perhaps a reflection of reality, that prior to any deliberate contamination being recognised by scientific or technological assessment, people may be deceased or ill, with the primary alert issued from medical services (Meinhardt, 2005). Prague 6, the identified region of this contamination is the area where most foreign missions and embassies are located in Prague.

Craig Stanners recently expressed some concerns over deliberate water contamination in the U.K. in the U.K. media, with an observed absence of water monitoring. As Director of IVL Flow Control in the U.K., Stanners stated that, "The UK's drinking water is at far too great a risk from potential contamination of supply by terrorists, with current systems simply not quick enough to contain a chemical or biological attack" (Brockett, 2015) and "What's in place at the moment isn't anywhere near quick enough to cope," said Stanners. "Those wishing to cause damage to our drinking water would laugh at our response that we're waiting five days for results to come back from the lab–by then, it will be too late" (Brockett, 2015). Stanners also cited previous Al-Queda threats to poison drinking water in American and Western cities, in addition to arrests in Jordan of Iraqi agents who attempted to poison the water supply that served American troops in the eastern Jordanian desert (Feuer, 2003).

However, (Gleick, 2006) suggests that it is not necessary to contaminate water supplies, with the terrorist objective achieved by a plausible threat to contaminate. The mild ingress of a harmless vegetable dye would potentially be sufficient to create the sought objective of fear and chaos in the community.

3 Dependencies of water critical infrastructure

The continual progression of the computerisation of modern society, relative to critical infrastructure, has created an expanding incremental dovetailing of complex and increasingly dependent linkages across the value chain of each critical infrastructure (Figure 2). Gillette expands on these increasingly complex linkage vulnerabilities by computer and utility communications.

"Mutual dependence and interconnectedness made possible by the information and communications infrastructure lead to the possibility that our infrastructures may be vulnerable in ways they never have been before" (Gillette et al., 2002).
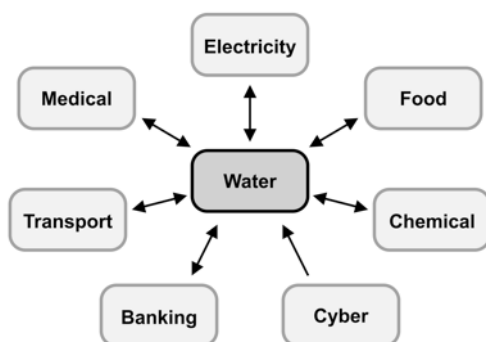

Figure 2: Dependency of water critical infrastructure on other CIs

The dependency of water infrastructure firstly to water CI's supply chain and secondly to other forms of CI is

a significant issue for water managers. An example of the complexity of these dependent relationships is that water CI displays a strong reliance on the chemical industry CI to perform disinfection and water treatment. The chemicals are conveyed, and delivered, by the transport CI sector to water CI destinations, utilising rail, road and marine transport. In a hypothetical case of the various key assets of the transport sector being compromised as a consequence of a terrorist attack, the chemical CI may not be delivered, the transport sector may not function and the water CI may well cease to deliver products and services (Bennett, 2007). In addition to the challenge of potential full outages of various dependent CI as described, emerges one of the most significant business questions relating to interdependency interruptions to Water CI service delivery. That is the issue of service outage time prior to restoration of service or product to maintain the operability of the water service to customers (Gillette et al., 2002)

To a certain extent, restoration times are identified, assessed and analysed, within industry business continuity plans (BCP) to effectively maintain the activities of the specific business. Indeed, (Bouwmans et al., 2006) consider that the growing trend of the increasing connectivity between infrastructures and the interdependent services creates new vulnerabilities to be considered. Furthermore, it is suggested that targeted attacks on vital points or identified SPOFs[2] within the water dependent supply chain, may well cripple water CI delivery. This action, directed at the water sector supply chain, may well create a series of interconnected infrastructure failures, which consequently may subsequently influence water CI service outage time.

Water distribution systems have grown exponentially, relative to the growth of the economy and with consideration to population spread across geographical areas. However, over the recent decade the dependent and interdependent technological value chain has sustained a period of growth and extension to support the industry. Furthermore, (Gillette et al., 2002) warns that:

> *"Failure to understand how disruptions to one infrastructure could cascade to others, exacerbate response and recovery efforts, or result in common cause failures leaves planners, operators, and emergency response personnel unprepared to deal effectively with the impacts of such disruptions."*

It is this perception of the failure to understand these often hidden dependence and interdependency nodes, which may affect the water sector suddenly, with minimal warning, and may well escalate to contribute to a series of cascading failures across other interdependent infrastructure.

3.1 Dependencies of other critical infrastructures on water

The service chain dependency of water is understood to be the most significant reliance of any CI on water and wastewater to continue to conduct normal business. (Sullivan, 2011) considers that most CI sectors are to a certain extent dependent on the water sector. According to (Porod et al., 2014) the water CI sector interconnects strongly with all other CI, and in a recent survey, 75% of all U.S. CI could be directly impacted should the continuous supply of treated water be lost. This dependency can lead to major incremental cascading effects across societies in the case of a sudden absence of treated water and wastewater services. (Porod et al., 2014) identifies that most other CI display a dependency on water services varying in a percentage from 67%–99% reduction in service loss, after 4 hours of water loss. Additionally, critical manufacturing, after a six-hour period of wastewater loss, is predicted to experience a 34%–66% reduction in production.

A dependency analysis conducted by (Porod et al., 2014) across 12 identified CI areas, related the specific CIs

to their dependency to water by percentage of dependency, and estimated offline degradation time without a water supply. Of specific interest to the issue of water vulnerability, as separate from the actual mitigation of the water distribution system itself, is the aspect of interdependency, which is in the form of the mutual dependency of water with other CI. An example of this is the electricity CI displaying a 92% dependency on water, with a 4-hour degradation period (Porod, 2014). The interdependency of water is reflected in the use of water within the generation plant's cooling systems, with the continued supply of electricity essential for water supply pumps, water and wastewater treatment processes and the SCADA communications network for the remote operation of the water and Wastewater network.

Furthermore, as the water industry progressively attains a greater dependency on computers, the supply chain vulnerabilities are increasingly hidden within the context of an assumed product or service supply. To a certain extent, these SPOFs may be forgotten, overlooked or neglected during water vulnerability assessments. Although water and wastewater are considered essential, to varying degrees, on a wide variety of other CIs, water is also dependent, displaying an interdependency of varying percentages. Electricity is considered as an essential form of CI dependency for water and wastewater, to supply pumps, treatment and operational controls, as is the CI of chemicals to treat the water and wastewater. It is these often-variable interdependencies and dependencies, which are considered the 'soft underbelly' of water, displaying the often-overlooked single points of failure, without which the water or wastewater service may not operate effectively.

3.2 Risk of dependencies

The challenge of analysing the risk or threat perception of interconnected interdependent systems of infrastructure is becoming increasingly complex as modern society and technology progresses, with computerised automated ordering systems reflecting variances in individual risk exposures and resistance to service failures (Brown et al., 2004). However, some researchers have developed tools and processes to assess this arduous task, such as (Brown et al., 2004), who describe the goal of assessing the "complex adaptive systems" as identifying the significant risks to critical systems and devising effective mechanisms for mitigating these risks. A suite of simulation tools have been developed at Sandia National Laboratories in the United States, utilising a systems viewpoint and analysis techniques (Brown et al., 2004).

(Brown et al., 2004) describes a generic process, which may be applied to water CI when evaluating the risks inherent in the identified supply chain to clarify the potential risks from either adverse human intervention or on an all hazard basis, the natural risks and threats, which may affect or imping on the supply chain service delivery. Many other forms of analysis and mitigation processes have been developed to assess the vulnerabilities of the supply chain vulnerabilities and CI, with some incorporating algorithmic analysis and assessment (Brown et al., 2004, Hokstad et al., 2012, Rinaldi, 2004). However, as Rudner states :

> "While actuarial risks (e.g. accidents, criminal acts, fire) can be assessed quite conventionally through insurance-type risk assignment and risk-sharing principles, the evaluation of terrorism risk presents significantly more problematic challenges to the techniques of risk management:" (Ranstorp, 2007).

The incidence and timing of a terrorist act is less predictable than many of the risks traditionally considered within the spectrum of a risk management matrix.

Nevertheless, in order to adequately comprehend current risk exposures within the spectrum of water and wastewater CI, the system requires to be considered from the broader perspective. To be more concise, an

analysis of the supply chain, in conjunction with the dependent services and industries is required to be undertaken to completely understand the vulnerabilities and threats to service functionality and integrity. The potential water and wastewater subliminal failure and associated predictive industry degradation may be considered in relation to the complexities and number of reliant interdependent services within the supply chain.

Water and wastewater CI may be impacted by multiple and variable dependencies and interdependencies as an indication of the progressive complexities of modern supply chains and interconnected services. Moreover, these dependencies and interdependencies are not currently entirely understood or identified by industry. This perceived lack of understanding may lead to potential significant points of failure in times of disaster or emergency situations. Frequently, their owners or water resilience strategies do not consider these interdependent services and products in their entirety. This lack of clear understanding can lead to a softening of the vulnerability of water and wastewater CI to sudden and protracted failure, particularly from external adverse human intervention.

As these rising levels and complexities of dependent linkages become increasingly dependent on each other, it is often difficult to identify the potential SPOFs that may occur should one of these supportive link nodes fail, with subsequent potential cascading impact on the operation of various critical infrastructure. However, it is the hidden interdependencies and dependencies within the water supply chain, which are becoming increasingly complex and hidden as technology and the computerisation of society progresses. It is this supply chain, which displays the most significant vulnerability for water, which may elude and escape the water, business continuity analysis, and process.

Future partnerships and communications linkages across the supply chain may be developed to discuss and increase awareness of the mutually dependent relationships. These improved relationships would tend to reduce the potential impact of any supply chain failure, and conversely to raise the awareness of the impact of possible water loss on other CI and supply chain owners.

4 Security of water critical infrastructure

4.1 Water critical infrastructure as a 'soft' target

Numerous studies indicate that water CIs are recognised as vulnerable soft targets (Drake, 1998). These studies are related to deliberate, adverse human intervention under the categories of sabotage, terrorism or criminal incidents (Abrams and Weiss, 2008, Birkett et al., 2011, Birkett and Mala-Jetmarova, 2014, Brockett, 2015, Cameron, 2002, Coleman, 2005, Copeland, 2010, Covert, 2008, Kroll, 2010, Gleick, 1993, Kroll, 2006). Furthermore, (Gleick, 1993) comments that as our civilization and development progresses forward in the 21st century, the likelihood of both military action and instruments of war is increasing to involve water and wastewater. He further suggests that as time is progressing in the 21st century, water services are increasingly likely to be the targets of military or aggressive actions.

In consideration of the previous studies indicative of the elevated level of probability of a terrorist attack on water CI, as a soft target, it is appropriate to examine the likely high risk bandings of water CI. As indicated in Figure 3 below, the graded threat bandings may be assessed, and divided into three specific groups, primary, secondary and tertiary. The primary group displays water systems (treated or non-treated). The second radial banding displays the diagrammatic representation of wastewater systems. The tertiary grouping consists of

other ancillary support system functions such as skilled human resources, buildings and facilities, vehicles and equipment, information technology and financial systems. As indicated, the physical and chemical, biological, radiological, nuclear (CBRN) attacks are the most probable, with cyber-attack, supervisory control and data acquisition (SCADA) having an elevated risk in relation to financial and operational control systems. However, all the indicated bandings represent potential terrorist targets in water CI, with terrorist groups potentially identifying the single points of failure (SPOFs).
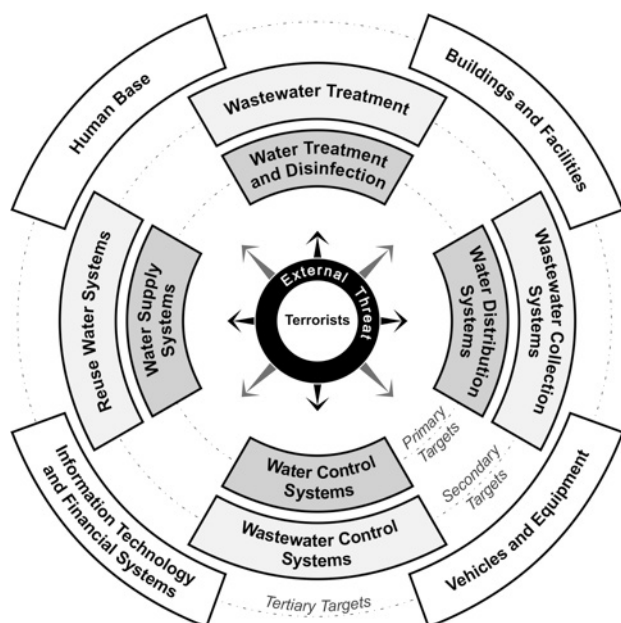
Figure 3: Potential terrorist attack targets in water critical infrastructure

4.2 Attack planning on water critical infrastructure

Assuming that water is a future terrorist target option, and that the areas of possible attack are also identified as in Figure 1, then consequently, it is potentially appropriate to examine the planning process that would occur, prior to any future attack. Figure 3, is a typical representation of the broad considerations faced by a terrorist group planning to attack water CI, with the described actions variable, relative to the size and composition of the group and the complexity of the planned attack. The planning process activities outlined in Figure 4 are complex, and often occur over a 3 month to 1 or more years (Bennett, 2007), and as indicated are extremely complex with a potential number of attacks considered simultaneously, to identify the highest profile attack, or for the terrorist group to maximise the injuries and deaths in some cases (Drake, 1998).
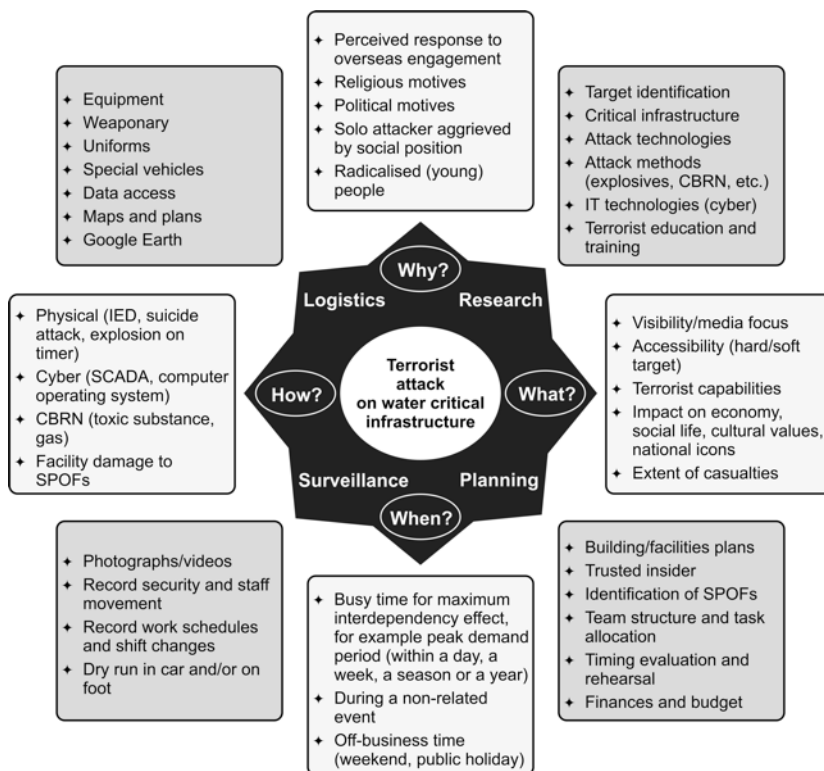
LEGEND: CBRN = chemical, biological, radiological, nuclear; IED = improvised explosive device; IT = information technology; SCADA = supervisory control and data acquisition; SPOF = single point of failure

Figure 4: Typical components of terrorist attack planning

However, Figure 4 illustrates the complexity and the range of alternative options available to the terrorist group when considering and planning attacks on water CI. Although there is no universal blueprint or exact model for terrorist attack planning strategies there are commonalities and strategies from other successful attacks that the various groups have learnt from, with the cross fertilization evident in personnel exchanges, training and information sharing between various cells and groups (Drake, 1998). Indeed as numerous studies indicate, water is a soft target and some attack planning has occurred internationally over the past 10 years (Kalil and Berns, 2004, Kroll et al., 2010a, Kroll, 2012b, Meinhardt, 2005, Meinhardt, 2006) related to water services.

During terrorist planning and addressing of the selection of the components required for a specific attack on water CI, there is some initial linkage and consideration as to the selection of the CI target relative to the ideology of the group, once a decision is confirmed to perform a terrorist attack. That is, what is the focus, and to a certain extent, what outcome is required. Typical of these are, significant media coverage, economic damage, and mass casualties, or even to prove themselves as a competent terrorist cell to their peers. (Bennett, 2007) describes three terrorist target measurement considerations as:

- The attractiveness of the target in regards to the attack accomplishing the terrorist's goals and objectives (which links to the ideology of the group).

- The potential threat level to the population with estimates of service disruption (for example water quality or supplies impacted across a wide area of society), facility and service damage with numbers of injuries and deaths amongst the selected population.

- Vulnerability, or 'softness', of the specific target, with indicative low levels of security to allow weapon

placement and adequate target access.

As some studies indicate, there is a pattern of planning and process adopted by all terrorists (Stewart, 2012, Drake, 1998) & (Lee, 2009a). Whether the 1970s models of left wing, such as the Red Brigades in Italy, the Irish Republican Army or the Baader-Mienhoff cell in Germany, or the more modern Islamic Fundamentalists such as al-Qaeda, al Shabaab, or Daesh, they all adopt and exhibit defined planning procedures and processes, with some commonalities (Lee, 2009a). A terrorist attack planning process, directed at water CI, would reflect some, or all of the pre-attack tasks, as indicated in Figure 5, dependent on the scale of the attack and the size of the terrorist group.
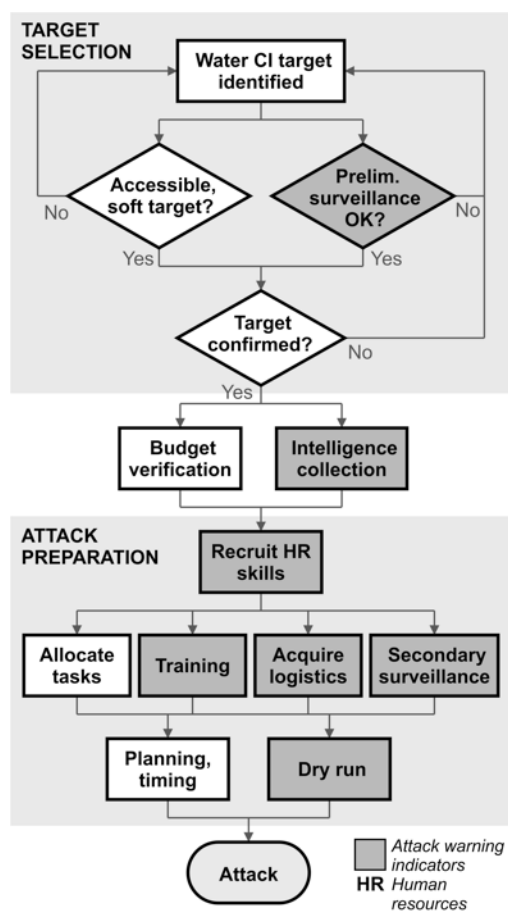
Figure 5: Terrorist attack planning process flowchart

4.3 Perceived threat levels on water critical infrastructure

International treated water critical infrastructure across continents and nations display many similarities. They all engage the functions of bulk water storage, filtration, and chemical treatment with water transport or distribution. Water CI is interlinked, with the growth of communities over time, and as such, often appear as illustrative 'spider webs' of distribution design meeting the cyclic and intermittent growth of cities, towns and communities. It is this form of system design, often spread geographically over large areas, which proves difficult to protect, and to ascertain the localised threat levels from deliberate adverse acts of human intervention, or terrorism. Assessment of the threat levels and vulnerability will change over time with considerations of various nation's population, economy coupled with national threat exposures to various

terrorist groups, and an understanding of terrorist motivations and their motivations to attack water CI (Haimes et al., 1998).

Furthermore, (Gleick, 1993) suggests that as time is progressing in the 21st century, water services are increasingly likely to be the targets of military or aggressive actions. Presently, there are considered to be "hundreds of threats against municipal water systems each year" in the United States (Beering, 2002). The potential for Terrorists to target and compromise water distribution systems is a widely recognised global CI vulnerability within the water industry by international researchers (Coleman, 2005, Court-Young, 2003, Kroll, 2009, Kroll, 2012a, Meinhardt, 2006). It is reported that recently, only a few terrorist threats have been directed against water supply systems, and those threats have not been widely publicised by the media (Haimes et al., 1998). However (Gleick and Heberger, 2014) document 108 individual attacks on water CI between 2000 and 2012. Furthermore, Gleick et al research sought examples and sources that were not always reported from media sources. It is feasible that the deficit of media reporting possibly creates a lax environment related to the water security perspective and activities of water CI owners. As (Gleick, 2006) further advises, "The chance that terrorists will strike at water systems is real but poorly understood by water managers and the public".

Most business continuity and risk matrixes tend to accentuate the priorities for 'high likelihood' events, whereas any terrorist attack in most areas is considered 'low likelihood', but with high consequences related to the protection of life, property, the environment, with reputational considerations. As (Gilbert et al., 2003) highlights, the deliberate, adverse human asset intervention requires different levels of mitigation and protection, than for orderly historic process to mitigate natural or 'all-hazard' risks.

Many people in communities consider that water CI is not a target of terrorism for the reason that modern terrorist incidents appear to be interlinked with a form of 'theatre' (Kroll, 2006). Some researchers allude to an oblique association between the terrorist act and media amplification (Howie, 2009) providing the terrorist 'oxygen' for further future attacks. However, Kroll considers that an attack on water CI would potentially affect populations in a greater way than an airline attack or a transport terminal or restaurant, as a person can make a decision not to fly, or to avoid transport terminals or restaurants, but we all use and drink water (Kroll, 2006). Water CI is an essential service to all global populations and any potential future terrorist attacks will maximise disruption in communities, interrupting community development, striking emotion and fear across populations (Kroll, 2006).

Indeed, potable water systems are not the only potential target within water CI. Elevated exposures of risk exist in the further development of computer based water and wastewater control systems, such as SCADA (Byres et al., 2004, Hildick-Smith, 2005, Luiijf et al., 2011). Furthermore, the wastewater sector of water CI exhibits some vulnerabilities, when the Guadalajara incident of 1992 is considered. In this incident, a massive explosion resulted in 252 people killed, nearly 500 injured and 15,000 left homeless. The estimated monetary damage ranges between $300 million and $1 billion, and 750 businesses failed to recover (EET, 1992) (Dugal, 1999). Although the Guadalajara incident was an accidental incident, it demonstrates the potential application of the wastewater system with adverse external human intervention, resulting in high casualties, economic and social disruption.

4.4 Discussion

The historical interpretation of water security prior to the modern phenomena of terrorism was water quality, pressure and supply availability. In the 21st century, it is more significantly, the physical and cyber security

of potable water and wastewater. It now requires the security assessment of the SPOFs along the water CI cycle in both systems. Typical of these are the storage, treatment facilities, transport and distribution with consideration of the security of service and product delivery to the consumer. There are significant new layers of security to be assessed, with each layer and component of water CI offering opportunities and challenges from bulk water storage to the end user. The objective is to harden water CI, to any potential future terrorist attack to inhibit the selection of water CI as a future target.

As water is perceived as essential to all life on the planet, some researchers consider that Islamic Jihadist extremists would be unlikely to plan and conduct an attack on water CI (Kroll, 2006). In contrast, (Kroll, 2006) indicates that interpretations from Islamic writings, such as "Those in the Garden will drink delicious wine, while those in the Fire will drink boiling water that will tear apart their intestines" (Kroll, 2006) (quoting Muhammad 47:15) may be construed to justify a future attack on water CI.

A converse view was expressed by Ronald Dick, former Deputy Head of the U.S. Federal Bureau of Investigation (FBI) in a 2001 testimony before the U.S. Congress. He stated that, "With regard to contamination by biological agents, the nation's water supply may seem to be a logical target for a terrorist attack in reality, targeting the water supply may prove difficult. In order to be successful, a terrorist would have to have large amounts of agent and some knowledge of the water supply network and access to critical locations within the network " (Dick, 2001, Kroll, 2006). Unfortunately, this statement occurred in 2001, and within that environment, law enforcement and risk managers were only considering bulk water storage as a potential target of concern.

However, in recent years and an escalated global terrorism environment, attitudes, opinions and assessments of water CI has progressed to consider that water CI is a target, and more significantly, the SCADA control systems and identified single points of failure across the CI system, downstream from the reservoirs and bulk water storages (Hildick-Smith, 2005). Indeed, (Copeland, 2010) advises that the in 2010, the U.S. Congress allocated USD$923 Million to provide increased security at water CI and in particular, to assess and protect federal facilities and support security assessment and risk reduction activities by non-federal facilities and passed a bill requiring drinking water utilities to conduct security vulnerability assessments across water CI.

The U.S. government's water CI target hardening may well reduce the likelihood of any future potential terrorist attack, as (Enders and Sandler, 1993) indicate, proactive policy measures and target hardening to ensure that potential terrorist attacks are more difficult, causes the terrorist to seek other targets that are 'softer' and easier to attack. This form of transference is well recognised and understood by researchers (Brandt, 2009), and when applied to the water CI this form of transference could well shift to water and its supply chain, as a form of impact on a current soft target to maximise the attack results required by the terrorist group.

The water CI sector is considered by (Porod et al., 2014) to represent a 'lifeline' sector to the majority of other CI. (Porod et al., 2014) further suggests "….it is essential to ensure both the protection and resilience of these systems in order for the successful treatment of water and wastewater to occur" (Porod et al., 2014). Accordingly, an assessment on the assets and supply chain related to criticality (how essential is the asset?) could be initiated by water CI owners. Considerations of these assessments are,

- **vulnerability** (How susceptible are the range of supply assets to surveillance and attack);
- **recoverability** (How difficult will it be to recover from inflicted damage, in consideration of time, special repair equipment, and manpower to restore the supply chain assets to normal functional

operation?).

- **current threat level**, and more importantly, how many water businesses regularly review the threat level from Terrorism? (Brown et al., 2005).

5 Conclusion

This paper reviewed two major areas of water and wastewater critical infrastructure (water CI), first, its dependencies including links to other critical infrastructures, and second, its security in relation to external adverse human interventions (i.e. terrorist attacks). Regarding security of water CI, the main focus is on attack planning considering its typical components and perceived threat levels on water CI as a 'soft' target.

The conclusions are summarised as follows. The lack of clear understanding by water sector managers of relevant dependencies and interdependencies can lead to an increase of water CI vulnerability, which could, in the case of an external attack, result in sudden and protracted failure. Development of future partnerships and linkages across the supply chains could increase awareness of potential failures, which could assist in reduction of potential impacts.

Water CI is recognized as a target. Hardening its protection is necessary in order to inhibit its selection as a subject of a terrorist attack. Security assessments would require identification of single points of failures (SPOFs) in both water and wastewater systems. Additionally, these assessments would require an evaluation of system vulnerability, recoverability and current threat level within specific nation social and political environments.

6 References

AAP. 2003. Man Charged over Threat to Melbourne Water. *The Age*, January 31st 2003.

ABC 2003. Man Who Threatened Melbourne Water Supply Bailed. Australian Broadcasting Network.

ABRAMS, M. & WEISS, J. 2008. Malicious Control System Cyber Security Atack Case Study–Maroochy Water Services, Australia. *In:* CORPORATION, T. M. (ed.). The MITRE Corporation, Springfield, VA, USA The MITRE Corporation & Applied Control Solutions.

ALTMAN, P., CUNNINGHAM, J., DAHNESHA, U., BALLARD, M., THOMPSON, J. & MARSH, F. 2006. Disturbance of Cerebral Function in People Exposed to Drinking Water Contaminated With Aluminium Sulphate: Retrospective Study of the Camelford Water Incident. Oxford, UK: Oxford University, UK.

BALMER, C. 2004. Italian Court Acquits Nine in Alleged Plot Against US Embassy. *In:* REUTERS (ed.). Reuters.

BBC & ROSE, M. 2012. Camelford Water Poisoning: Authority 'Gambled With Lives'. URL: http://www.bbc.co.uk/news/uk-england-cornwall-17367243 (Accessed on 12 December 2015). *In:* BBC (ed.).

BEERING, P. S. 2002. Threats on Tap: Understanding the Terrorist Threat to Water. *Journal of Water Resources Planning and Management,* 128, 163-167.

BENNETT, B. T. 2007. *Understanding, Assessing and Responding to Terrorism – Protecting Critical Infrastructure and Personnel,* New Jersey, USA, John Wiley & Sons.

BIRKETT, D. & MALA-JETMAROVA, H. 2014. Plan, Prepare and Safeguard: Water Critical Infrastructure Protection in Australia. *In:* CLARK, R. M. & HAKIM, S. (eds.) *Securing Water and Wastewater Systems, Protecting Critical Infrastructure 2.* Switzerland: Springer International Publishing.

BIRKETT, D., TRUSCOTT, J., MALA-JETMAROVA, H. & BARTON, A. F. 2011. Vulnerability of Water and Wastewater Infrastructure and its Protection from Acts of Terrorism: A Business Perspective. *In:* CLARK, R. M., HAKIM, S. & OSTFELD, A. (eds.) *Handbook of Water and Wastewater Systems Protection, Series Protecting Critical Infrastructure.* New York, USA: Springer.

BOUWMANS, I., WEIJNEN, M. & GHEORGHE, A. 2006. Infrastructures at Risk. *In:* NETHERLANDS, S. (ed.) *Critical Infrastructures at Risk: Securing the European Electric Power System.* Netherlands: Springer.

BRANDT, P. T. 2009. What do Transnational Terrorists Target? Has It Changed? Are We Safer? California: US Department of Homeland Security (DHS), Center for Risk and Economic Analysis of Terrorism Events (CREATE).

BROCKETT, J. 2015. UK Water Networks Vulnerable to Terrorist Attack. *In:* HTTP://UTILITYWEEK. CO.UK/NEWS/UK-WATER-NETWORKS-%E2%80%98VULNERABLE-TO-TERRORIST-ATTACK/1150512#.VKC-C8TOCYU, O.-L. U. W. U. (ed.). Utilities Week.

BROWN, G., CARLYLE, M., SALMERON, J. & WOOD, K. 2005. Analyzing the Vulnerability of Critical Infrastructure to Attack and Planning Defenses. *INFORMS Tutorials in Operations Research.* Institute for Operations Research and the Management Sciences, Hanover, MD.

BROWN, T., BEYELER, W. & BARTON, D. 2004. Assessing Infrastructure Interdependencies: The Challenge of Risk Analysis for Complex Adaptive Systems. *International Journal of Critical Infrastructures,* 1, 108-117.

BYRES, E. J., FRANZ, M. & MILLER, D. 2004. The Use of Attack Trees in Assessing Vulnerabilities in SCADA Systems. *International Infrastructure Survivability Workshop (IISW'04), IEEE.* Lisbon, Portugal, 5-8 December 2004.

CAMERON, C. 2002. Feds Arrest al-Queda Suspects with Plans to Poison Water Supplies. *In:* NEWS, F. (ed.). Fox Media. URL: http://www.foxnews.com/story/2002/07/30/feds-arrest-al-qaeda-suspects-with-plans-to-poison-water-supplies/.

COHEN, F. 2010. What Makes Critical Infrastructures Critical? *International Journal of Critical Infrastructure Protection, Elsevier,* 3, 53-54.

COLEMAN, K. 2005. Protecting the Water Supply From Terrorism. *In:* HTTP://WWW.DIRECTIONSMAG. COM/ENTRY/PROTECTING-THE-WATER-SUPPLY-FROM-TERRORISM/123563, D. M. O.-L. U. (ed.). United States of America: Directions On-Line Magazine.

COLES, I. 2014. Iraq Insurgents Use Water as a Weapon After Seizing Dam. Reuters. URL: http://www.reuters.com/article/2014/04/11/us-iraq-security-idUSBREA3A0Q020140411.

COOK, C. & BAKKER, K. 2012. Water Security: Debating an Emerging Paradigm. *Global Environmental Change,* 22, 94-102.

COOPER, A. 2013. Man's al-Qaeda Link. *The Melbourne Age, Australia. URL:* , Tuesday April 09, 2013.

COPELAND, C. 2010. Terrorism and Security Issues Facing the Water Infrastructure Sector. Washington, U.S.A.: CRS Report for Congress, Congressional Research Service.

COPELAND, C. & CODY, B. 2003. Terrorism & Security Issues Facing the Water Infrastructure Sector. *In:* CONGRESS, U. S. (ed.). Washington, DC, U.S.A.: U.S. Congress.

COURT-YOUNG, H., C. 2003. *Understanding Water and Terrorism,* Denver, Colorado, U.S.A., Burg Young Publishing LLC.

COVERT, A., J. 2008. *Water: Vital to Life, Vulnerable to Terrorism.* PhD Partial Fulfillment of the Graduation Requirements, Air University. Maxwell Air Force Base, Alabama, USA.

CRC 2008. Drinking Water Treatment. *In:* TREATMENT, T. C. R. C. F. W. Q. A. (ed.) *Drinking Water Facts.* Issue 2 ed. Adelaide, South Australia: The Cooperative Research Centre for Water Quality and Treatment.

DICK, R. L. 2001. Terrorism: Are America's Water Resources and Environment at Risk? *Subcommittee on Water Resources and Environment.* Washington, DC, USA: House Committee on Transport and Infrastructure.

DRAKE, C. J. M. 1998. *Terrorists' Target Selection,* London, U.K., MacMillan Press.

DREAZEN, Y., J. 2001. Officials Fear Terrorists Could Use 'Backflow' To Put Toxins Into Water Distribution Grids. *The Wall Street Journal*, 27th December 2001, p.1.

DUGAL, J. 1999. Guadalajara Gas Explosion Disaster. *Disaster Recovery Journal,* 5, http://www.drj.com/drworld/content/w2_028.htm (Accessed on 21 January 2012).

E.P.A. 2000. The History of Water Treatment. *In:* AGENCY, E. P. (ed.). Washington, United States of America: Environmental Protection Agency- Office of Water.

EET 1992. 1992 Guadalajara explosions. U.S.A. http://everything.explained.today/1992_Guadalajara_explosions/ (Accessed on 02 December 2015).

ENDERS, W. & SANDLER, T. 1993. The Effectiveness of Anti-Terrorism Policies: A Vector-Autoregression-Intervention Analysis. *Americal Political Science Review,* 87, 829-844.

FEUER, A. 2003. Jordan Arrests Iraqis in Plot to Poison U.S. Troops' Water. New York Times. URL: http://www.nytimes.com/2003/04/01/international/worldspecial/01CND-JORD.html.

GILBERT, P. H., ISENBERG, J., BAECHER, G. B., PAPAY, L. T., SPIELVOGEL, L. G., WOODARD, J. B. & BADOLATO, E. V. 2003. Infrastructure Issues for Cities–Countering Terrorist Threat. *Journal of Infrastructure Systems,* 9, 44-54.

GILLETTE, J., FISHER, R., PEERENBOOM, J. & WHITFIELD, R. 2002. Analysing Water/Wastewater Infrastructure Interdependencies *6th International Conference on Probabilistic Safety Assessment and Management (PSAM6).* San Juan, Puerto Rico, USA, 23-28 June 2002.

GLEICK, P. H. 1993. Water and Conflict: Fresh Water Resources and International Security. *International Security,* 18, 79-112.

GLEICK, P. H. 1996. Basic Water Requirements for Human Activities: Meeting Basic Needs. *Water international,* 21, 83-92.

GLEICK, P. H. 2006. Water and Terrorism. *Water Policy,* Volume 8, 481-503.

GLEICK, P. H. & HEBERGER, M. 2014. Water Conflict Chronology. *The World's Water, Volume 8.* California, USA: Pacific Institute.

HAIMES, Y. Y., MATALAS, N. C., LAMBERT, J. H., JACKSON, B. A. & FELLOWS, J. F. R. 1998. Reducing Vulnerability of Water Supply Systems to Attack. *Journal of Infrastructure Systems,* 4, 164-177.

HICKMAN, D. C. 1999. A Chemical and Biological Warfare Threat: USAF Water Systems at Risk. Alabama, http://www.au.af.mil/au/awc/awcgate/cpc-pubs/hickman.pdf (Retrieved 19 January 2012): USAF Counterproliferation Center, Maxwell Air Force Base.

HILDICK-SMITH, A. 2005. Security for Critical Infrastructure Scada Systems. SANS Reading Room, SANS Institute, Bethesda, Maryland: GSEC Practical Assignment, Version 1.4c, 23 February 2005.

HOKSTAD, P., UTNE, B. I. & VATN, J. 2012. *Risk & Interdependencies in Critical Infrastructures–A Guideline for Analysis,* Springer–London, Heidelberg, New York, Dordrecht, Springer.

HOWIE, L. (ed.) 2009. *Terrorism, the Worker and the City–Simulations and Security in a Time of Terror,* Farnham, UK: Gower.

IRELAND, E. 2011. Water Treatment Manual–Disinfection. Wexford, Ireland. URL: http://www.epa.ie/pubs/advice/drinkingwater/disinfection2_web.pdf: EPA.

KALIL, J. M. & BERNS, D. 2004. Drinking Supply: Terrorist Had Eyes on Water. *In:* JOURNAL, R. (ed.). Washington U.S.A. URL: http://www.defendyourh2o.com/pdfs/DRINKING%20SUPPLY.pdf.

KHAN, S. & HANJRA, M. A. 2009. Footprints of Water and Energy Inputs in Food Production–Global Perspectives. *Food Policy,* 34, 130-140.

KROLL, D. 2006. *Securing Our Water Supply: Protecting a Vulnerable Resource,* Tulsa, Oklahoma, United States of America. , PennWell Corporation.

KROLL, D. Testing the Waters: Improving Water Quality and Security Via On-Line Monitoring. ICMA, 22nd September 2008 2008 Richmond VA, U.S.A. URL: http://hachhst.com/wp-content/uploads/2010/07/Presentation_Water-Security-and-Quality.pdf (Accessed 04.12.2015). Richmond VA, U.S.A., 89 Pages.

KROLL, D. 2010. Aqua ut a Telum "Water as a Weapon". Colorado, United States of America. URL: http://hachhst.com/wp-content/uploads/2010/07/White-Paper_Water-as-a-weapon.pdf (Accessed 24.11.2015): Hach Homeland Security Technologies.

KROLL, D., J 2012a. The Terrorist Threat to Water and Technology's Role in Safeguarding Supplies. 16.

KROLL, D., J. 2009. Water Distribution Monitoring: Opportunities and Challenges for Enhancing Water Quality and Security. *In:* TECHNOLOGIES, H. H. S. (ed.). Colorado, U.S.A.: Hach Homeland Security Technologies.

KROLL, D., J. 2012b. The Terrorist Threat to Water and Technology's Role in Safe Guarding Supplies. USA.

KROLL, D., J., KING, K., ENGELHARDT, T., GIBSON, M., CRAIG, K. & SECURITIES, H. H. 2010a. Terrorism Vulnerabilities to the Water Supply and the Role of the Consumer: A Water Security White Paper. Water World On -Line Journal.

KROLL, D., KING, K., ENGELHARDT, T., GIBSON, M. & CRAIG, K. 2010b. Terrorism Vulnerabilities to the Water Supply and The Role of the Consumer: A Water Supply White Paper. *In:* TECHNOLOGIES, H. H. (ed.). Waterworld.

LAZAROVA, D. 2015. Problem With Contaminated Tap Water in Prague 6 Still Unresolved. *In:* PRAHA, R. (ed.). Radio Praha. URL: http://www.radio.cz/en/section/news/problem-with-contaminated-tap-water-in-prague-6-still-unresolved (Date accessed 27.05.2015).

LEE, E. 2009a. *Homeland Security and Private Sector Business: Corporations' Role in Critical Infrastructure Protection,* Boka Rato, Florida, U.S.A., Auerbach Publications.

LEE, J.-J. M. 2009b. A War for Water. *World Environmental and Water Resources Congress 2009: Great Rivers.* Kansas City, Missouri: American Society of Civil Engineers.

LUIIJF, E., ALIB, M. & ZIELSTRAB, A. 2011. Assessing and Improving SCADA Security in the Dutch Drinking Water Sector. *International Journal of Critical Infrastructure Protection, Elsevier,* 4, 124-134.

MEINHARDT, P., L. 2005. Water and Bioterrorism: Preparing for the Potential Threat to U.S.Water Supplies and Public Health. *Annual Review of Public Health,* 24, 213-237.

MEINHARDT, P., L. 2006. Medical Preparedness for Acts of Water Terrorism. *In:* MEDICINE, A. C. O. P. (ed.). U.S.A.: American College of Preventative Medicine.

MONITOR, P. D. 2015a. Prague to Vaccinate Children From Districts With Contaminated Water. URL: http://praguemonitor.com/2015/06/08/prague-vaccinate-children-districts-contaminated-water (Accessed on 08 June 2015).

MONITOR, P. D. 2015b. Prague Town Hall Files Complaint Over Contaminated Drinking Water.: URL: http://www.praguemonitor.com/2015/05/28/prague-town-hall-files-complaint-over-contaminated-drinking-water (Accessed on 26 November 2015).

MORRIS, S. 2012. The Camelford Poisoning: Blackwater, A Driver's Mistake.

NOBLE, T. & SCHREMBI, J. 1984. Geelong Man Charged over Poisoning Threat. *The Melbourne Age*, 17th September 1984, p.Page 1.

PALANIAPPAN, M., GLEICK, P. H., ALLEN, L., COHEN, M., J,, CHRISTIAN-SMITH, J. & SMITH, C. 2010. Clearing the Waters: A Focus on Water Quality Solutions. *In:* ROSS, N. (ed.). Nairobi, Kenya, Africa: Pacific Institute.

PIMENTEL, D., HOUSER, J., PREISS, E., WHITE, O., FANG, H., MESNICK, L., BARSKY, T., TARICHE, S., SCHRECK, J. & ALPERT, S. 1997. Water Resources: Agriculture, the Environment, and Society. *BioScience*, 97-106.

POROD, C., COLLINS, M. & PETIT, F. 2014. Water Treatment Dependencies. *The CIP Report. URL: http://cip.gmu.edu (Accessed on 10 April .2015),* Volume 13, 10-13.

RANSTORP, M. (ed.) 2007. *Mapping Terrorism Research,* Abingdon: Routledge.

REID, S. 2007. Camelford A Lethal Cover Up: Britain's Worst Water poisoning Scandal. *In:* MAIL., D. (ed.). Daily Mail. URL: http://www.dailymail.co.uk/news/article-502442/A-lethal-cover-Britains-worst-water-poisoning-scandal.html (Accessed on 03 December 2015).

RINALDI, S. M. 2004. Modeling and Simulating Critical Infrastructures and Their Interdependencies. *37th Hawaii International Conference on System Sciences.* Big Island, Hawaii, 5-8 January 2004: IEEE.

SCHUTTE, E. 2006. Handbook for the Operation of Water Treatment Works. Department of Chemical Engineering, University of Pretoria, South Africa, : Water Institute of South Africa, Water Research Commission (WRC).

SILVA, C. J. 2011. Attempted Water Poisoning in Spain. Gates of Vienna. URL: http://gatesofvienna.blogspot.cz/2011/08/more-on-attempted-water-poisoning-in.htm (Accessed on 16 June 2015).

SNOW, J. 1857. Cholera, and the Water Supply in the South Districts of London. *British Medical Journal,* 4, 864-865.

STEWART, S. 2012. Detection Points in the Terrorism Attack Cycle. *Security Weekly: Fundamentals of Terrorism*, Chapters 3 and 5.

SULLIVAN, J., K. 2011. Water Sector Interdependencies–Summary Report. Alexandria, VA, USA: Water Environment Federation.

TURCIOS, R. M., WIDDOWSON, M.-A., SULKA, A. C., MEAD, P. S. & GLASS, R. I. 2006. Re-evaluation of Epidemiological Criteria for Identifying Outbreaks of Acute Gastroenteritis Due to Norovirus: United States, 1998–2000. *Clinical Infectious Diseases,* Volume 42., Issue 7., 964-969.

WEISS, J. 2011. Hackers 'Hit' US Water Treatment Systems. *BBC News Technology. URL: http://www.bbc. co.uk/news/technology-15817335 (Accessed on 28 January 2012)*, 21 November 2011, p.1.

WILLOUGHBY, I. 2015. Anger after slow announcement of water contamination leaves scores sick in Prague. *URL: http://www.radio.cz/en/section/curraffrs/anger-after-slow-announcement-of-water-contamination-leaves-scores-sick-in-prague (Accessed 27.07.2015).* Radio Praha. CZ. .

WOLF, A. T. 2007. Shared Waters: Conflict and Cooperation. *Annual Review of Environment and Resources,* 32, 3.1-3.29.

WOLF, A. T., KRAMER, A., CARIUS, A. & DABELKO, G. D. 2005. Managing water conflict and cooperation. *State of the World 2005: Redefining Global Security. .* The World Watch Institute.

Notes

[1] GLEICK, P. H. 1993. Water and Conflict: Fresh Water Resources and International Security. *International Security,* 18, 79-112. Pp 79.

[2] SPOFs = Single Points of Failure

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Critical Infrastructure protection.

Women Chief Executives: The Political Catch-22 of Counterterrorism

by Courtney Burns and Kyle T Kattelman

Abstract

Do women chief executives experience more terrorist activity during their time in office? We are interested in exploring this question given the rise in the study of gender and conflict. We argue that women leaders experience higher levels of terrorist violence due to gender perceptions. Women leaders are perceived as conflict averse. Concomitantly, women leaders who respond forcibly against terrorist agitation run the risk of domestic political costs and possibly additional terrorist recruitment as a result of policies that deviate from gender norms. This political catch-22 results in a higher frequency of terrorist violence. We examine this relationship on instances of domestic terrorism from 1980-2011. The results confirm that women leaders experience terrorist violence more frequently.

Introduction

Which leaders experience more terrorist activity than others? Previous research has attempted to answer this question through exploring the institutional constraints and behavior of chief executives. For example, it has been shown that autocrats with higher audience costs are expected to face more terrorism.[1] Moreover, countries that repress at higher rates may also see more terrorist activity. [2] We are interested in expanding the literature that examines when a regime or leader is more or less likely to be targeted by terrorist activity. In particular, we ask whether women chief executives are more likely to be targets. There are an increasing number of studies conducted on gender and terrorism from the terrorist's side of the conflict. To our knowledge, no study has examined the role of women in government and terrorist activity.

Benazir Bhutto was the first female prime minister elected in a Muslim state and served the country of Pakistan from 1988 to 1990 and from 1993 to 1996. She was assassinated by a suicide terrorist in 2007 when she had returned to Pakistan to campaign for the position of prime minister once again. Bhutto attained leadership of Pakistan through the party that her father established in the 1970s. During her tenure her family endured significant political violence along with a rise in terrorist attacks within the country. Corazon Aquino inherited two insurgencies with terrorist activity, one against the separatist Moro Muslims and one against the leftist National Democratic Front. She was able to bring the groups to the table for peace talks, but talks eventually failed when the government would not agree to all of the groups' demands. At what point do terrorists view their leader as more vulnerable or more willing to bend at the bargaining table? Does the gender of the leader influence their decisions?

Women leaders often face stereotypes regarding the types of policies they support or what their personality should be. In fact, women leaders must often maintain a hawkish personality in respect to foreign policy in order to be taken more seriously.[3] However, when it comes to the treatment of their own people, domestic

audiences may expect a more caring and nurturing leader. Indeed, some post-conflict societies purposefully select a female leader because of these stereotyped traits.[4]

We argue that female chief executives seeking to counter terrorist organizations find themselves in a catch-22. As Winkler succinctly puts it, a catch-22 is "…an idiom representing a no-win situation built on illogic and circular reasoning."[5] The logical trap for female leaders lies in two contradictory traits that they must exhibit simultaneously: compassion and hawkishness. They need to present a hard-lined face to the world, which violates gendered assumptions about women, and a soft façade to their people in order to demonstrate that they are also feminine.[6]This can be a difficult line to balance. We argue that this leaves women leaders vulnerable to domestic terrorist attacks. Female leaders that are perceived as warm and compassionate present a favorable target for terrorist organizations seeking quick capitulation from a leader that is averse to violence. Conversely, a hawkish response from a female leader can be perceived as overtly harsh, which can also possibly trigger a backlash of terrorist violence. This circular reasoning leaves female leaders at a unique loss when dealing in areas of national security. This research is important for two reasons. First, it sheds light on the catch-22 for female leaders and the unrealistic expectations that women be both traditionally masculine and traditionally feminine as a leader of a country. Second, it also demonstrates that terrorist groups, along with domestic populations, continue to stereotype women leaders. Furthermore, terrorist groups use these stereotypes, whether explicitly or inadvertently, in their calculations of whether to engage in terrorist activity.

The following section outlines existing theories concerning the relationship between female leaders and expectations of the public. The literature stresses that female leaders are evaluated differently according to gender stereotypes. Overall, female leaders are perceived as violence averse, which affects evaluations of strength on matters of foreign policy. To counter this impression, some female leaders behave in an overtly hawkish manner in the international arena.[7] Such behavior is also perceived in a gendered light, as it is not stereotypically assumed that women should behave aggressively, suggesting that a male leader would elicit a different reaction. This catch-22 leaves female leaders without an ideal response. We then tie this theory into the decision calculus of terrorist strategy, utilizing existing theories of cost-benefit analysis and backlash effects in the terrorist literature. Since terrorism is a tool of the weak, its strategy is often directed at soft, vulnerable targets. The gender of the executive can serve as a heuristic of vulnerability, based on gender stereotyping. However, terrorists can also direct their attacks in retaliation to perceived overaggressive counterterrorist actions. This backlash effect can also be perceived differently based on the gender of the executive. Strong counterterrorist action from a female leader can incense terrorists to a higher degree than would be if coming from the orders of a male executive. The political catch-22 for female leaders makes necessary decision-making even more difficult because perceptions of softness and aggressiveness are magnified for female executives, resulting in a higher frequency of terrorist violence regardless of strategy.

We test this theory on instances of domestic terrorism from 1980-2011, utilizing a set of the most commonly used independent variables of terrorist violence. The results confirm that women leaders experience terrorist violence more frequently. The point of this study is not to say that women leaders are weaker than men, but being aware that this calculation is happening could help lead to better methods at ensuring domestic and international security.[8]

Gender, Preferences, and Stereotypes

When invoking the notion of leadership, the public tends to believe that leadership traits include qualities

such as aggression, competitiveness, dominance, rationality, and decisiveness. Particularly in times of terrorist threat, individuals find it psychologically calming and practically useful to place candidates who are perceived as strong leaders into positions of power.[9] For women, though, it may be harder to demonstrate these qualities because society tends to have different expectations for them than for men. Previous research has consistently shown that men and women are perceived in stereotyped ways; in other words men are associated with male traits and women are associated with female traits.[10] Male traits are usually in line with those of political leadership: dominance, aggression, rational, competitive. On the other hand, female traits are sometimes the opposite: caring, nurturing, compassionate, polite, and emotional. These traits are also particularly magnified under instances of low information.[11]

These stereotypes are not necessarily done with ill intention. In fact, extant research has examined the preferences of women in the aggregate, and to some extent, women leaders. Generally, findings on the preferences of women point to a gender gap where women are more averse to violence than men. Aggregate information on women both within countries and cross-nationally finds that women are less likely to support the use of force.[12] For example, in a 2012 Pew Global Studies survey, across 12 different countries women were far more against the use of drone strikes by the U.S. than men.[13] The ranges differed from a 31-point gap in Japan to a smaller 13-point gap in Uganda. This conforms to previous cross-national, gender gap opinions on the Gulf War, indicating a strong aversion to violence on the part of women that is independent of any single conflict.[14] Further, social psychology research has found that women appear to practice more prosocial behavior. That is, they are more likely to be socially sensitive, friendly, and concerned with other's welfare.[15] Other research posits that women are more likely to be cooperative and less "selfish" than men. [16]

 In regards to women leaders, it has been argued that women leaders may initiate conflict behavior with other countries and increase defense spending, but this does not necessarily relate to how they view domestic audiences.[17] Interviews with prominent women in U.S. foreign policy reveal that some of these officials view foreign policy much differently than their male counterparts and are averse to violence. [18] Furthermore, cross-national research on women in parliament finds that when more women are in parliament, more woman-friendly policies are passed.[19] Often the interpretation of "woman-friendly" indicates spending on domestic concerns such as education, health care, and family leave policies. Moreover, when more women are in parliament a country is less likely to be hawkish in their foreign policy stance.[20] Given this information about women in the aggregate and women leaders, one can see why there may be stereotyped expectations of women chief executives.

However, research done in the context of U.S. elections has found that gender is not necessarily the go-to heuristic of the public while evaluating candidates. Instead, several studies have shown that gender stereotypes must be activated through either a campaign commercial or story or security threat in order for voters to make assessments based on gender.[21] Holman, Merolla, and Zechmeister find an intersectional relationship between political party and gender for candidate evaluation during times of terrorist threat. Specifically, they find that a democratic woman will be evaluated harsher than a republican woman because of party issue ownership.[22] However, this research has only been done in the context of candidate evaluation during U.S. elections and not for sitting leaders. To our knowledge, no research has specifically found that gender does not play a role in the evaluation of a sitting leader. Further, extending partisanship findings in the United States to other countries is a contentious debate in political science. For example, party systems in East Asia did not develop in the same manner as the U.S., indicating differences in social cleavages and patterns of elite politics.[23] Other research finds that in the Netherlands, party identification was a post-

election phenomenon and not something that voters made decisions with[24] In other words, while there does appear to be potential complicating factors with partisanship, gender, and candidate evaluation in the U.S. , these findings do not necessarily translate well cross-nationally.

In fact, most research has found that gendered expectations and stereotypes can work against women who seek positions of power. For example, Falk and Kenski find that when U.S. citizens believed that terrorism and national security were important policy areas, they were less likely to say that they would elect a woman to office.[25] This is primarily due to the fact that men more frequently match the stereotypes of leaders than women do.[26] Eagly, Makhijani, and Klonsky demonstrate that women are perceived more negatively by the public for exhibiting the same behavior as men.[27] This means that women acting assertively violate gendered expectations and they tend to be penalized more for this behavior.[28] To that end, women are subjected to more scrutiny as chief executive than men because they are not typically the people that come to mind when picturing those in power[29]

When faced with scrutiny, women will attempt to act more masculine to appear more capable in policy areas traditionally thought to be better handled by men.[30] These policy areas overwhelmingly include taxes and national security.[31] Women leaders may resort to more hawkish behavior when dealing with security, in order to make up for appearing too "soft" with domestic policies. Caprioli and Boyer state:

> *"Female leaders who have risen to power through a male-defined and male dominated political environment may well need to be more aggressive in crises than their male counterparts… women may also work harder to 'win'… because to appear and act feminine (and therefore weak) would be political suicide"[32]*

In other words, a woman leader must exhibit masculine (aggressive, rational) traits in order to be taken seriously; however, we often expect women leaders to be both feminine (caring, nurturing, soft) and masculine at the same time.[33] Women leaders are faced with a political double bind. They must demonstrate masculine qualities to show that they are leaders, but this challenges traditional assumptions about them as women. So, they must also act traditionally feminine (cooperative, compassionate, nurturing) in order to show that they are not violating stereotypes.

Given that women leaders act hawkish to portray competence (masculinity/leadership), we posit that women will opt to demonstrate their feminine traits with their domestic audiences. For example, women, particularly in developing countries, are often elected after a conflict ends purely for the reason that they are stereotypically viewed as different in temperament than the men that got them into conflict.[34] One primary example is that of Liberia and Ellen Johnson Sirleaf. Sirleaf was elected following her activity in the transitional government after Charles Taylor was exiled from Liberia in 2003. Many people, primarily women, advocated for her candidacy simply because she was a woman and they thought she would do things differently.[35] Such a finding is not uncommon; several women have been elected to office directly following conflict because the citizens believe women represent the values of communication and cooperation.[36] This directly reflects the gender stereotype that women are more peaceful than men when it comes to the treatment of their own people.

Since women leaders must be able to demonstrate both masculine and feminine traits, a woman leader faces extra obstacles that a male leader may not. For example, when bargaining with dissatisfied non-state actors, these stereotypes may make them more likely to be targets for violence. The political catch-22 we posit finds responses for women leaders' complicated by needing to portray compassion to her domestic audience, and aggression and strength towards terrorist activity. As we discuss in the next section, women leaders may find

themselves in a bind for how they can react.

Terrorism and Gender Perceptions

This study utilizes a definition of terrorism best captured by Enders and Sandler, who define terrorism as: "the premeditated use or threat to use violence by individuals or subnational groups in order to obtain a political or social objective through intimidation of a large audience beyond that of the immediate victims."[37] The two essential elements of this definition are the threat or presence of *violence* and a political or social *motive*. The political or social *motive* implies that terrorists are goal-oriented, rational actors.[38]

Why would a group resort to terrorism? Our understanding of the motivations behind terrorism has moved from an ideographic approach to one in which the factors of stimulus have largely diverged into institutional and societal elements[39] Researchers also model terrorism as a bargaining interaction between states and terrorist organizations, finding information inconsistencies and problems of credible commitment as contributing elements.[40] Utilizing the rational choice approach of cost-analysis, however, allows us to structure the decisions at a most basic level. Our working theory is based on Enders and Sandler's "substitution" model in which terrorists organizations deciding to substitute from terrorist to non-terrorist activities examine state efforts to either raise the price for terrorist attacks or lower the price of non-terrorist activities.[41] A high cost of terrorism manifests itself through antiterrorism laws, military action, and tighter security, while a lowered price of non-terrorist activities includes the easing of access to elections.[42]

This cost-benefit analysis supports the presence of the catch-22. It is theorized here that, due to outlined gender perceptions, the presence of a woman leader lowers the costs of terrorism relative to non-terrorist activities. This is because, under a female chief executive, her *perceived* aversion to violence due to stereotypes from the terrorists' perspective should result in a reluctance to raise the costs of terrorism by enacting stricter antiterrorism laws and engaging in the use of force. It is important to stress that this theory is centered on the terrorist organization's calculated reaction of the female leader. In effect, they are weighing the expected costs of engaging in terrorism based off of incomplete information. The presence of a female leader signals to the organization that the expected costs of a terrorist act will be lower vis-à-vis engaging in non-terrorist activities.

The reaction of the government to this terrorist activity is also critical. Scholars have found that when governments respond with repression, they are more likely to provide a broader audience base for the terrorists and could potentially hurt their ability to collect information on the group from the public.[43] This is, perhaps, counter intuitive for many regimes, and suggests that leaders must carefully choose the degree of severity when responding to terrorism. A weak response on the part of the state can trigger perceptions that a leader is incapable of dealing with the threat, while too harsh of a response can swell the ranks of terrorist organizations and even manifest in the form of retaliatory attacks.[44] When a state leader is threatened domestically, according to the "law of coercive responsiveness," it is more likely that violations of physical integrity rights will occur.[45]

The "law of coercive responsiveness" is especially problematic for female leaders when dealing with terrorist threats. A woman chief executive must be both hawkish and hard-lined with the terrorist group, but must remain caring and compassionate towards the population. In other words, we ask women leaders to display both masculine and feminine traits at once, something we do not ask male leaders to do. Again, this sheds light on the political catch-22 faced by women leaders. In terms of dealing with domestic terrorism, it can be difficult to be two things at once when terrorists can hide within that domestic population.

In other words, we bind the actions women leaders can take in regards to counterterrorism. Corazon Aquino, for example, gave permission for civilian volunteers to carry out counterinsurgency tactics, and later Amnesty International reported human rights violations by these volunteers.[46] For some, this tarnished the overtly feminine personality that Aquino was known for. Moreover, despite these efforts, the National Democratic Front and the Moros continued terrorist activity. In effect, there is no ideal degree of response that will both satisfy a frightened public and sufficiently neutralize a terrorist organization's capacity to produce violence. This is a defining characteristic of a catch-22 – a difficult situation with no easy solution.

Given the stereotypes that exist portraying women leaders as compassionate and caring, we argue that terrorist groups purposefully target female chief executives as a tool for either recruiting more members, generating more sympathizers, or getting more of their demands met by the regime. The female chief executive is in a bind in how to respond to domestic threats. In effect, women leaders must work harder to win, because if they lose it could be political suicide.[47 However, if a female leader represses her people, as many leaders do in this situation, it is the opposite of what the population expects from her due to gendered stereotypes. It is here that the second half of the catch-22 comes into effect. Walsh and Piazza posit that repression leads to a population that is less likely to work with their government to provide information and can create more sympathizers for the terrorist cause.[48] Additionally, terrorists calibrate their response to target states based off of the degree of severity of a state's counterterrorist strategy.[49] As stated previously by Caprioli and Boyer, some female executives counteract their perceived roles by behaving in a more aggressive manner.[50] In a counterterrorist situation, these instances of over aggression can trigger retaliatory terrorist attacks. Evidence of this can be seen in the assassination of Indira Gandhi by two of her own Sikh bodyguards in retaliation for her ordered assault on the Golden Temple, the Sikhs' holiest shrine.[51] Further, if she appears to lose to the terrorist group this could hurt her political career. In other words, female leaders are in a lose-lose situation when facing terrorist activity. They are in a paradoxical situation of needing to be both masculine and feminine at the same time. It can be nearly impossible to display contradictory qualities in the face of terrorism. This makes them an elevated target for terrorism, leading to our hypothesis.

> *Hypothesis: Women chief executives will experience more domestic terrorist attacks than men.*

Research Design

Dependent Variable

Data are taken from a sample of 188 states between the years 1980-2011. The unit of analysis is a country-year. Data on the frequency of terrorist violence consists of a raw count of domestic terrorist incidents that occur within a country's geographical boundaries and are taken from the Global Terrorism Database, or GTD, collected by the Center for the Study of Terrorism and Responses to Terrorism (START Center) at the University of Maryland.[52] The GTD data conform to our earlier definition of terrorism in that the incident must be intentional, include either the threat or presence of violence, and consist of sub-national actors as the primary perpetrators. To further ensure that we are working exclusively with terrorism incidents divested from other forms of political violence, the attack data consist of successful attacks in which three additional filtering mechanisms are present. Specifically, the act must be conducted in pursuit of a political, economic, religious, or social motive that is intended to coerce or intimidate a broader audience or audiences, which is outside the context of legitimate warfare activities. Additionally, the terrorist incident must be affiliated to a known terrorist organization. This is meant to distinguish attacks carried out by a single individual, a lone

wolf, from those that are the product of organizations such as Al Qaeda or the Irish Republican Army (IRA). The logic behind lone wolf terrorism can be hypothesized to stem from psychological factors inasmuch as political factors.[53] As a result, only attacks from terrorist organizations are included.

Summary statistics display a conditional mean far lower than the variance across both dependent variables, indicating overdispersion in its distribution across observations. We assume that the counts of attacks within more than one observation are not independent of one another. The main culprit behind this overdispersion is due to the large occurrence of zeroes within many of the observations in which no terrorist attacks occurred within a given year. Because of this assumption and the fact that the dependent variable consists of nonnegative integers, a negative binomial model is used rather than a Poisson or OLS method.[54]

Independent Variables

The main independent variable of interest concerns gender and leadership in the executive, and consists of a simple dummy variable, *Female Chief Executive* (FCE), coded as a 1 if female and a 0 otherwise. This is a preliminary look into the effects of gender. The theory behind terrorist violence stems from the perception of the terrorist, which circumvents the conceptual weight that the term "gender" embodies. It is reasonable to assume that the terrorist organizations within our data view gender in a binary fashion or approximate it as such. Additionally, executive leadership is the sole position of analysis due to its visibility with the public. Our theory ties gender and leadership to perceptions from the terrorist organization in addition to public expectations about how a female leader is "supposed" to govern. Given the rich literature on the dearth of political knowledge in the American electorate and the tangential evidence suggesting similar patters in Western Europe, we assume that the gender of subordinate leadership positions is something that the public is either unaware of or unconcerned with.[55] Data on the dispersion of FCEs by length of tenure in years are presented in map format in Figure 1. Darker shades indicate a longer length of tenure. The average length of an FCE is 5.31 years in office, with a standard deviation of 4.62. The minimum term is one year, which is characteristic of a sizeable minority of states with FCEs, and the maximum is 19, which was held largely via the alternations of female political rivals Sheikh Hasina and Khaleda for the position of the Prime Minister of Bangladesh. Cursory analysis of the map reveals that FCEs are not particularly concentrated in any one region of the globe, nor are they confined to any particular regime type. In addition to Bangladesh, countries that have had FCEs for the longest tenure include Norway, Finland, the UK, Philippines, and New Zealand. There are also a substantial number of states in South America and Southeast Asia that have had female leaders at one time or another. The most obvious piece of information conveyed by this figure, however, is the number countries that do *not* have a female leader in our data. This underrepresentation, compounded with the broad dispersion of female leaders and our very strict interpretation of terrorist events, provides a hard test for the effects of gender stereotyping on the part of terrorist organizations.
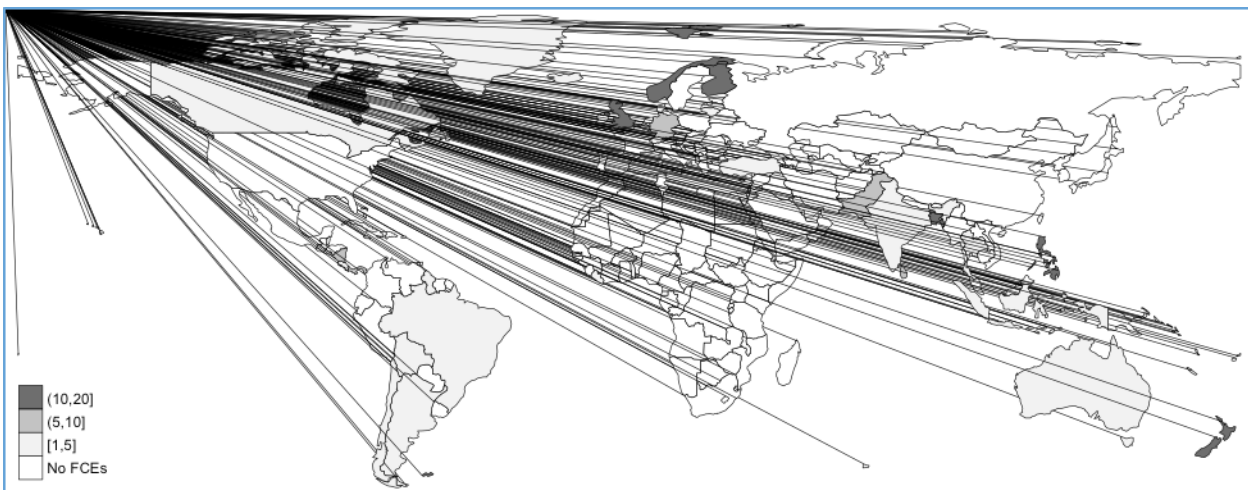
Figure 1. Map of FCEs by Term Length (years)

While both male and female leaders may be products of political dynasties or political appointments, many female leaders are chosen to serve as an interim leader to fill a void or achieve their status based off of a familial or marital relationship to a powerful male politician.[56] Furthermore, there is a consensus indicating that women who ascend to politically powerful offices are more likely to recruit women to positions of authority and are more likely to network with other women.[57] These relationships could work to mitigate the occurrence of political violence and terrorism overall, as empirical research shows that violent conflict is less likely in countries with empowered women.[58] To account for this and isolate the gender of the executive exclusively, we control for *women's empowerment*. This variable is an index taken from the Varieties of Democracy (V-Dem) project, housed at the University of Gothenburg.[59] Utilizing nine democratic indicators, the index ranges from 0 to 1, with 1 signaling complete empowerment along three political dimensions: political choice, women civil liberties, and women civil society participation. It is expected to have a negative relationship with the occurrence of terrorist violence.

The remaining independent variables attempt to set up a standard model for conditions that are favorable to the occurrence of terrorism and largely follow a model put forth by Qvortrup and Lijphart.[60] Additional controls are then added as a robustness check. The base controls intend to capture both institutional and sociological factors that create a favorable environment for terrorist activity. In effect, these variables intend to model the expected value of engaging in terrorism against the expected value of not engaging in terrorism and include some of the most frequently used explanatory variables for domestic terrorism. According to the theory outlined previously, the presence of female leadership in the executive conveys to terrorist groups that leadership is weak, and that terrorist violence will be a more effective method of conveying political change than conventional channels. Hence, female leadership increases the expected payoff of utilizing terrorism by lowering the costs of engaging in terrorist activity.

The first set of variables captures institutional features. Terrorism utilizes strategic violence against civilian targets as a political message. These distinctive features make it extremely reactive to regime type.[61] To this end, a Polity IV measure is included to capture the effects of democracy.[62] The effects of democracy in the terrorist literature can be divided into two strands of thought, each balanced upon the institutional guarantees that protect the freedom of association and expression, the assurance of free and fair elections, and the rights of citizens to participate in the electoral process as first conceptualized by Dahl.[63] Depending on the viewpoint, these protections are either a method of exploitation for terrorists, allowing

them the logistical ease to carry out their violent activities,[64] or conversely they function as an escape valve that provides a method for disenfranchised groups to eschew violence in favor of a method that allows them to peacefully air their grievances.[65]

To more precisely capture the political grievances inherent within a given state as well as the government response, two measures of repression are included. The data are taken from Cingranelli and Richards and consist of two indexes.[66] The first measures physical integrity rights and consists of an index of torture, extrajudicial killing, political imprisonment, and disappearance indicators. The second measures political empowerment and is constructed from freedom of movement, freedom of speech, workers' rights, political participation, and freedom of religion indicators in the data set. On both measures, a positive increase on the value indicates an increase in respect of rights. The logic behind the relationship between terrorism and repression is best captured through the security-liberty tradeoff. Consistent with the argument that democracies increase terrorist incidents, states with low levels of repression make especially appealing targets, because terrorists are able to exploit human rights freedoms through asymmetric tactics. This is due to their inability to defeat their enemy in the more traditional sense.[67] In effect, the game between freedom and security is zero-sum. Indeed, this tradeoff is sharper with regards to terrorism than other threats such as international war, where an enemy is an identifiable state actor.[68] However, moving to the other side of the scale by increasingly restricting rights may also drive the frequency of terrorist violence in the positive direction. The rationale within this conclusion is well defined in research on counterinsurgency, where winning the "hearts and minds" of a local population circumspect of, yet not outright opposed to, terrorist organizations is the strategic goal in order to thin the enemy's ranks.[69] This logic can be extended to terrorism,[70] and can partially explain the Obama administration's revocation of the phrase, "Global War on Terror." To further refine the effects of violence on terrorism, a *civil war* dummy is included that indicates whether a country experienced an intrastate conflict of at least 25 battle deaths within a given year, per the Peace Research Institute Oslo data.[71] Since terrorism is an oft-employed tactic in civil wars, it is expected that the presence of a civil war will increase the occurrence of terrorist violence. Although great effort was made to parse terrorist acts carried out in pursuit of civil war related goals from of the data, this variable will serve as an additional robustness check.

The remaining controls intend to measure the sociological aspects that drive terrorist behavior. *Youth bulge* consists of the percentage of the population between the ages of 10 and 25 years of age. The argument is that states with exceptionally large youth cohorts are more prone to terrorism.[72] The second control, *urbanization*, measures the proportion of the population living in an urban area. Urbanization trends towards aggregation and complexity, which increases the wealth and accessibility of targets for terrorists.[73] *Human development index* (HDI) captures the latent frustration that exists between the mixes of highly developed and less developed cohorts that could lead to acts of terrorism.[74] *GDP* is the log of a state's gross domestic product per capita and is taken from The World Bank, World Development Indicators.[75] GDP is a widely used variable in the literature that presents mixed effects. Some studies show a negative relationship with terrorism,[76] while others finds a null relationship.[77] Poverty is a reasonable grievance that could motivate terrorism, however, it is also equally possible that financial issues would not be a primary concern for ideological or religious organizations.[78] Since we make no attempt to measure terrorist ideology, we are unsure of its impact and direction of influence. A logged *population* is included, as it is suggested that countries with large populations suffer from a greater frequency of terrorist attacks.[79] Finally, to control for geographic and cultural characteristics, regional dummies are included. Summary statistics are presented in Table 1.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Attacks	5460	4.474	27.122	0	544
Major Attacks	5753	0.232	2.166	0	84
Casualties	5460	10.262	65.888	0	1953
Female Chief Executive	5353	0.033	0.178	0	1
GDP per capita, ln	4832	7.857	1.581	4.597	12.174
Youth Bulge, ln	4746	7.459	1.863	2.847	12.790
HDI	2031	40.815	9.981	16.23	99.91
Population, ln	4902	15.536	2.006	10.161	21.014
Urbanization, ln	4905	51.960	23.831	4.339	100
Polity	4290	1.932	7.368	-10	10
Electoral Parties	2455	4.778	5.065	1.23	57.56
Parliamentary Parties	2455	3.831	8.243	1	178
Women's Empowerment	4095	0.649	0.202	0.110	0.969
Physical Integrity	3579	5.029	2.303	0	8
Empowerment Rights	3579	6.013	3.257	0	10
Civil War	5656	0.128	0.334	0	1

Results

The first analyses looks at whether female executives are more likely to experience terrorism in general. To do this, the raw count data is recoded as a binary variable to record whether any acts of terrorism take place within a country year. The results take the form of a simple joint frequency distribution and are presented in Table 2. The results show a distinctive pattern. Despite only representing 3.3% of the observations, FCEs experience 7% of the incidents of terrorist violence. As Table 1 displays, the odds of a female leader experiencing a terrorist attack within a given year are approximately 60%, compared to their male counterparts at 21%. This gives us an odds ratio of .60/.21 = 2.89, indicating that female leaders have a 2.9 greater odds of experiencing terrorist attacks in a given year. These results show early support for the hypothesized relationship.

Table 2. Odds of the Presence of Terrorist Violence Within a Country-Year

	Male Chief Executive	Female Chief Executive
Absence of Violence	4436	119
Presence of Violence	919	71
Odds of Terrorist Violence	0.21	0.60

Odds Ratio = 2.879; X^2 = 51.085; $p < .001$

To test the main hypotheses of whether female leaders experience terrorist attacks in greater frequency in a

more rigorous manner, we turn to our full models employing negative binomial regression. We are interested in the effects of variables across observations as well as over time, particularly the gender of executive leadership. Because fixed effects estimation eliminates spatial variation of fixed characteristics such as gender, a random effects model is estimated.[80] In addition to a lagged dependent variable to control for temporal dependence, all time-dependent variables on the right side are lagged. Across all of the models tested, the likelihood-ratio chi-square test of the dispersion parameter is significantly different from zero, indicating that the dependent variables are over-dispersed and not sufficiently described by Poisson estimation.

The results are displayed in the Table 3 and examine the relationship between female leadership and the frequency of domestic terrorist attacks. The coefficients presented are incidence rate ratios. Since the difference in logs is equal to the log of their quotient, and we can technically interpret a count as a rate, we can remodel the regression coefficients as the log of the rate ratio. A coefficient greater than 1 indicates an increase in the frequency of terrorist attacks. Model 1 presents the baseline effects, and we can clearly see that the presence of a female chief executive increases the frequency of terrorist attacks as compared to her male counterparts. This relationship is confirmed true below a 0.05 probability of error, reporting that FCEs experience almost 40% more attacks than their male counterparts. HDI is the sole sociological variable that garners a significant effect, indicating that as the gap on development closes, there is a rise in terrorist violence by 2% with every unit increase. This is a curious finding, as it suggests that physical grievances alone are an insufficient motivator for terrorism. Significance is also observed in the Latin American and East Asian regional controls, with each experiencing almost 67% more terrorist attacks than the rest of the world.

The second model increases our understanding of the driving factors behind domestic terrorism considerably. Female chief executives still experience 42% more attacks than their male counterparts, despite the inclusion of repression controls. These three variables depict contradictory effects. Concerning the treatment of women, countries that have large numbers of empowered women experience a lower frequency of terrorist attacks by a significant margin. Indeed, increasing Women's Empowerment by a standard deviation leads to an 18.5% reduction in terrorist violence. It was hypothesized a state's repression of women may drive both the occurrence of terrorism and whether there is a female leader, thus presenting a spurious link between gender perceptions and terrorism. This control highlights that, regardless of the gender equality of a state or the manner in which a female executive achieved her status, female chief executives experience a greater frequency of terrorist attacks. The gender of the chief executive influences terrorist attacks independently of female empowerment. Hence, the gender relationship comes into even starker contrast when controlling for repression.

The two indexes of political and physical repression also reveal an interesting relationship. States with higher levels of political empowerment experience an *increase* in terrorist attacks, while respect for physical integrity results in a decrease in attacks. This relationship suggests that terrorists do indeed exploit the civil liberties that free states bestow upon their population, including freedom of speech, association, and religion. This suggests that the political "carrots" that democracies offer to their public comes with unintended costs. However, the "sticks" that states employ to counteract terrorism, such as killings, torture, and imprisonment sow the seeds of discontent that alienates the population from the government and makes it more difficult for the government to collect intelligence and appropriately monitor suspect groups.[81] Such a response undermines effective counterterrorist policies. It is also worth noting that measure of democracy reflected in the Polity IV measure becomes positive and significant when controlling for repression, which is in line with much of the literature that indicates a positive relationship between the level of democracy and the occurrence of domestic terrorism.

Finally, the full model includes the occurrence of civil wars. Looking at female leadership first, a coefficient of 1.35 is presented in model three. This indicates that the presence of a female chief executive results in a 35% increase in the frequency of terrorist attacks. When examining Women's Empowerment, we see consistent results from model 2. The effects of repression are revealed in the last column as well. Every unit increase on the 8-point scale of physical integrity, indicating respect for civilian rights, reduces the frequency of attacks by 10% while an increase on the 10-point scale of empowerment increases the frequency by 6.8%. These findings largely confirm Wilson and Piazza's (2013) study of political institutions. Their study splits institutions into military autocracies, single-party authoritarian regimes, and democracies. Out of the three regimes, single-party authoritarian regimes experience the fewest number of attacks. This is attributed to the regime's ability to achieve the correct mix of counterterrorism policies, including the "carrots" of political inclusiveness offered by democracies, with the "sticks" of physical punishment that are present largely in militaristic dictatorships

Table 3. Negative Binomial Regression: Chief Executive Gender and Domestic Terrorism Incidents, 1980 – 2011

	Model 1	Model 2	Model 3
	Incidence rate ratio	Incidence rate ratio	Incidence rate ratio
Lag Attacks	1.006***	1.003***	1.002***
	(0.000)	(0.001)	(0.001)
Female Chief Executive	1.388**	1.424**	1.348*
	(0.215)	(0.248)	(0.2178)
GDP per capita, ln	0.999	0.893	0.10
	(0.092)	(0.108)	(0.115)
Youth Bulge, ln	1.60	0.174**	0.334
	(1.016)	(0.142)	(0.264)
HDI, ln	1.018**	1.018**	1.021***
	(0.009)	(0.009)	(0.008)
Population, ln	0.801	6.817**	3.672
	(0.511)	(5.593)	(2.901)
Urbanization	1.003	1.004	1.001
	(0.008)	(0.009)	(0.008)
Polity IV	1.009	1.04**	1.041**
	(0.013)	(0.017)	(0.017)
Women's Empowerment	—	0.073***	0.077***
		(0.044)	(0.045)
Political Empowerment	—	1.097***	1.068**
		(0.029)	(0.030)
Physical Integrity	—	0.817***	0.904***
		(0.029)	(0.033)
Civil War	—	—	3.30***
			(0.503)
Africa	0.498	0.312*	0.721
	(0.293)	(0.215)	(0.429)
Latin America	0.357*	0.21**	0.818
	(0.194)	(0.129)	(0.445)
South Asia	0.833	0.28*	0.836
	(0.493)	(0.187)	(0.499)
Europe/Cent. Asia	0.506	0.155***	0.359**
	(0.262)	(0.089)	(0.177)

Middle East	1.358	0.697	1.053
	(0.878)	(0.502)	(0.66)
East Asia	0.334**	0.201***	0.569
	(0.186)	(0.126)	(0.309)
Constant	0.144	0.000**	0.000**
	(0.727)	(0.000)	(0.000)
Wald X^2	303.79***	236.05***	308.33***
Probability $> X^2$	0.000	0.000	0.000
Observations	1919	1461	1461

Standard errors in Parentheses $p < .01$***; $p < .05$**; $p < .10$*

Overall, the results across all three models of terrorist violence suggest that gender stereotyping is a global phenomenon that even reaches into relatively progressive states, and that female leaders in highly visible leadership positions can trigger terrorist violence regardless of policy preference or executive decision-making.

Robustness Checks

Given the low representation of female leadership throughout history, we previously argued that females are pressured to emasculate to a higher degree in order to convince the public that they are worthy of handling traditionally "male" centric endeavors such as conflict and international politics. To this end, Fukuyama suggests that female leaders are actually more violent than men, noting the trials of Indira Gandhi against Sikh separatists in India and her war with Pakistan, Golda Meir's hard line against the Arab world and Palestine, and Margaret Thatcher's role in the Falkland War and, more pertinent to this study, the Irish Republican Army.[82] In particular, it is speculated that Thatcher exclusively could be a driver in the gender variable due to her heavy handed policies against the IRA, which could generate a backlash of terrorist attacks sufficient to bias the small sample of female leaders. To test this, a second model is run with the Cold War dummy variable coded as a "1" for the years 1980 to 1991. The coefficients result in a minor drop in the significance and magnitude, yet the overall model shows no deviation worth note. To directly test for the "Thatcher Effect" the results were run again without the observations in which Thatcher was Prime Minister. Again, there is no significant deviation, upholding the robustness of the gender variable.

A corollary to the argument that female executives employ harsher repressive tactics concerns the direction of causality. It is posited here that terrorists perceive female leaders as weaker adversaries to their male counterparts. Figuring that the retaliation from the executive will be minimal, or that the public will chastise a female leader as ineffective at providing domestic security, terrorist organizations calculate, either implicitly or explicitly, that the costs of terrorism are lowered when a female executive is in office. However, consistent with Fukuyama, it could be that female leaders actually *are* more repressive.[83] As the results show, increasing repression of physical rights leads to an increase of terrorist violence. Additionally, there is a significant strand of literature arguing that increased repression leads to a series of retaliatory attacks, much like the relationship present in counterinsurgencies.[84] If female executives are more likely to employ physical repression, it calls into question the direction of causality. Preliminary evidence shows mixed support. A two-sample t-test shows that female executives are *less* likely to respect physical integrity rights, with a sample mean difference of -0.55 significant at .01 (Female: 4.49 – Male: 5.04), but

they are simultaneously *more* likely to uphold political empowerment rights (Female: 7.57 – Male: 5.96), with a sample mean difference of 1.61 significant at .01. A tentative argument could theorize that women are generally more inclusive towards marginalized groups, since they are traditionally a minority group themselves. This inclusion represents the softer, "feminine" aspect of their leadership. However, compared to their male counterparts, they uphold their authority with an iron fist and are quick to crush dissent, a representation of their obligation to behave "masculine" when the time calls for it. More research is needed to explain this dynamic. Regardless, to test for the direction of causality, ordered logit regressions are run on each repression variable. The results show that repression is partially a function of past attacks, but that the gender of the executive plays no role in the reaction. Since the dependent variables have a fairly wide range, the models are run again with OLS. The coefficients show minimal change and gender remains insignificant. This implies that the causality runs in the hypothesized direction.

Conclusions and Future Research

This study is one of the first of its kind to examine the relationship between women leadership in government and terrorist behavior. Utilizing existing arguments on gender stereotypes and perceptions, we extend the theoretical logic that portrays women as violence averse into a terrorist organization's cost-benefit evaluations when deciding when and how to resort to terrorism. The results both confirm and extend existing theory, finding that the perceptions of gender lower the costs of engaging in terrorist activity. Additionally, the perceived and real aggressiveness of counterterrorist strategies are magnified when conducted by a female executive, which can trigger a backlash of violence. Regardless of the mechanism, the result is the same: female leaders experience terrorist attacks with greater frequency. Consistency across all three of our models depicts a relationship that is more than an mere artifact and is something that terrorists work into their decision calculus, even if inadvertently. Though this is one of the few studies to directly look at the relationship between women and terrorism in this manner, the results should not come as a surprise. Despite the massive amount of variance among countries with regard to their treatment of women, the fact of the matter remains that there have been very few women in positions of executive leadership, revealing a reluctance of even the most progressive states to bestow such grand, far-reaching, physical and symbolic power that chief executives so often embody into the hands of a woman. Terrorist organizations comprise groups of politically and socially marginalized individuals who eschew political compromise in favor of coercive violence to achieve goals that are not in line with mainstream thought. Yet in terms of gender stereotyping, it appears that large swaths of the global public align with terrorist logic on the thought of female leadership in the seat of national security.

This research question is still in its infancy. It is unclear which side of the catch-22 drives the response variable and when. However, the robust effects of gender demonstrate that there is indeed a relationship between women leaders and domestic terrorist activity, which is strengthened further when one considers that women leaders make up less than 4% of our observations. Furthermore, female leadership is dispersed across the globe and is not regionally concentrated in any one area, which controls for specific cultural perceptions. Indeed, it appears that this is a global phenomenon, independent of any one region. Further research can more directly measure this relationship by examining the actual attitudes towards women leaders by examining the media that terrorist organizations produce. Many organizations publicize their motives in manifestos, websites, videotapes, and interviews.[85] Such material produces a wealth of knowledge into guiding philosophies and worldviews of terrorist organizations. Content analyses of news

media affirm that women are portrayed as out of place when participating in male domains such as national security and terrorism.[86] When examining the narratives of women in the war on terror, women are not perceived as legitimate actors with a sense of agency. This framing is evident even in countries in which women enjoy a relative status of equality with men.[87] As can be seen here, such a system of framing can affect actual matters of national security. Learning how these frames alter terrorist perceptions would further our understanding of gender and could quite possibly lead to methods that subtly increase both domestic and international security in ways heretofore unseen.

Another factor overlooked in this study is the ideology of the terrorist group. It is highly possible that right-wing, reactionary terrorist organizations would be more likely to oppose an executive solely on the basis of gender due to pre-established and deeply held beliefs about the social hierarchy. While it true that women join both left and right-wing terrorist organizations, including deeply conservative organizations like the Islamic State, their roles in right-wing organizations tend to be downplayed and subordinate in contrast to liberal organizations, which see greater female involvement in both proportion and leadership positions. [88] The results here treat terrorism as a monolith, its existence portrayed as a function of institutional and demographic characteristics of the state, in addition to the gender of the executive. It should be examined whether specific state characteristics, including the gender of chief executives, elicit similar or different reactions from terrorist organizations across the ideological spectrum. The significance of this study and future endeavors down this path of research are manifest and suggest that, all things being equal, a female leader will face unique challenges to ensuring domestic security that a male counterpart of the exact character and political ideology would not.

Notes

[1] Courtney R. Conrad, Justin Conrad, and Joseph Young, "Tyrants and Terrorism: Why Some Autocrats are Terrorized While Others are Not," *International Studies Quarterly* 58 (2014): 539-549.

[2] James I. Walsh, and James A. Piazza, "Why Respecting Physical Integrity Rights Reduces Terrorism," *Comparative Political Studies* 43, no. 5 (2010): 551-557; Ursula E. Daxecker, and Michael L. Hess, "Repression Hurts: Coercive Government Responses and the Demise of Terrorist Campaigns," *British Journal of Political Science* (January 2013): 1-19.

[3] Koch and Fulton (see note 1 above).

[4] Farida Jalalzai, "Women Political Leaders: Past and Present," *Women and Politics* 26, no. 3/4 (2004): 85-108.

[5] Adam Winkler, "Heller's Catch-22," *UCLA Law Review* 56 (2009, 1552).

[6] Ceilia Ridgeway, "Gender, Status, and Leadership," *Journal of Social Issues* 57 (2001): 637-655

[7] Michael Koch and Sarah Fulton, "In Defense of Women: Gender, Office Holding, and National Security Policy in Established Democracies," *Journal of Politics* 73, no. 1 (2011): 1-16.

[8] We acknowledge that gender and sex are not the same thing. We are in line with the argument that gender is a social construct displayed by people based on their biological sex and that biological sex does not necessarily define one's gender (Steans 1998). While sex and gender do not coincide with one another naturally, there are societal expectations that if one is a man one will be masculine and if one is a woman one will be feminine. This concept makes the study of gender in International Relations particularly murky, especially quantitatively. For example, not every leader in the world has explicitly stated their biological sex and their gender identification. However, we believe that understanding leadership traits is important to the study of terrorism and International Relations. In order to further this study, we must make some large assumptions about gender and sex. By no means do we employ a perfect measure of gender, but to the best of our ability we have found that biological women leaders are female and biological men leaders are male. In our research, then, we equate woman with female and man with male. Furthermore, our research will highlight some of the problems that gender and gender assumptions have for leaders. For more information, see Jill Steans, *Gender and International Relations* (New Brusnwick, NJ: Rutgers University Press, 1998).

[9] Jennifer L. Merolla and Elizabeth J. Zechmeister, "Terrorist Threats, Leadership, and the Vote: Evidence from Three Experiments," *Political Behavior* 31 (2009): 575-601.

[10] Inge K. Broverman, S. R. Vogel, D. M. Broverman, F. E. Clarkson, and P. S. Rosenkrantz, "Sex-Role Stereotypes: A Current Appraisal," *Journal of Social Issues* 28 (1972): 59-78; Irene Diamond, *Sex Roles in the State House* (New Haven, CT: Yale University Press, 1977); Ruth B. Mandel, *In The Running: The New Woman Candidate* (New Haven, CT: Tichnor & Fields, 1981); Raisa Deber, "'The Fault, Dear Brutus': Women as Congressional Candidates in Pennsylvania," *Journal of Politics* 44 (1982): 463-79; Virginia Sapiro, *The Political Integration of Women: Roles, Socialization, and Politics* (Urbana, IL: University of Illinois Press, 1983).

[11] Deborah Alexander and Kristi Andersen, "Gender as a Factor in the Attribution of Leadership Traits," *Political Research Quarterly* 46 (1993): 527-45.

[12] Lise Togeby, "The Gender Gap in Foreign Policy Attitudes," *Journal of Peace Research* 31 (1994): 375-92; Clyde Wilcox, Lara Hewitt, and Dee Allisop, "The Gender Gap in Attitudes Toward the Gulf War: A Cross-National Perspective," *Journal of Peace Research* 33, no. 1 (1996): 67-82;

[13] Juliana Menasce Horowitz, "Global Opinion of Obama Slips, International Policies Faulted: Drone Strikes Widely Opposed," Pew Research Global Attitudes Project, (June 13, 2012): http://www.pewglobal.org/2012/06/13/global-opinion-of-obama-slips-international-policies-faulted/, accessed on August 23, 2016.

[14] Wilcox, Hewitt, and Allison (see note 7 above).

[15] Alice H. Eagly. "The Science and Politics of Comparing Women and Men," *American Psychologist* 50, (1995): 145-161.

[16] Catherine C. Eckel and Phillip J. Grossman. "Are Women Less Selfish than Men? Evidence from Dictator Experiments," *Economic Journal* 108 (1998): 726-735.

[17] Koch and Fulton (see note 1 above).

[18] Nancy E. McGlen and Meredith Reid Sarkees, *Women in Foreign Policy* (New York, NY: Routledge, 1993).

[19] Miki C. Kittilson, "Representing Women: The Adoption of Family Leave in Comparative Persepctive," *Journal of Politics* 70, no. 2 (2008): 323-334; Amy Atchinson and Ian Down, "Women Cabinet Ministers and Female-Friendly Social Policy," *Poverty and Public Policy* 1, no. 2 (July 2009): 1-23.

[20] Mary Caprioli, "Primed for Violence: The Role of Gender Inequality in Predicting Internal Conflict," *International Studies Quarterly* 49 (2005): 161-178.

[21] Nichole M Bauer, "Emotional, Sensitive, and Unfit for Office? Gender Stereotype Activation and Support Female Candidates," *Political Psychology* 36, no. 6 (2015): 691-708. Jennifer Lawless, "Women, War, and Winning Elections: Gender Stereotyping in the Post-September 11th Era," *Political Research Quarterly* 57 (2004): 479-490. Mirya R. Holman, Jennifer L. Merolla, and Elizabeth J. Zechmeister, "Terrorist Threat, Male Stereotypes, and Candidate Evaluations," *Political Research Quarterly* 69 no 1 (2016): 134-147.

[22] Mirya R. Holman, Jennifer L. Merolla, and Elizabeth J. Zechmeister, "Terrorist Threat, Male Stereotypes, and Candidate Evaluations," *Political Research Quarterly* 69 no 1 (2016): 134-147.

[23] Russell J. Dalton, Yun-han Chu, and Doh Chull Shin, "Introduction: Parties, Party Choice, and Partisanship in East Asia," *Journal of East Asian Studies* 7 (2007): 177-184.

[24] Thomassen, Jacques, "Party Identification as a Cross-National Concept: Its Meaning in the Netherlands," in *Party Identification and Beyond*, edited by Ian Budge, Ivor Crewe, and Dennis Farlie, (London: Wiley, 1976).

[25] Erika Falk and Kate Krenski, "Issue Saliency and Gender Stereotypes: Support for Women as Presidents in Times of War and Terrorism," *Social Science Quarterly* 87 no. 1 (2006): 1-18.

[26] Pamela Paxton and Melanie Hughes, *Women, Politics, and Power: A Global Perspective,* (CA: Sage, 2014).

[27] Alice H. Eagly, M. G. Makhijani, and B. G. Klonsky, "Gender and the Evaluation of Leaders: A Meta-Analysis," *Psychological Bulletin* 111 (1992): 3-22.

[28] Ceilia Ridgeway, "Gender, Status, and Leadership," *Journal of Social Issues* 57 (2001): 637-655.

[29] Julie Dolan, Melissa Deckman, and Michele L. Swers, *Women and Politics: Paths to Power and Political Influence*, (NJ: Pearson, 2007).

[30] Leonie Huddy, and Nadya Terkidlsen, "Gender Stereotypes and the Perception of Male and Female Candidates," *American Journal of Political Science* 37, no. 1 (1993): 119-147.

[31] Ibid.

[32] Caprioli and Boyer 2001 (see note 1 above), 507.

[33] Pamela Paxton and Melanie M. Hughes, *Women, Politics, and Power: A Global Perspective, Third Edition*, (CQ Press, 2016).

[34] Jalalzai 2004 (see note 5 above).

[35] Ibid.

[36] Ibid.

[37] Walter Enders and Todd Sandler, *The Political Economy of Terrorism*, (New York: Cambridge University Press 2006, 3).

[38] David A. Lake, "Rational Extremism: Understanding Terrorism in the Twenty-First Century," *International Organization* (Spring 2002): 15-29; Joseph K. Young and Michael G. Findley, "Promise and Pitfalls of Terrorism Research," *International Studies Review* 13, no. 3 (September 2011): 411-431.

[39] Matt Ovortrup and Arend Lijphart, "Domestic Terrorism and Democratic Regime Types," *Civil Wars* 15, no. 4 (2013): 471-485.

[40] Harvey E. Lapan and Todd Sandler, "Terrorism and Signaling," *European Journal of Political Economy* 9, no. 3 (1993): 383-97; Ethan Bueno de Mesquita, "Conciliation, Counterterrorism, and Patterns of Terrorist Violence," *International Organization* 59, no. 1 (2005): 145-76; Navin Bapat, "State Bargaining with Transnational Terrorist Groups," *International Studies Quarterly* 50, no. 1 (2006): 213-29.

[41] Enders and Sandler (see note 24 above).

[42] Ibid.

[43] James I. Walsh and James A. Piazza, "Why respecting Physical Integrity Rights Reduces Terrorism," *Comparative Political Studies* 43, no. 5 (2010): 551-557; Daxecker and Hess (see note 3 above).

[44] Peter B. Rosendorff and Todd Sandler, "Too Much of a Good Thing?: The Proactive Response Dilemma," *Journal of Conflict Resolution* 48, no. 5 (2004): 657-671; Peter B. Rosendorff and Todd Sandler, "Suicide Terrorism and the Backlash Effect," *Defense and Peace Economics* 21, no. 5-6 (2010): 443-457.

[45] Christian Davenport, "State repression and Political Order," *Annual Review of Political Science* 10 (2007): 1-23; Steven Poe and C. Neal Tate, "Repression and Human Rights to Personal Integrity in the 1980s: A Global Analysis," *American Political Science Review* 88, no. 4 (1994): 853-872; Courtenay Rvals Conrad and Will H. Moore, "What Stops the Torture?" *American Journal of Political Science* 54, no. 2 (2010): 459-476.

[46] Carolina G. Hernandez, "the Philippines in 1987: Challenges of Redemocratization," *Asian Survey* 28, no. 2 (1988): 229-241.

[47] Caprioli and Boyer 2001 (see note 1 above).

[48] Walsh and Piazza 2010 (see note 3 above).

[49] Rosendorff and Sandler 2004 (see note 30 above).

[50] Caprioli and Boyer (see note 1 above).

[51] Clutterbuck, Richard. *Terrorism and Guerrilla Warfare: Forecasts and Remedies* (New York: Routledge, 1993).

[52] Khusrav Gaibulloev, Todd Sandler and Donggyu Sul, "Common Drivers of Transnational Terrorism: Principal Component Analysis," *Economic Inquiry* 51, no. 1 (2013): 707-721; National Consortium for the Study of Terrorism and Responses to Terrorism (START, 2011).

[53] R. Spaaij, "The Enigma of Lone Wolf Terrorism: An Assessment," *Studies in Conflict and Terrorism* 33, no. 9 (2010): 854-70.

[54] Patrick T. Brandt, John T. Williams, Benjamin O. Fordham, and Brian Pollins, "Dynamic Models for Persistent Event Count Time Series," *American Journal of Political Science* 44, no. 4 (2000): 823-843; Gary King, "Statistical Models for Political Science Event Counts: Bias in Conventional Procedures and Evidence for the Exponential Poisson Regression Model," *American Journal of Political Science* 32, no 3. (1988): 838-863; Colin A. Cameron and Pravin K. Trivedi, *Regression Analysis of Count Data* (Cabridge: Cambridge University Press, 1998).

[55] Robert C. Luskin, "Measuring Political Sophistication," *American Journal of Political Science* 31, no. 4 (1987): 856-899; Russell W. Neuman, *The Paradox of Mass Politics: Knowledge and Opinion in the American Electorate* (Cambridge, MA: Harvard University Press, 1986); Philip E. Converse, "The Nature of Belief Systems in Mass Publics," in D.E. Apter (eds.) *Ideology and Discontent* (New York: Free Press, 1964), 206-61; Jason Ross Arnold, "The Electoral Consequences of Voter Ignorance," *Electoral Studies* 31, no. 4 (2012): 796-815; Hobolt, Sara B., "Taking Cues on Europe? Voter Competence and Party Endorsements in Referendums on European Integration," *Europe Journal of Political Research* 46, no. 2 (2007): 151-82. Models run including the gender of Defense Ministers and Foreign Policy Ministers yielded insignificant results. Given that we have no strong theoretical reasoning for their effect, they are not included in the final results.

[56] Louise K. Davidson-Scmich, "Gender, Intersectionality, and the Executive Branch: The Case of Angela Merkel," *German Politics* 20, no. 3 (2011): 325-341.

[57] Azza Karam and Joni Lovenduski, "Women in Parliament Making a Difference," in Julie Ballington and Azza Karam (eds.) *Women in Parliament: Beyond Numbers* (Stockholm: IDEA, 2005).

[58] Caprioli and Boyer 2001 (see note 1 above).

[59] V-Dem Data: Varieties of Democracy. University of Gothenburg. https://www.v-dem.net/en/data/data-version-6-1/ (last accessed August 25, 2016).

[60] Ovortrup and Lijphart (see note 23 above).

[61] Matthew C. Wilson and James A. Piazza, "Autocracies and Terrorism: Conditioning Effects of Authoritarian Regime Type on Terrorist Attacks," *American Journal of Political Science* 57, no. 4 (2013): 941-955.

[62] Monty G. Marshall and Keith Jaggers, "Polity IV Project: Political Regime Characteristics and Transitions, 1800-2013" Center for Systemic Peace, http://www.systemicpeace.org/polity/polity4.htm (last accessed August 24, 2016).

[63] Dahl, Robert A. *Polyarchy: Participation and Opposition* (New Haven, CT: Yale University Press, 1971).

[64] Jeffrey Ian Ross, "Structural Causes of Oppositional Political Terrorism: Towards a Causal Model," *Journal of Peace Research* 30, no. 3 (1993): 317-29; Joe Eyerman, "Terrorism and Democratic States: Soft Targets or Accessible Systems," *International Interactions* 24, no. 2 (1998): 151-70; Max Abrahms, "Why Democracies Make Superior Counterterrorists," *Security Studies* 16, no. 2 (2007): 223-53; Kyle T. Kattelman, "Testing the Prisoners' Dilemma of Counterterrorism: An Aggregate Analysis of Counterterrorist Efforts from 2001 to 2010," *Journal of International Relations and Development* (2014): doi:10.1057/jird.2014.26.

[65] Burcu Savun and Brian J. Phillips, "Democracy, Foreign Policy, and Terrorism," *Journal of Conflict Resolution* 53, no. 6 (2009): 878-904; Quan Li, "Does Democracy Promote or Reduce Transnational Terrorist Incidents?" *Journal of Conflict Resolution* 49, no. 2 (2005): 278-97.

[66] David L. Cingranelli and David L. Richards, *The Cingranelli-Richards (CIRI) Human Rights Dataset* http://www.humanrightsdata.com/ (last accessed June 17, 2016).

[67] Eric A. Posner and Adrian Vermeule, *Terror in the Balance: Security, Liberty, and the Courts* (New York, NY: Oxford University Press, 2007); Enders and Sandler (see note 24 above); Grant Wardlaw, "Terrorism, Counter-Terrorism, and the Democratic Society," in *Government Violence and Repression: An Agenda for Research*, (eds.) Michael Stoh and George Lopez (Westport, CT: Greenwood, 1986).

[68] James I Walsh, and James A. Piazza, "Transnational Terror and Human Rights," *International Studies Quarterly* 53 (2009): 125-48.

[69] Anthony James Joes, *Resisting Rebellion: The History and Politics of Counterinsurgency* (Lexington, KY: University of Kentucky Press, 2004).

[70] Martha Crenshaw, "The Causes of Terrorism," *Comparative Politics* 13, no. 4 (1981): 379-99; Rosendorff and Sandler, 2004 (see note 31 above).

[71] Kristian Gleditsch, "Expanded Trade and GDP Data," *Journal of Conflict Resolution* 46, no. 5 (2002): 712-24.

[72] H. Urdal, "A Clash of Generations? Youth Bulges and Political Violence," *International Studies Quarterly* 50, no. 3 (2006): 607-29.

[73] Crenshaw (see note 53 above).

[74] Qvortrup and Lijphart (see note 23 above).

[75] The World Bank: World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators (last accessed August 24, 2016).

[76] Li, (see note 48 above); Abdelaziz testas, "Determinants of Terrorism in the Muslim World: An Empirical Cross-Sectional Analysis," *Terrorism and Political Violence* 16, no. 2 (2004): 253-73.

[77] Alberto Abadie, "Poverty, Political Freedom, and the Roots of Terrorism," *American Economic Review* 96, no. 2 (2006): 50-56.

[78] Savun and Phillips (see note 48 above).

[79] J. P. Azam and A. Delacroix, "Aid and the Delegated Fight Against Terrorism," *Review of Development Economics* 10, no. 2 (2006): 330-44.

[80] We are interested in change within observations across time as well as between observations. Additionally, since the occurrence of FCE is so rare (i.e. little variation in the independent variable of interest both within and between observations) it is difficult to determine which estimator is more appropriate. Clark and Linzer (2015) argue that correlation between the regressor and unit effects is an insufficient justification for fixed effects. As a robustness check we ran models using both fixed and random effects. The results are largely consistent between the two specifications, indicating that the impact of choice is minimal. For more information, see Tom S. Clark and Drew A. Linzer, "Should I Use Fixed or Random Effects?" *Political Science Research and Methods* 3, no. 2 (May 2015): 399-408.

[81] Walsh and Piazza 2010, (see note 3 above).

[82] Francis Fukuyama, "Women and the Evolution of World Politics," *Foreign Affairs* 77, no. 5 (1998): 24-40.

[83] Ibid.

[84] Rui J. P. Figueiredo and Barry R. Weingast, "Vicious Circles: Endogenous Political Extremism and Political Violence," Unpublished Manuscript. Available at http://faculty.haas.berkeley.edu/rui/m13.04.pdf (last accessed August 24, 2016). Crenshaw, (see note 53 above); Rosendorff and Sandler 2004, (see note 31 above).

[85] Bruce Hoffman, *Inside Terrorism* (New York: Columbia University Press, 2006).

[86] C. Ortbals, M. Rinker, and C. Montoya, "Politics Closer to Home: The Impact of Subnational Institutions on Women in Politics," *Publius: The Journal of Federalism* 42, no. 1 (2012): 78-107.

[87] Lori Poloni-Staudinger and Candice Ortbals, "Gendering Abbottabad: Agency and Hegemonic Masculinity in an Age of Global Terrorism," *Gender Issues* 31 (2014): 34-57.

[88] Karla J. Cunningham, "Cross-Regional Trends in Female Terrorism," *Studies in Conflict & Terrorism* 26 (2003): 171-95.

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Remembering the Present: Dealing with the Memories of Terrorism in Europe

by Ana Milošević

Abstract

Whilst the interest of memory scholars in political violence and more specifically in terrorism is not novel, there appears to be a certain urgency to reflect upon memories of terrorist violence in collective, European immaginarium. By questioning how to deal with these memories and how the process of remembrance of the victims of terrorism will pave its way into a European memory culture, this article analyses spontaneous memorialization of the victims of terrorist attacks in Brussels (2016).

Whilst the interest of memory scholars in regards to political violence and more specifically, terrorism, is not novel, immediately following the terrorist attacks in Paris (2015) and Brussels (2016) there appears to be a certain urgency to reflect upon these nascent memories in collective, European *immaginarium*. This article traces the development of a "bottom-up" memorialization process in the immediate aftermath of terrorist attacks in Brussels (March–July 2016), questioning how these acts of terrorisms will settle in our collective memory. By scrutinizing unprompted memorialization of the Brussels' attack victims, I analyse social meanings and roles assigned to the spontaneous memorialization emerging in hours and days after these traumatic events. The implicated research is based on data collected through the techniques of ethnographic observations, explorative interviews with the visitors and documentary analysis of memorabilia in three spontaneous memorials' sites (*Place de la Bourse*, *Maelbeek* and Zaventem airport). Arguing that spontaneous memorialization is more than a simple vehicle for coming to terms with a trauma and a pre-step of "official" memory works, this article draws attention to the challenge before policy makers of transforming these ephemeral places of memory into an "official" monument without disfiguring the meanings to it attached by their own makers.

Keywords: *collective memory; Brussels attacks; terrorism; spontaneous memorials; memorialization; European memory;*

Introduction

The morning of 22 March 2016, two separate terrorist attacks occurred in Belgium, one at the Airport in Zaventem and the other at Maelbeek metro station in Brussels [1]. Plunging the city into a day-long lockdown, many of the Brussels' residents disobeyed the Government's calls to stay at home: in a symbol of defiance and solidarity, assembling spontaneously at the *Place de la Bourse (*The Bourse) to pay tribute to the victims of the attacks. The Bourse, Brussels' stock-exchange plaza, was transformed into a spontaneous memorial–a giant blackboard where people with chalk draw images and wrote messages of peace, solidarity but also of anger. As in the *Place de la Republique* after the Paris attacks [2] (2015), the emergence of spontaneous memorials became a vehicle for dealing with trauma, deliberation of emotions and narratives of

what was a societal response to a tragedy.

Collective trauma whether of natural (e.g. earthquake, hurricane) or human-made causes (e.g. terrorism, plane-crash) has the capacity to affect an entire community. "At times, a collective traumatic event is so overpowering, so shattering, that it tests that stock of knowledge and if that cultural system can offer no real explanation for the event or its aftermath, the members of the culture are left epistemically disempowered, that is, they are at a loss to explain what happened and why, and to derive any meaning from their own suffering" (De Young 1998). Yet, "differently from the past traumatic experiences often perceived as natural and inevitable, the nature of the violence and trauma has changed recently, making it possible for a collective response to trauma" (Moodley and Costa 2006, 40). The death of celebrities such as Lady Diana (1997), Chernobyl nuclear disaster memories (1986) or numerous mass-shootings in the American high-schools illustrate that the grief, "the intensely painful experience that results when a meaningful loss has occurred" (Granek 2014, 61), seems to transcend the individual's realm of expression as "collective traumas [can] negatively affect large numbers of people who ostensibly did not experience traumatic events directly" (Seery et al. 2008, 657).

After the events in Madrid [3] (2004), London [4] (2005), Utøya (2011) [5] and especially the attack on satiric journal Charlie Hebdo in Paris (2015), the question of how to deal with the memory of terrorism and its victims is steadily gaining momentum throughout the whole of Europe. In the days and months after the most recent attacks in the aforementioned European capitals, the pressing issue in politics and society seems to be a reflection of: the nature of terrorism itself, the destiny of the victims and their families, prevention of further attacks and motivation behind "a home-grown terrorism" (Tota 2005). As Tota (2005, 56-57) argues: "In the short-term perspective, both politically and scientifically speaking, immediately after a terror attack the most important thing is to find out by all possible means how to prevent further attacks and prosecute the terrorists." Nevertheless, wider social consequences of these collective traumas must not be underestimated: How will these acts of terrorisms settle in our collective memory? Shall the victims be memorialized by the official memory entrepreneurs or they shall continue to "live on in hearts but not in stone?"

Spontaneous memorials emerging in an immediate aftermath of a terrorist attack (e.g. *Place de la Republique*, Paris; *Place de la Bourse,* Brussels) seem to increasingly appeal not only to the local community but also to the other groups and communities who did not directly suffered a trauma or a human loss. In addition, if we observe the most recent acts of terror, such as the Nice attack [6] (2016) or Orlando shootings [7] (2016) , emergence of a spontaneous memorial after a collective trauma does not appear anymore to be an exception but an unwritten rule. What role do different memory actors (e.g. citizens, victims' families, governmental officials) ascribe to these spontaneous memorials? Can we consider this "bottom-up" memorialization to be a societal answer to a trauma or a collective expression of grief that makes use of memorialising language (e.g. "never forget", "remember", "forever in our hearts")?

Not much is known regarding the process of spontaneous or unprompted memorialization that precede "official" memory works such as: establishment of remembrance days, creation of a memorial or a monument. In addition, the vast literature on memorialisation offers limited answers in terms of memorials remembering the victims of terrorism – a relatively a new form of public monument which still have not gained significant scholarly attention (see e.g. Moodley and Costa 2006, Savage 2009, Donofrio 2010). In terms of existing cases, there have been few attempts of studying memorialization process involving the victims of terrorism in European context, with an exception of the Northern Ireland, Spain and Italy (see e.g. Tota 2004, 2005, 2013; Margry and Sànchez-Carretero 2007, 2011). There is a need for a better understanding

of how society copes with the trauma of terrorism through memorialization, especially in the immediate aftermath of the event when narratives and meanings of the traumatic event are being rehearsed and negotiated (see e.g. Simpson and Corbridge 2006).

This article seeks to foster–as well as contribute–to the empirical exploration of "spontaneous" memorials (Santino 2006), specifically addressing their potential to represent as mnemonic loci which could play an important role for setting the tone for how traumatic events will enter the collective memory. To this end, the article limits its range of the "knowable" to the early memorialisation process emerging in hours, days and months after the traumatic event. I cautiously refer to this time-frame as "pre-memorial"–defined by Simpson and Corbridge (2006, 566) as "the period before an official memorial is erected when the gap between the signified [traumatic event] and the signifier (the memorial) is still wide open and meanings and narratives of the disaster are being created, rehearsed, and contested." As argued in this paper "bottom-up" memorialization–unofficial and unprompted memory work occurring in an immediate aftermath of a traumatic event is likely the beginning of the overall memorialization process rather than a pre-stage of "official" memory works which might sub-enter later.

The article unfolds as follows: first, I discuss the nexus between memorialization theory and terrorism studies. In this section, I shed more light on the evolution of the process of memorialization analysing the relationship between permanent and spontaneous memorials and their memory actors. Secondly, by drawing evidence from unprompted memorialization of the Brussels attacks (2016), I ascertain the social meanings of spontaneous memorials, analyse mnemonic practices and purposes ascribed to them by various stakeholders. Next, I analyse the contents of spontaneous memorials as well as their life cycle – the period between the emergence and perishing either through transformation or dismantlement. In the closure, I discuss my findings in a light of a broader literature on memorialization.

Dealing with the memories of terrorism: Between "official" and vernacular, permanent and ephemeral

Studies addressing traumatic grief and memorialisation after a terrorist attack, while increasing, are small in number (e.g. Alexander et al. 2004, Tota 2005). A number of authors have considered how individuals cope with the acts of terrorism, violence and psychiatric symptoms such as the Post-Traumatic Stress Disorder, PTSD (e.g. Hobfoll et al. 2006; Moodley and Costa 2006). Thus far, many psychologists have studied how memory is mobilized to engage individuals and groups in terrorism and political aggression (e.g. Friedland and Merari 1985, Ginges and Atran 2009) while sociologists, historians and political scientists have sought to determine how societies and individuals remember (e.g. Halbwachs 1925, Anderson 1983, Nora 1989, Assman 2008) and deal with massive human rights violations and violence (e.g. Connerton 1989; Misztal 2003; Zerubavel 2004). Extensive research on memorialization and societal dealing with the past, atrocities of the Holocaust, totalitarian regimes, political violence, genocide and mass-murder (e.g. Arendt 1951; Levi 1958; Jaspers 1961; Bloxham 2005; Connerton 2012) suggests that memory matters both culturally and politically.

As a dynamic process, memorialization is marked by different activities providing the opportunity for people to "celebrate the lives of those who died, to mourn their passing, and to inscribe memories of the deceased in the public consciousness" (Foot et al. 2006, 72). Thus, memorialization can be achieved in many ways, not exclusively using physical memorials such are monuments or museums often created in later stage, but additionally through commemorative rituals, governmental responses and spontaneous memorials preceding "official" memory works. Among these expressions of memory, public sites play an important

role in honouring the victims of violence and offering a specific locus for mourning. Pierre Nora's concept of *les lieux de mémoire* – as places "where [cultural] memory crystallizes and secretes itself " (Nora 1989, 7), has been central in last two decades in understanding the purpose of these sites of memory born out of "a will to remember," "to stop time, to block the work of forgetting" (Nora 1989, 19). For Nora (1989,12) *lieux de mémoire* "originate with the sense that there is no spontaneous memory, that we must deliberately create archives, maintain anniversaries, organize celebrations, pronounce eulogies, and notarize bills because such activities no longer occur naturally." However, as Jay Winter (1995) reminds us "sites of memory" are also" sites of mourning," and as such they reflect the tension between official and vernacular expressions of memory.

The concept of "spontaneous shrines" (Santino 2006) challenge the view of memorialization as a symbiosis of the past and the present, as it considers unprompted mnemonic practices to be more of a contemporary mourning ritual (Santino 2003, 367), located between commemoration and social activism. Born in the present, spontaneous memorials look both in the immediate past and the future, uncontrolled and unconditioned by a previously established narrative of the event. In this sense, improvised memorials could be considered vernacular expressions of memory that has emerged in a response to the present traumatic event. As such, the latter are not an artefact of the time or "official" memory entrepreneurship which might encapsulate certain thinking about the past.

Another characteristic of these spontaneous places of memory is their apparent tendency to emerge promptly after the traumatic event accommodating a wide range of memorial purposes. As this article attempts to enunciate, memorializing helps survivors deal with the sense of loss, fear, uncertainty, helplessness as well as sorrow, and as such encompasses both "a shared memory and an act of collective grieving aiming to restore severed communal bonds and dismantled cultural ideals"(Pivnick 2011, 500). Free of official memory entrepreneurship, these sites of memory are not just vernacular expressions of memory but a pluralistic societal answer to traumatic event. The meanings, emotions and narratives derived from spontaneous memorialization therefore could be crucial in determining how the traumatic event will settle in collective memory.

Certainly, the most well-known example of memorialization of the terrorist victims is the Ground Zero–Memorial to the victims of September 11 (i.e. 9/11). What characterizes the memorialization process of the 9/11 is the often-unchallenged assumption of the decision makers that memorialization offers some kind of closure to participative community. Yet, it is not often that the community is included in the process of designing and construction of memorials, but offered a "creative" solution to come to terms with a tragedy in a form of an "official" monument. In her research on the plans for official memory works at the Ground Zero, Donofrio (2010, 150) investigated how an advocacy platform [8] made of family members of the 9/11 victims, attempted "to establish the authority to guide memorial construction by dismissing competing rhetoric as 'political' and employing conservatively charged metaphors of ownership." Her research demonstrates that the Ground Zero became site of "power struggle" between the official and vernacular, the top-down and bottom-up approaches to remembrance. Thus, it might be argued that the shift from spontaneous memorialization to an "official" monument, carries in-and-of-itself a potential danger of misinterpretation and instrumentalization of the meanings attached to places of memory by the "official" memory entrepreneurs or other stakeholders involved in the memorialization process.

Butler (2009) argues that when lives are publicly grieved, the ways in which this grief is conjured up in public discourse is a deeply political issue with tremendous consequences. The example of Ground Zero

again, illustrates this point clearly. Granek (2014, 65) shows that "the public mourning that followed 9/11 was encouraged and later used by political figures as justification for invasion of Iraq, despite the fact that it was Al Qaida who had taken responsibility for the attacks." For this purpose, the process of memorialization transformed the lives lost into symbols of American patriotism and heroism (Doss 2008). As Granek (2014, 65) stipulates, there is a "tremendous power in the manipulation of grief for political purposes and the ways in which it [is] consciously used in the service of particular political aims."

Comparing emergence of memorials after the Oklahoma and 9/11 with Madrid bombing (2004) and London bombing (2005), Joralemon (2015, 188) finds that American memorial projects extend "well beyond the therapeutic management of individual or collective grief." He argues that "the long experience with terrorism in the United Kingdom and Spain has produced a more measured response" to the traumatic event, reflecting in turn in their memorials which are "far simpler and less bureaucratic" (Joralemon 2015, 188). In contrast, American memorials to the victims of terrorism seem to advance "the powerful ideology of American exceptionalism by proclaiming a Phoenix-like rebirth after assaults on the nation's sense of invincibility, whether from traitorous home-grown extremists or foreign religious zealots" Joralemon (2015, 188). As such, these memorials are often reflective of nation and state based narratives regarding war and security (Doss 2008) while the narratives of victims [9], victims' families and groups are often obscured by more dominant memorial discourses, namely government and media dominated narratives (Low 2004). This approach to memorialization is highly criticized by the victims' families who are considered important stakeholders, playing a critical role in the transition from spontaneous to a permanent memorial (Britton 2007).

The preservation of the informal character of these memorials is likely dependant from the impact it has on society and the interest it raises. Prior research into the "official" acknowledgement and acceptance of these spontaneous memorials has demonstrated that "the staying power of memorial depends of municipal lenience and on memorial's continued usefulness, the sacrality it generates, and the respect that evokes" (Margry and Sánchez-Carretero 2011, 13). Nevertheless, spontaneous memorials are straddling "between the realms of public and private space "(Margry and Sánchez-Carretero 2011, 13) and as such are not entirely free of agency of public officials, governments and various organizations that deal with the public space (e.g safety, health, maintenance). In addition, spontaneous memorials emerge also in places such are e.g. metro stations, airports, supermarkets which all prior to the traumatic event had a distinct purpose and were managed by both private and state businesses. Therefore, these factors of re-establishment of original or intents purposes could also have an important effect on the temporality of emergent memorials, referred to here as a "life cycle of spontaneous memorial." Bearing in mind the temporality of the spontaneous memorials, this study divides life-cycle of spontaneous memorials into three stages: emergence – marking the birth of the memorial; life – period between the emergence and the first signs of dismantlement of site and finally, perishing – which refers to either an evolution of the memorial or its disappearance.

The primary research methods used for the research included semi-structured interviews with the visitors of memorials, site observation, and visual content analysis of memorabilia at three spontaneous memorials. From the moment of the occurrence of the terrorist act on March, 22. through first two (2) weeks, the main site (*Place de la Bourse*) was visited seven (7) times, while the other two sites (*Maelbeek metro* and *the Brussels airport*) were visited in four (4) occasions between March and July 2016. Based on field observations (Svendsen and Campbell, 2005), the goal with the site visits was to observe and analyse the life cycle (emergence, life and perishing) of spontaneous memorial while attempting to capture:

- Who are the initiators of the process? What groups, what individuals?

- What is the memorial purpose and meaning assigned to these memorials?

- Physical and spatial structure of memorial

- The contents and contexts of memorabilia present in the site

- Eventual shifts in terms of number of visitors, media attention, introduction of scheduled maintenance

- Factors affecting the temporality of memorials

- First signs of introduction of "official memory" works

Exploratory interviews (24) with the mourners were held as a means of investigating the main function of memorials, roles and meanings attached to them by their own makers. Considering that many of the visitors were non-Belgian residents of Brussels, interviews were held not only in French but also in English and Italian language. Interviewees included friends and acquaintances of the victims and (at the certain point of time) the missing, bystanders, community members as well as journalists and street sweepers. In addition, photographs of memorabilia placed on the site were taken, creating a data base which consist of 212 pictures of chalk written messages, post-it papers, images and other objects found in-site (e.g. stuffed toys, candles, flowers, bottles, flags). Photographs were classified by date of the visit to the memorial and the events occurring on that day (e.g. mass anti-immigrant protest, visit of the Prime Minister).

A visual content analysis of the photographs was undertaken to explore and analyse the imagery and material dimensions of the memorials and memorabilia under this study. Images were coded according to their content: the messages written and/or type of the object portrayed in the picture. The frequency of certain elements in the images was analysed and linked to thematic clusters emerging out of key words, phrases, repeated language, and common ideas (Svendsen and Campbell, 2005). The latter were created to aggregate common codes together into broader themes in order to provide information about the meanings attached to the memorial and memorabilia (Ryan and Bernard, 2003; Svendsen and Campbell, 2005).

Sharing tears and fears: Emergence of spontaneous memorialization after the Brussels attacks

All over Europe "tears, real and symbolic, ran throughout the day" (Guardian 2016e).

When the first bombs exploded in the departure area of the Zaventem Airport in Brussels, images from the explosions were immediately published on witnesses' social media accounts and taken over by the international media. Pictures of the wounded, dead and terrified passengers running for their lives were broadcasted by almost every TV station in country. While the news of the attacks was seemingly shaking the whole world, an hour later, a third explosion hit a rush hour metro train at Maelbeek station on the Rue de la Loi, which connects city centre with the main European Union institutions. With emergency services rushing to the both parts of the city, Brussels became silent and paralyzed by the shock, with children locked in schools and residents invited to stay where they were until the further notice. A few hours after the tragedy, a small group of citizens, some of them with children, started gathering near the Bourse [10]. In a solemn silence, mourners were praying for the victims and the wounded, lighting candles and crying. By 6 o'clock in the afternoon, Belgian Prime Minister Charles Michel and the European Commission's President Jean-Claude Juncker visited this emergent spontaneous memorial in the city centre, the plaza was crowded with mourners and covered with messages, flowers and banners. A night-long, candle-lit vigil was taking place

while the news of increasing number of wounded and dead founded under debris was whispered among worried mourners.

People from around the world have shown their solidarity with Belgium on social media, as they did previously with Paris, sharing pictures of the famous Belgian Statue Mannequin Pis relieving himself on an assault rifle and of Tintin – Belgium's beloved boy reporter – crying. The iconic Eiffel Tower in addition to other world landmarks such as Burj Khalifa in Dubai, The Brandenburg Gate in Berlin or Rome's Trevi fountain lit up in colours of Belgium: black, yellow and red. In what was emerging as a global wave of commemoration National landmarks were used to express transnational solidarity with Belgium and its victims. This seems to have become an unwritten rule which when not honoured tends to provoke a strong reaction of citizens. For example, in the United Kingdom (UK) media verbally attacked the Mayor for almost no major London monuments took part in the commemorations immediately after the attack. Unlike after the Paris attacks in November 2015, prominent monuments such as Trafalgar Square, the London Eye and Tower Bridge were not lit in different colours immediately after terror attacks in Brussels (Dailymail 2016), rather a few hours later. The terrorist attack in Brussels seem to have provoked not only as Habermas (2012) would say "solidarity among strangers," but also a global wave of grief, resulting in a visible pattern of transnational commemorative practices such is the emergence of spontaneous memorials, erected in honour of victims of the terrorist attacks [11].

In Brussels, three main spontaneous memorials emerged in the following order: *Place de la Bourse* (The Bourse), *Maelbeek* metro station and the Zaventem Airport. Initiators of all three memorials range from witnesses and individual survivors and the communities in which they live, to private sector enterprises such are the companies operating in the Zaventem airport or the Brussels' public transportation company, STIB. Among these spontaneous memorials, the Bourse emerges as a central locus of memorialization. The first memorial to emerge was also first in terms of number of visitors, physical surface covered by the memorial and visits of high-profile mourners (e.g. politicians, religious leaders, celebrities).

In the hours immediately following the traumatic event (up until the end of the second week), all three memorials shared a certain number of similarities. As a paramount, emergence of Brussels' spontaneous memorials took place in a "safe environment." Especially in the hours after the attacks, the act of going to the Bourse memorial, itself, became a demonstration of courage and solidarity. While citizens were invited to avoid public gathering because of security concerns, "visiting the memorial was an act of defiance" – explain several interviewed visitors (2016). "I refuse to be taken as a hostage by the fear of terrorists" says a young student from one of the local Universities while humming a song in French (Interview 2016). Despite the appeals to "stay home and stay safe" many of interviewed visitors felt the need to collectively mourn and share they tears and fears of "being blown-up" and "dying without a reason" (Interview 2016). While *Place de la Bourse* was considered to be the main memorial to which was given significant media attention, other two memorials (where the tragedy actually occurred) emerged the day later [12]. Once that the extraction of the victims and wounded was over in Maelbeek and Zaventem, and the sites proclaimed "safe," mourners started creating memorials by bringing flags, banners, flowers, candles, teddy-bears and other memorabilia.

The second similarity shared by all three memorials is the claim of "authenticity" and closeness to the place of tragedy. While for the Maelbeek metro station and the Airport–as actual sites of death and trauma, the claim of authenticity is direct and linear, *Place de la Bourse* received a different kind of authenticity validation. Visits from Belgian politicians amongst them the Prime Minister Charles Michel in the afternoon of the first day of memorials' existence, confirmed its importance–as a place of authentic, living memory. Adding to this

validation of authenticity was also the ever-growing media attention for the memorial, with journalist and TV reporters from around the world constantly interviewing and filming the site and its mourners. Strong media presence of journalists and reporters in Brussels contributed to the fast coverage and immediate distribution of images and videos of the attack, while survivors themselves often had the role of real-time reporters sharing their smart-phone's videos and images from crime scenes. Journalists and TV reporters were therefore numerous spectator-visitors who turned these sites of memory into a "media event" (Dayan, 2006). [13]

The violent scenes from the terrorist attacks received world-wide coverage, nevertheless, they were not merely a "media event" but also a manner in which to frame public debate and remember these events, as not only personal or national but also as European issues. Several facts can support this observation. First and the foremost, in the media coverage of the attacks, Brussels is always referred to as "the capital of Europe." Secondly, governmental responses and statements, issued in immediate aftermath of the attack, frame "the event" as "an attack on Europe" and "European values". Few hours after the explosions, French president Francois Holland, as the first European leader to publicly react to the terrorist event, expressed his solidarity with Belgian people saying that Europe was under attack (EU Observer 2016). In an opinion piece in the "Guardian", Italian PM Matteo Renzi writes: "It is true they hit Belgium, but they also hit the capital of Europe," arguing that "terrorists aim to threaten our freedom because they know it is what makes us Europeans" (Renzi 2016). Among the reactions to the attacks by political figures, the image of the EU's foreign policy chief Federica Mogherini crying is certainly one of the most memorable moments. Unable to finish her speech, she told the Jordanian foreign minister, Nasser Judeh: "I will stop here. You will understand this. Today is a difficult day" (Guardian 2016e).

The Bourse memorial: Site of Contestation, Negotiation, and Resistance

The community of bereavement in these three sites was in time joined by other groups: visitors, bystanders, religious leaders as well as other groups of citizens (e.g. musicians, celebrities) who assigned a broad range of meanings to the memorials. Moreover, many children had been taken to the chalk memorial and candlelight vigil created outside the *Place de la Bourse* building, offering messages of encouragement, lighting candles alongside adults similarly searching for answers and comfort in the wake of tragedy.

The Bourse was considered also to be a performance stage for both groups and individual expressions of emotive, social and political identity in a public space. As was the case in Brussels and additionally in *Place de la Republique* after the Paris attacks, different stakeholders (e.g. musicians,) were expressing their own identity and conveying their messages of peace. In both Paris and Brussels, anonymous local musicians performed John Lennon's song "Imagine" engaged the mourners who in one voice sang: "All we are saying is: Give peace a chance." In the Bourse plaza, the Brussels Philharmonic and Vlaams Radio Koor performed Beethoven's "Ode to Joy," "not only [as] the European anthem, but also a call for peace, a hymn of hope for the future" (Vlams Radio Koor, 2016). While the initiative to join the mourners at the Memorial site came directly from the musicians, they had chosen also to perform seeing as "music bonds, helps with healing, with dealing with what has happened, bringing people together" (Vlams Radio Koor, 2016).

However, early politicization of the memorial and abuse of the media attention surrounding the locales occurred starting the first week of the life of the memorial. There were several episodes of Israeli-Palestinian contestations: a hijab-wearing woman was filmed lifting a Palestinian flag while tearing up an Israeli flag to shreds (New York Post 2016); another man was seen picking up a Palestinian flag and placing it over

the Israeli flag so it can no longer be seen (Dailymail 2016). In another episode a man stepped into the circle of flags and candles, demanding "justice for Palestine!" Some of gathered mourners protested against his actions, booed the man, shouting for him to "focus on Brussels today" while the others cheered and applauded his statements. Whereas the Bourse was used as a place for Israeli-Palestinian contestations, the Memorial became also a stage for expression of domestic tensions between the national political forces. Domestic political parties, as for example the Flemish, right-wing party *Vlaams Belang* politicized the terrorist attacks publicly in the media by propagating an anti-Islamic and anti-immigrant measures in response to the attacks. In addition, the party laid a wreath decorated with the Belgian flag and writings "*Vlaams Belang*" at one of spontaneous memorials. More than an expression of grief for the victims, the wreath itself appeared to be a political statement.

While the memorial was used as a performance stage and a platform by various stakeholders with a political agenda, the most striking moment was the march of anti-immigrant protesters in the first days after the terrorist attack. On 27 March, hundreds of hooligans, some wearing balaclavas and anonymous masks, pushed their way to the Bourse, in an anti-immigrant, islamophobic protest that provoked strong yet peaceful reaction of gathered mourners. Protesters, mainly football supporters, posing as members of "Casuals against terrorism" moved in and occupied the steps of the Bourse – an improvised altar of the memorial. In front of them lay accumulated flowers, candles and other memorabilia–the core of memorial. Across the memorial, mourners and visitors (according to some media outlets around 400 of them) in shock observed "intruders" chanting and taking over the public space. Soon everybody was surrounded by journalists, TV reporters and the riot police. The memorial became an arena in which participants, both rioters and mourners, verbally and physically defended their right to voice, *albeit* different, opinion, emotions and political views.

Riot police intervened to try to restore order after the group confronted Muslim women in the crowds and made Nazi salutes (BBC 2016). Not only were the protesters chanting nationalist and anti-immigrant slogans and songs, they were also destroying the memorial by trampling the accumulated flowers, candles and slogans. "We don't believe in candles and flowers. That is for the dead" said one of the rioters to numerous journalists (National Post, 2016). In already forming collective memory of the bystanders, visitors and present mourners, the "savage" act of de-sacralisation of the memorial was taking place. In this sense, the Bourse Memorial was considered to be a consecrated place whose sacredness was threatened by the outsiders (i.e. non-mourners). When the police hit the protesters with a water cannon and a pepper spray, dispersing them forcefully from the city centre, the memorial became also the place of violent contestation. The Belgian Prime Minister and the City Mayor have strongly condemned this behaviour. Charles Michel, the Belgian prime minister, said: "It is highly inappropriate that protesters have disrupted the peaceful reflection at the Bourse. I strongly condemn these disturbances" (National Post 2016). The mayor of Brussels, Yvan Mayeur had a stronger reaction as he was "appalled […] that such thugs have come to provoke residents at the site of their memorial" (Guardian 2016b).

Two days after these anti-immigrant protests, a wreath-laying ceremony was held to demonstrate Belgium's unity in the face of extremist violence. Interfaith religious leaders, survivors and victims' families united to pay tribute to the victims in a cathedral service. However, on April, 1 a ceremony was organized at a memorial site for the victims at the *Place de la Bourse [14]*. By the beginning of April, the memorial was attracting fewer visitors, namely people passing through the city centre and some of the tourists who visited the open-space memorial with an aim "to take pictures of the memorial," "express their sympathy for the victims and wounded" and "write the message of peace and solidarity" (Interview 2016). After the violent contestations on March 27 and with an on-going high-alert security concerns, the memorial was considered

to be "unsafe."

As discussed in this section of the paper, spontaneity of these grassroots memorials lies in their use as a prompt response to an unexpected tragedy. In line with Savage's work (2009, 297), undoubtedly the purpose of these "therapeutic memorials," is to 'heal [the] collective psychological injury' from collective traumatic events creating also a sense of community. This appears to be very true in the immediate aftermath of the event, more precisely in the hours and days after the establishment of the memorial. After the birth of the memorial, the number of visitors has exponentially grown expanding from the community of bereavement to more diverse public, with multiple agendas. Therefore, besides therapeutic purpose which is the most prominent role assigned to spontaneous memorials, other roles are exercised through participation in a joint commemorative ritual. Societal tensions and the pressure for the answers about the causes and consequences of the trauma tend to be higher in the first days and weeks after the event. In this period, the memorial is used as a site of contestation, negotiation and resistance.

Memorabilia at the site: Post-it memory

Having discussed how spontaneous memorials emerged in an immediate aftermath of the terrorist attack and what meanings various stakeholders attach to the latter, this section addresses the content of memorials: its objects and messages. The findings in this section while relating to all three memorials, focus mainly on materials gathered in the *Place de la Bourse*.

A large number of memorabilia was placed in all memorials. Among these objects the most numerous were: banners, flags, statues, candles, flowers (firstly fresh then plastic), balloons, stuffed animals and other. In line with the research of Margry and Sanchez (2007, 2) one common feature of observed memorials in Brussels was "that citizens do not place memorabilia or offerings at memorial sites solely in memory of the deceased" but as symbols of the faith in better future, looking for answers.

A few meters away from the Bourse memorial, an improvised stand offered pens and paper for visitors to write their messages. Two NGO workers from Romania came up with the idea when they realized that the next rain will wipe out all the chalk messages written on the sidewalks and walls: "We just wanted the families to have a hard copy of the warm messages. We wanted to spread solidarity, and have it written on paper" (Deutsche Welle, 2016). Mourners wrote messages that ranged from expression of anger: "Fuck ISIS" or "Fuck terror," through expressing international solidarity in different foreign languages like "*Volem pau*" [i.*e I want peace*] or "Imagine all the people living in the peace" to finally conveying messages of a better future: "*Bruxelles est belle*" [i.e. Brussels is beautiful], "*Viva la vie!*" [i.e. Celebrate the life], *"Union fait la force*" [i.e. Union makes force] or "Make love not war." Analysed chalk graffiti and messages written on the Bourse memory site are presented in Table 1. for illustration purposes.

There are four main thematic clusters emerging from more than 200 analysed messages from the site. Firstly, messages of unity and solidarity with Brussels and Belgium are the most salient meanings of these memorabilia. Often paired with cultural and political symbols of Belgium, these messages appeal to sense of patriotism and unity as an answer to insecurity and instability faced by the mourners. Second cluster of messages is future oriented, evoking frequently the words like "strength" and "survival" while contemporary narrating the hardship of the trauma. Third group of messages is of religious reference. Seen that the terrorist organization ISIS claimed the responsibility for the attacks and that attackers themselves came from the Belgian Muslim community, there were numerous references to Islam. These range from anger and blame, to messages that speak of the perils of attributing the culpability and responsibility to any religion. Interestingly,

some of the visitors were erasing hateful messages referred to religious background of the attackers. In addition, Christian symbols were also present in the site and references to "prayer", "redemption", "heaven" and "angels" were often present. Finally, there were messages of anger directed towards the perpetrators and terrorist organization to whom they are allegedly associated (i.e. ISIS). Few messages even evoked the ethnic origin of some of the mourners, while a message referring to Belgian colonial past in Africa was also present (e.g. " *Je suis belge et je suis Congo*" [I am Belgian and I am Congo]).

Thematic clusters:	Examples:
Unity and solidarity	"Care and love to Belgium", "Pray for Belgium", "I am Brussels"
Future oriented	"We will survive", "Brussels is strong"
Religious reference	"Stay united among Christians. ", "Not in the name of Islam", "Terrorists have no religion"
Anger	"Daesh go to hell!", "Fuck ISIS"

Table 1. Thematic representation of memorabilia's messages present at the Bourse memorial

Numerous messages were written in a wide swath of foreign languages, which not only reflects multicultural character of Brussels, seen through the mourners' eyes as the capital of Europe and Belgium, but also a collective, solidarity expression of public grief by the community of bereavement and visitors alike. The multicultural character of the capital was also represented with an important number of flags of different communities [15] present in Brussels (e.g. Albanian, Turkish, Moroccan, Romanian) which were exposed on its "altar"–the entrance to the actual building of the Bourse on the top of the main staircase. Displayed flags were expression of unity and solidarity of Brussels residents, regardless of their ethnic origins.

Memorabilia present on the site, speaks in favour of national unity and identity confirmation, which is expressed in several ways: a) Belgian bilingual character was omnipresent, with most of the banners in both French and Dutch, b) national symbols such is the Belgian flag were showcased, c) cultural landmarks and symbols (statues of Atomium, Manneken Pis), as well as d) the most important Belgian delicatessen products (frittes, waffle, beer and chocolate) also remembered in messages of the visitors (e.g. "Make waffles, not war"). Parading national symbols and appealing to patriotism and national identity symbolises the need for unity that the community of bereavement was expressing while facing terror and its consequences. This was visible not only in the urban centre where spontaneous memorial emerged but also around the entire city, when the day after the attacks, many households started placing Belgian flags on their windows and terraces.

Gradual "return to life": Acceleration of memory works

So far, this paper focused on the emergence and life of spontaneous memorials and their content in immediate aftermath of the Brussels attacks, providing evidence of numerous memorial purposes assigned to these places of memory by a variety of stakeholders. As argued, both emergence and valour of spontaneous memorials spring out of the vernacular of expressions of memory. Using the example of the Bourse memorial

as the central place of this vernacular memory, I have demonstrated how its initiators self-manage the memorial in the first two weeks of its existence. This section of the paper, however discusses gradual "return to life", "to normality" illustrating the final stage of the life cycle of spontaneous memorials starting from the third week until its final end (i.e. removal) or transformation to a more "official" place of memory (i.e. designated memorial).

The ephemeral nature of memorabilia (flowers dry, food rot, trash accumulates) and a high number of visitors call for a daily maintenance of the site. Large quantities of lit candles, burning day and night are also a matter of security concerns (i.e. fire). For all these practical reasons, the first sign of change in all the observed sites was an introduction of a scheduled maintenance. By mid-April, with fewer visitors and increased police and military operations regarding the seizure and prosecution of the presumed terrorists, there seemed to be a dire need that the city resumes "normal" rhythms. A fresh sign of that "return to life" was re-opening of the metro station Maelbeek on April, 25.

Before the re-opening, Maelbeek memorial consisted of a large number of memorabilia dispersed around two main entrances to the Station. The exterior of the station was also turned into a spontaneous memorial as people placed dozens of bouquets outside and wrote messages with chalk on the walls facing the Station. During the first three weeks, a small site on the exterior was cordoned off by fences and security workers. However, once the Station was reopened, the public transportation company (STIB) in charge of the site provided a new tool for expression of grief for Brussels' commuters: a memory wall. These memory walls are made of big white boards (approximately 2m per 2m but the dimensions vary according to site) with a red heart in the centre. Inside the heart, there are drawings of Brussels' landmarks such are Atomium, Heyzel Stadium, Manneken Pis and other cultural symbols of the city (e.g. a dinosaur–symbol of Brussels' Natural Science museum, Concert Hall–Ancienne Belgique, Bozar, Matongé, African Museum). With the memory wall, commuters were given a specially designed locus to express their emotions, convey their messages and voice their thoughts about the traumatic events which took place in that place of tragedy.

As was observed in the same time frame, Zaventem Airport and Maelbeek metro memorials both became "managed." At the Zaventem airport, where the first form of memorial emerged the day after the attacks, the initiators were the workers of the airport and their families. The initial memory site was very sober and personal, created to mourn the victims but also as an expression of the relief and gratitude for the survival of many who were present that day at their workplace in the Airport. After a partial reopening of the Zaventem airport on May, 1, the memorial fragmentized into several memory walls dispersed between temporary check-ins and corridors of the building. However, at the Airport the memory walls are slightly different: instead of the heart in the middle of a white panel, there is a round shaped Belgian flag with a "B" letter, [16] standing for "Brussels airport" itself, a victim of tragedy.

While both Maelbeek and Zaventem memorial sites evolved over time, transforming into smaller memorials and specially designed memory walls, the Bourse memorial maintained the same form for 60 days after which it was removed. For comparison, clean-up of the flowers left at the gates of Buckingham Palace began 12 days after the death of Princess Diana. The removal and clean-up of the *Place de la Republique* in Paris where candles, photographs, hand-written letters, and other memorabilia have accumulated since January 2015 has started in August 2016. In Brussels, residents started lamenting of the smell coming from the memorial after several weeks saying that "it was nice 6 weeks ago, now it just looks sad" (McDonald 2016). On the order of the City Council, memorial was finally dismantled on May, 20. by the Brussels' waste management company and the volunteers of the Archive of Brussels who had the hope of collecting some

of the messages and objects of the memorial. At the moment of writing this article (2016), the plans for the establishment of a permanent memorial are not known.

As Fullerton et al. (2003, 9) demonstrate in analysing the shift from unprompted to official memory works, "memorialization carries the potential to both cause harm as well as to do good," that is why a special thought must be given to the placement of an eventual memorial, but also to its physical aspect and narratives told. As seen from examples analysed in this paper, Brussels' spontaneous memorials emerging in places of atrocity transformed from an open space memorial to more manageable and "adequate" (social) memory walls after one month (Maelbeek) and a month and a half (the Airport). The original purpose of both sites of tragedy (i.e. a metro station and an airport) was established very quickly with re-construction works proceeding almost parallel to the criminal investigation. Therefore, the transformation to a more contained physical locus dedicated to expressions of memory (i.e. memory walls) has supposedly accelerated the return to normality. Nevertheless, the attention of many commuters and tourists passing through Maelbeek metro station and the Airport, the tragic history of these places of atrocity seems not to cease [17].

Plans for the memory works had however started circulating almost immediately after the traumatic events. In Maelbeek station, which prior to the attacks showcased [18] murals of a Belgian artist Benoît Van Innis, a plan for the reconstruction of the site was announced few weeks after the explosion. Further reconstruction works shall allegedly include a commemorative mural by the same artist who himself confirmed these plans:" I got an offer from STIB and the Region of Brussels, to create a new artwork which will be indirectly a commemorative one" (La Capitale.be 2016). For purpose of illustration, one year after the Charlie Hebdo attacks, in memory of people killed in January and November 2015 a plaque and a memorial oak tree were unveiled in Paris (Guardian 2016). As a new research on memory of the Paris attacks shows, the anniversary of the Charlie Hebdo tragedy was chosen to mark this passage to official memorialization (Hollis-Touré 2016).

Concluding remarks

In a permanent evolution, memory resides on a cross-road of remembering and forgetting, both eternal and ephemeral. Therefore, in every society emerging from a traumatic past there are both, urges "to remember" and efforts to suppress memory in an effort to "move on" or "put the past behind us."

The analysis of a "bottom-up" memorialization of the terrorist attacks in Brussels, speaks in favour of a societal need to remember the present and cope with the trauma. The community of bereavement, consisting of individuals and groups who create spontaneous memorials out of "need to remember" and "seek answers," use these places of memory to start the healing process. In this sense, these places of memory–contrary to Nora's claim that there is no spontaneous memory (1989)–are indeed also "the sites of mourning" (Winter,1995). In stark contrast with the current trend to accelerate memory works by creating plans and projects for "official" memorials immediately after the tragic events, these ephemeral memorials carry a genuine societal response to the tragedy which should be taken into account during eventual creation of a more permanent representations of memory.

As spatial *loci* and discursive arenas for expression and negotiation of emotions, narratives and identities, spontaneous memorials transcend their own community of bereavement generating transnational solidarity through expression of grief. More research is needed to better understand how European society will embrace memories of terrorism in their collective memory. In that light, dealing with the memories of terrorism, spontaneous memorials and solidarity through memorialization call for fresh theorizing.

References

Alexander, Jeffrey C. 2004. "Toward a Theory of Cultural Trauma." In *Cultural trauma and collective identity*, edited by Alexander, Jeffrey C.; Eyerman, Ron ; Giesen, Bernhard ; Smelser, Neil J. ; Sztompka, Piotr, 1–30. Berkley: University of California Press.

Arendt, Hannah. 1951. The origins of totalitarianism. New York: Harcourt, Brace and Co.

Anderson, Benedict. 1983. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. London: Verso.

Assmann, Aleida. 2008. "Transformations between History and Memory." *Social Research* 75(1): 49-72.

BBC. 2016. "*Brussels attacks: Police move against 'hooligan' protesters.*" March 27.

Bloxham, Donald. 2005. *Genocide on trial: war crimes trial and the formation of Holocaust history and memory*. Oxford: Oxford university press.

Britton, Dee. 2007. "Arlington's Cairn: Constructing the Commemorative Foundation for United States' Terrorist Victims." *Journal of Political and Military Sociology* 35(1):17-37.

Butler, Judith. 2009. *Frames of war: When is life grievable?* London: Verso Press.

Connerton, Paul. 1989. How societies remember. Cambridge: Cambridge University press.

Connerton, Paul. 2012. *The spirit of mourning: history, memory and the body*. Cambridge: Cambridge University Press.

Dailymail. 2016. "*World landmarks were lit up in Belgian colours to honour Brussels victims – so WHY not in London? (Where even Star Wars merited an illuminated Nelson's Column)*" March 23.

Dayan, Daniel (ed.) 2006. *La terreur spectacle : terrorisme et télévision*. Bruxelles : De Boeck.

Deutsche Welle. 2016. *"On Place de la Bourse, many nations mourn Brussels dead."* March 27.

De Young, Mary. 1998. "Collective Trauma: Insights from a Research Errand." The American Academy of Experts in Traumatic Stress. Source: http:/ /www.aaets.org/arts/art55.htm, Last access: 14/08/2016.

Donofrio, Theresa Ann. 2010. "Ground Zero and Place-Making Authority: The Conservative Metaphors in 9/11 Families' "Take Back the Memorial" Rhetoric." *Western Journal of Communication* 74(2):150-169.

Doss, Erika. 2008. "Memorial Mania: Fear, Anxiety, and Public Culture." *Museum* 36-43, 72-75.

EU Observer. 2016. "Brussels attack hits all of Europe, EU leaders say." March, 22.

Foley, Malcolm and Lennon, John. 1996. "Editorial: Heart of darkness." Journal of *International Heritage Studies* 2(4):195–197.

Foot, Kirsten; Warnick, Barbara; Schneider, Steven M. 2006. "Web-based Memorializing After September 11: Toward a Conceptual Framework." *Journal of Computer Mediated Communication* 11(1):72-96.

Friedland, Nehemia and Merari, Ariel. 1985. "The Psychological Impact of Terrorism: A Double-Edged Sword." Political Psychology 6(4):591-604.

Fullerton Carol S., Ursano, Robert J., Norwood Ann E. and Holloway, Harry H. 2003. "Trauma, Terrorism and Disaster." In *Terrorism and Disaster: Individual and Community Mental Health Interventions*, edited by Ursano, Robert J., Fullerton Carol S., Norwood, Ann E., 1-23. Cambridge: Cambridge University Press.

Ginges, Jeremy and Atran, Scott. 2009. "What Motivates Participation in Violent Political Action. Selective Incentives or Parochial Altruism?" *Annals of the New York Academy of Sciences* 11671(1):115-123.

Granek, Leeat. 2014. "Mourning Sickness: The Politicizations of Grief." *Review of General Psychology* 18(2):61–68.

Habermas, Jürgen. 2012. *The crisis of the European Union: a response.* Cambridge : Polity.

Halbwachs, Maurice. 1925. *Les cadres sociaux de la mémoire.* Paris: Librairie Félix Alcan.

Hobfoll, Stevan E.; Canetti-Nisim, Daphna; Johnson, Robert J. 2006. "Exposure to terrorism, stress-related mental health symptoms, and defensive coping among Jews and Arabs in Israel." *Journal of Consulting and Clinical Psychology* 74(2): 207-218.

Hollis-Touré, Isabel. 2016. "The multidirectional memory of Charlie Hebdo." *French Cultural Studies* 27(3):293-302.

Jaspers, Karl. 1961. *The question of German guilt.* New York : Capricorn books.

Joralemon, Donald. 2015. "Ordering chaos: the process of remembering mass murder." *Mortality* 20(2) :178-191.

La Capitale.be. 2016. "*Benoît Van Innis réalisera une nouvelle fresque pour la station de métro Maelbeek, avec une référence au drame du 22 mars.*" April, 5.

Levi, Primo. 1958. *Se questo è un uomo*. Torino: Einaudi.

Low, Setha M. 2004. "The memorialization of September 11: Dominant and local discourses on the rebuilding of the World Trade Center site." *American Ethnologist* 31(3): 326-339.

Margry, Peter Jan and Sánchez-Carretero, Cristina. 2007. "Memorializing traumatic death." *Anthropology Today* 23(3):1-2.

Margry, Peter Jan and Sánchez-Carretero, Cristina (eds). 2011. *Grassroots Memorials: The Politics of Memorializing Traumatic Death.* New York and Oxford: Berghahn.

McDonald, Karl. 2016. "Brussels memorial flowers being left to rot." May, 13. Source: https://inews.co.uk/essentials/news/world/brussels-flowers-left-wilt-bombing-victims-memorial/ Last access: 04/10/2016.

Misztal, Barbara A. 2003. *Theories of social remembering.* Maidenhead: Open university press.

Moodley, Roy and Costa, Iara. 2006. "Teddy bears, flowers and crucifixes: Collective responses to trauma." *International Journal of Health Promotion and Education* 44(1):38-42.

National Post. 2016. " *'We don't believe in candles and flowers': Neo-Nazis bring violence to peace vigil in Brussels.*" March 28.

New York Post. 2016. "*Woman in hijab rips up Israeli flag at Brussels memorial.*" March 24.

Nora, Pierre. 1989. Between Memory and History: Les Lieux de Mémoire, *Representations* (26):7-25.

Pivnick, Billie A. 2011. "Enacting Remembrance: Turning Toward Memorializing September 11th." *Journal of Religion and Health* 50(3):499-515.

Portarti, David. (ed.). 2003. *September 11th families for peaceful tomorrows: Turning our grief into action for peace*. New York, NY: RDV Books.

Ryan, Gery W. and Bernard, H. Russell. 2003. "Techniques to identify themes." *Field Methods* (15):85-109.

Renzi, Matteo. 2016. "*To fight terrorism we need social workers as much as soldiers.*" in The Guardian. March, 22.

Santino, Jack. 2003. "Performative Commemoratives, the Personal, and the Public: Spontaneous Shrines, Emergent Ritual, and the Field of Folklore (AFS Presidential Plenary Address)." *Journal of American Folklore* 117(466):363-372.

Santino, Jack. 2006. *Spontaneous shrines and the public memorialization of death*. New York: Palgrave Macmillan

Savage, Kirk. 2009. *Monument wars: Washington, D.C., the National Mall and the transformation of the memorial landscape*. Berkeley, CA: University of California.

Seery, Mark D. ; Silver, Roxane Cohen ; Holman, E. Alison ; Ence, Whitney A. ; Chu, Thai Q. 2008. "Expressing Thoughts and Feelings Following a Collective Trauma: Immediate Responses to 9/11 Predict Negative Outcomes in a National Sample." *Journal of Consulting and Clinical Psychology* 76(4):657-667.

Simpson, Edward and Corbridge, Stuart. 2006. "The Geography of Things That May Become Memories: The 2001 Earthquake in Kachchh-Gujarat and the Politics of Rehabilitation in the Prememorial Era." *Annals of the Association of American Geographers* 96(3):566-585.

Svendsen, Erika S. and Campbell, Lindsay K. 2005. "*Living Memorials Project: Year 1 Social and Site Assessment.*" United States Department of Agriculture, Forest Service: Delaware.

The Guardian. 2016a. *Witnesses to Brussels suicide attacks*. March 22. http://www.theguardian.com/world/video/2016/mar/22/witnesses-to-brussels-suicide-attacks-i-felt-it-was-the-end-of-the-world-video

The Guardian. 2016b. *Water cannon used on anti-immigrant protesters in Brussels*. March 27.

The Guardian 2016c, *Thousands gather in Paris as Hollande leads tributes to terror attack victims*. January 10.

The Guardian. 2016d, *Staged picture from Brussels bombings prompts ethics debate.* March 25

The Guardian. 2016e. "*Europe responds to Brussels attacks with show of solidarity.*" March 22.

Tota, Anna Lisa. 2004. "Ethnographying Public Memory: The Commemorative Genre for the victims of Terrorism in Italy." *Qualitative Research* 4(2):131-159.

Tota, Anna Lisa. 2005. "Terrorism and Collective Memories Comparing Bologna, Naples and Madrid 11 March." *International Journal of Comparative* Sociology 46(1–2): 55–7.

Tota, Anna Lisa. 2013. "How to Transform a 'Place of Violence' into a 'Space of Collective Remembering': Italy and its Traumatic Past." *Journal of Terrorism Research* 4(1). DOI: http://doi.org/10.15664/jtr.623

Vlaams Radio Koor. 2016. "*We're playing for healing, hope and the future.*" March 25. Source:http://www.vlaamsradiokoor.be/en/news/detail/were-playing-for-healing-hope-and-the-future/ Last access: 12/08/2016.

Winter, Jay. 1995. *Sites of Memory, Sites of Mourning: The Great War in European Cultural History.* Cambridge: Cambridge University Press.

Zerubavel, Eviatar. 2004. *Time Maps: Collective Memory and The Social Shape of The Past.* Chicago: University of Chicago Press.

Notes

[1] The Islamic State of Iraq and Syria (ISIS) claimed responsibility for these attacks in which over 300 people were injured and 32 civilians and 3 perpetrators were killed.

[2] Paris attacks refers to two series of coordinated terrorist attacks: events between 7th and 9th of January 2015 (e.g. *Charlie Hebdo* mass-shootings, Hostage siege at Hypercacher kosher supermarket in *Porte de Vincennes*); and the November 2015 Paris attacks (i.e. 11/13) that occurred on November, 13. 2015 in Paris (i.e. mass shooting at a concert in the Bataclan theatre) and the city's northern suburb, Saint-Denis (i.e. three suicide bombers struck outside the *Stade de France* during a football match).

[3] Madrid bombing (i.e 11-M) were bombings against the *Cercanías* commuter train system of Madrid (Spain) on March, 11. 2004. The attack claimed a total of 192 lives while around 2,000 people were injured.

[4] London bombings (i.e 7/7) – On July, 7. 2005, terrorists detonated three bombs in the London Underground and a fourth on a double-decker bus in the city. Fifty-two people were killed and 700 more were injured.

[5] Utoya massacre is refereeing to two terrorist attacks of Anders Behring Breivik on July, 22. 2011 in Norway: a car bomb explosion in down-town Oslo and a mass-shooting of civilians at the youth summer camp on Utøya island. The attacks claimed a total of 77 lives.

[6] Nice attack happened on July, 14. 2016, when a cargo truck was deliberately driven into crowds on the *Promenade des Anglais*, in the city of Nice, France. The attack claimed 85 lives while more than 300 people were injured.

[7] Orlando nightclub shootings refers to the mass killing in a gay nightclub in Orlando, United States where 49 people were killed and 53 other wounded.

[8] Take Back Memorial (TBM). See more Donofrio (2010).

[9] Granek (2014,65), shows that "in the United States, the 9/11 memorials tended to commemorate a certain type of citizen, leaving out countless others. For example, those who were illegal immigrants or those who were not United States citizens received little coverage, little public grief, and very little attention in general."

[10[The Bourse plaza is situated in the city centre and was recently turned to a pedestrian zone.

[11] Many of these spontaneous memorials were erected in front of the Belgian embassies around the world.

[12] These two sites were hard to reach in immediate aftermath of the attacks due to the work of first responders, medics, military and police who coordinated the extraction of the victims.

[13] Fox news camera caught on video a young photojournalist "moving the arm of a young girl and directing her in front of the makeshift memorial, while he snaps away with his camera" sparking a debate among internationally renowned news photographers about how often news photographs are staged (Guardian 2016d).

[14] by the Belgian Muslim Executive organization.

[15] Only few EU flags were displayed by the mourners.

[16] The same hashtag is promoted by both Maelbeek and Zaventem memory walls: #BrusselsTribute. Their reference to social media makes of them a sort of Social memory wall.

[17] For example, many journalists reporting from Brussels went on a macabre metro ride, passing through the station Maalbeek after re-opening, interviewing the commuters on 'the sentiment' they prove when driving through the place of explosion and mass death.

[18] Partially damaged in the explosion in March 2016.

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Effects of Terrorism Threat on Economic Preferences: The Role of Personality

by Alina Velias and Philip J Corr

Abstract

Certain threats, such as terrorism tend to have a low probability of affecting us directly, yet reminders of them (such as media news) are striking. Could individuals with particular personality traits find them distractive from the usual priorities in daily decision-making? This study explored the putative effects of media-driven terrorism threat, on two economic preferences (risk aversion and delay discounting) - using a sample reasonably closely representative of a modern Western city. Participants (N = 78) higher on impulsivity showed lower risk-seeking under terrorism threat. Discussed are directions for further research and the implications for media coverage of terrorist threat.

[Note: All supplementary materials referenced in this article may be downloaded from https://www.st-andrews.ac.uk/~cstpv/jtr/8_2/1305-3805-1-SP.pdf]

Introduction

Terrorism has become a prominent feature of the modern world. While governments focus on preventing attacks and improving physical security, some researchers and policy-makers are concerned with the psychological 'ripple' effects on the public, suggesting that fear/anxiety, itself, may carry a cost and, as such, should be a major concern for governments (Sunstein, 2003). For many people, terrorism may be conceptualised as a dread risk which entails a high degree of uncertainty regarding the probability of threat, its time/location and mechanism of attack (Slovic, 2002) – where it is especially difficult to exercise personal control. These features of terrorism are made worse by the realisation that terrorists target places considered to be 'safe' and of everyday use.

Terrorism-related behaviour changes have been observed with regards to multiple risk-taking, impulsive behaviours and coping behaviours (see review by Ben-Zur & Zeidner, 2009; for specific link of dread risk to car accidents, see Gigerenzer, 2006). Many of these changes were demonstrated to be affected, or even driven, by exposure to media (Ben-Zur, Gil, & Shamshins, 2012). Individual differences in these effects have also been observed (Maguen, Papa, & Litz, 2008). Although the literature is rich and varied, there is no consensus as to how far the threat reaches and the direction of effects on behaviour. Ben-Zur and Zeidner (2009) highlighted the tension between studies reporting an increase, on the one hand, in risky driving, substance abuse and raised consumption and, on the other hand, the substantial set of opposite or null effects – this may be due to the post-hoc nature of self-reported behaviours and conflation with extraneous variables, or, even, variation in the individual differences of participants in the different samples.

Controlled experimental studies offer insight into the ability of terrorism threat to evoke thoughts of one's own mortality (Mortality Salience, MS) within the Terror Management Theory (TMT) framework (Solomon,

Greenberg, & Pyszczynski, 2004). TMT states that we cope with the inevitability of death by celebrating life and affirming one's existence in the present. Consequently, thoughts of one's own death have been linked to such 'carpe diem' outcomes in economic decision-making as heightened risk-taking, reduced self-regulation, conspicuous consumption, and present-bias (reviewed in Burke, Martens, & Faucher, 2010). Several studies in the TMT field have used specifically terrorism-based stimuli in experiments, but conclusions on risk-taking and impulsive behaviours have, once again, been mixed. At the same time, an emerging literature on Uncertainty Management looks at changes in behaviour caused by uncertainty about how to behave and what to expect from the world (Van den Bos et al., 2005). Existing studies show that, in the domain of cultural beliefs, uncertainty has a different effect to mortality (Yavuz & Van den Bos, 2009). Exploring whether a similar uncertainty component within the threat of terrorism would affect economic preferences appears important.

Individual differences under existential threat do not have an established link to economic preferences in the literature; however, there are reasons for believing such links may exist. Low socioeconomic status in childhood has been linked to higher risk-seeking and delay-impatience under salience of treacherous and life-threatening environments (Griskevicius, Tybur, Delton, & Robertson, 2011). Self-esteem and locus of control over events in one's life has been shown to predict higher risk seeking (Burke et al., 2010). The lack of consensus in this literature points to the need for more studies to examine the relevance of personality traits in much more detail.

Although the specific links between personality and economic preferences have yet to be established (Almlund, Duckworth, Heckman, & Kautz, 2011), there are some findings of relevance. Zuckerman and Kuhlman (2000) linked lower levels of impulsive sensation-seeking to lower risk-taking, appraisal of environment as being more threatening, and higher harm-avoidance. However, since most of the past studies have relied on the five-factor personality model, which includes impulsiveness as a subscale of neuroticism (Costa & McCrae, 1992), it has proved difficult to disentangle the specific effects of impulsivity from those of neuroticism and harm-avoidance, which themselves have been shown to be associated with risk-averse decisions (Nicholson, Soane, Fenton-O'Creevy, & Willman, 2005; Lauriola & Levin, 2001). On a neuropsychological level, risk-taking tasks activate the insula, which is, in turn, linked to harm-avoidance and neuroticism (Paulus et al., 2003). Uncertainty, in turn, had been shown to provoke heightened neural response in same insula brain areas linked to harm-avoidance (Hirsh & Inzlicht, 2008). In cancer patients, uncertainty about threat to life has been shown to manifest in present-focused consumption of 'possessions and experiences' (Pavia & Mason, 2004).

The above leads us to suggest that certain dimensions of personality should respond to the uncertainty component of terrorism threat leading to more present-focused and harm-avoidant choices. We feel there is a need to test how individual variation in decision-making in reaction to terror-related and mortality-related stimuli relate to variation in major systems of approach and avoidance. To examine this issue, we adopted the theoretical framework afforded by the reinforcement sensitivity theory (RST) of personality (Gray & McNaughton, 2000; McNaughton & Corr, 2004; summarised in Corr, 2013) which provides measures of fundamental traits based on neurobehavioral systems underlying emotion and motivation. As detailed by Corr and Cooper (2016), RST contains three major systems: one positive, the *Behavioural Approach System* (BAS, related to approach motivation and the emotions of hopeful anticipation and reward reactivity); and two negative, the *Fight-Flight-Freeze System* (FFFS, related to avoidance/escape and the emotion of fear) and the *Behavioural Inhibition System* (BIS, related to the detection of goal-conflict and the emotion of anxiety).

The advantage of using the RST personality scale is that it distinguishes between behaviour-inhibiting (BIS-related) anxiety and behaviour-expressive (BAS-related) impulsivity, as it also allows separation of (FFFS-related) fear. We thus do not have a conflation of these separate factors with general neuroticism.

We made the following predictions.

1. We expected that individuals high on both impulsivity and anxiety would react most to the uncertainty component of terrorism, as assessed by behaviour reflecting greater harm-avoidance and present-focus – this would translate into choices of lower risks and more immediate rewards. However, recognizing that BIS-anxiety reflects not only reaction to a threat, but also behavioural inhibition until a goal-conflict is resolved, we anticipated that its effect may be less clear-cut than the one for impulsivity.

2. For mortality salience, which is associated with much higher certainty (we will all die eventually) and, therefore, more of a 'carpe diem' reminder to transcend death by celebrating life here and now, we expected high impulsivity and anxiety either not to dominate decision-making, or to lead to greater higher risk-taking and, likely, higher preference for immediate rewards.

3. To have a way of distinguishing effects on delay-impatience, we also suggested that individuals low on the Goal-Drive Persistence factor of BAS personality (responsible for focus on achievement of one's goals, and opposite to impulsive actions) would respond to the 'carpe diem' effect of mortality salience, increasing delay-impatience, but we predicted it would not change preferences under terrorism.

Most of the studies discussed above focused on people who experienced a proximate exposure to terrorism (Israeli citizens, New York citizens after 9/11, Turkey citizens). In contrast, we aimed to test a wider effect of terrorism, focusing on people exposed to it through news stories.

Method[1]

Participants

Data collection took place over August 2015. Participants (N = 108) were recruited online to participate in the study which was described as an investigation of media and economic preferences. Fully completed surveys were entered in a raffle for €20 Amazon voucher. Some attempts (n = 22) were interrupted by a software issue. For the remaining 86 participants[2], mean age was 31 years (SD = 7.7); 54 were UK residents, 16 EU residents, 12 resided in the rest of the world, 4 preferred not to declare.

The sample represented reasonably well the population of a modern Western city on dimensions of income, employment, religion, and sexual orientation – as compared to the demographics for London, Paris, New York or Berlin. There were 24 students, 46 full-time employed, 3 unemployed, 1 retired, 10 part-time employed, 2 non-declared; 39 were male, 41 female, 6 non-declared. Mean annual combined household income was £46,000. There were 52 participants who declared no religion; for the reminder: Christianity = 19, Judaism = 2, other religions = 2, preferred not to say = 2. Sixty-three had heterosexual orientation, 5 bisexual, 9 homosexual, and 1 did not say. We also checked that participants had not been directly exposed to terrorism (see results section).

Out of the 86 participants, four showed inconsistent preferences, for two participants, data on economic

preferences were missing, two did not complete the writing task, so their data were removed from the analysis. The remaining complete questionnaires for seventy-eight _participants (39 males, 35 females, 4 preferred not to declare; mean age 32 years) were analysed.

Design

A between-subjects design was used.

Threat manipulation. Priming in the TMT protocol allows some flexibility (see review by Burke et al., 2010). Most popular prime involves asking participants to write down what they think happens when they die, and to jot down emotions aroused by thoughts of their own death. Some primes used death-related pictures; there have also been successful primes using terrorism-related stimuli (Echebarria Echabe & Perez, 2015). The goal of this study was to prime Terrorism as it is naturally encountered through the media; priming Mortality in the same format would enable comparisons between combination of MS and uncertainty in case of Terrorism.

Terrorism prime comprised extracts from a video: 'Dozens Killed in Islamic Militant Attacks in Four Countries' (2 min 50s; Bloomberg Business, 2015). The video emphasized high uncertainty and unpredictability of the threat, discussed whether the attacks were to increase in frequency, and whether danger might come from extremist citizens within western countries; it did not contain explicitly aversive images (see Supplementary Material 2.4 for script and screenshots). Mortality prime posed a challenge of finding an applicable TV-programme; our best option comprised extracts from the video: 'How Much Is Your Dead Body Worth' (2 min 33s; BBC Horizon, 2008). The control video was 'The Truth About…Your Teeth' (2 min 0s; BBC One, 2015). Dental pain has been widely used as control prime and can produce routine levels of anxiety and fear, compared to existential threats (Solomon, Greenberg, & Pyszczynski, 2004). Following the Threat video, participant completed a task designed to reinforce the prime in the video.

Materials

RST-PQ. The 65 items Reinforcement Sensitivity Theory Personality Questionnaire (RST-PQ, Corr & Cooper, 2016), consisting of six factors, was used. The *behavioural inhibition system* (BIS, related to anxiety, responsible for worry, obsessive thoughts and behavioural inhibition) reflects the assessment of goal-conflict, which generates negative emotion and leads to 'cautious approach' (example item, *I'm always weighing-up the risk of bad things happening in my life*). Distinguishing between the four components of *behavioural approach system* (BAS) allows finer-grained differentiation of reactions to rewarding stimuli and resulting approach behaviour: BAS Impulsivity (e.g., *I'm always buying things on impulse),* BAS Goal-Drive Persistence (e.g., *I am very persistent in achieving my goals*). Items are answered on 4-point Likert scale ranging from 1 (Strongly disagree) to 4 (Strongly agree). The RST-PQ contains two other BAS factors: Reward Interest (e.g., *I regularly try new activities just to see if I enjoy them*) and Reward Reactivity (e.g., *I get a special thrill when I am praised for something I've done well*).

Distraction task. According to the TMT literature, the distal, threat-unrelated effects of Mortality threat manifest more strongly after a distraction task, once the threat is out of immediate consciousness (Solomon, Greenberg, & Pyszczynski, 2004). In compliance with the standard procedures of the field, a self-report mood scale PANAS (Watson, Clark, & Tellegen, 1988) and general questions supporting cover story were used.

Risk and Delay. This measure was a variation of a standard multiple options checklist widely used in

experimental literature (Andersen, Harrison, Lau, & Rutstrom, 2008). For risk, participants answered questions *'What would you prefer to get?'* separately for each pair of options: a risky option of '50% chance of €800' and a safe option (ranging over the 11 choices of €100 to €600). For delay, participants answered the same for each pair of options: a smaller-sooner amount of €100 "tomorrow" and a larger-later amount (ranging over the 7 choices from €110 to €170) after a delay of 90 days–this is detailed in Supplementary Material 2.4.

Procedure

The experiment was based on the Qualtrics Platform. Following an online signature of informed consent, participants completed the RST-PQ personality questionnaire, then were randomly allocated to one of the three Threat conditions. They then proceeded to the distraction task on mood and media preferences, and questions on target economic preferences. The flow of study activities is shown in Figure 1.

Results

Pearson product-moment correlations and descriptive statistics are shown in Table 1.

Writing Task

We utilized the writing task with a second purpose of checking participants' self-reported experience with terrorism and identify those who were directly affected.

All the participants under the terrorism treatment completed the writing task (mean length = 43 words). None of them mentioned direct experience of terrorism. We hoped to see a variety of opinions on terrorism, expected from a sample to be reasonably reflective of a modern Western city. The opinions ranged from radical "Can't wait for a religion free society" to reflective "Complicated. Not black & white. Don't trust agencies with agendas too much" to analytical "religious fundamentalism is a symptom, not a cause", to detached "Won't be going to Tunisia any time soon", to emotional "I am scared for my family and friends being victims of an attack".

Mood

We used the PANAS mood scale to compare emotional response to the treatments on the measures of General Positive Affect (GPA, 10 items) and General Negative Affect (GNA, 10 items).

There was no evidence of significant difference in GNA between Mortality and Dentistry, $p > .10$, which is common for the TMT literature (Lambert et al., 2014 review supporting studies and recent counterevidence). In Terrorism, however, GNA was significantly higher (20.48) compared to Dentistry (16.89), and to Mortality (16.11), $p < .05$. This suggests that Terrorism evoked proximal (threat-related) emotions, whereas Mortality did not.[3]

Economic Preferences Measures

Risk-Seeking

To compare the overall effects of threat manipulation, a between-groups ANOVA was first run with Threat as fixed factor, and Sex, Age and negative Mood as covariates. Three orthogonal contrasts were constructed to assess whether either of two experimental conditions were different from the control condition, and whether the experimental conditions were different between each other. Specifically, we computed a contrast that coded the Terrorism condition as +1, the Mortality condition as 0, and the Dentistry condition as -1, testing whether the Terrorism salience manipulation yielded differential effects on risk-seeking than the control condition. The contrast showed significant differences in mean risk-seeking under Terrorism (4.87) and Dentistry (5.70), $F(1, 78) = 5.46$, $p < .05$. Mean risk-seeking in Terrorism was also significantly lower than in Mortality (5.58), $F(1, 78) = 9.81$, $p < .001$. The same procedure comparing Mortality to control (Terrorism coded as 0, Mortality as +1, Dentistry as -1) showed no significant difference in means, $p > .10$. This supported our prediction regarding the effects of Terrorism on risk-seeking, but made us weary about the strength of Mortality manipulation.

The prediction about effect of high/low levels of (BAS-related) Impulsivity and (BIS-related) Anxiety on risk preference under threat was tested using the following model.

$$\text{Risk-seeking}_{scale} = \alpha + \beta_0 \text{Mood}_{GNA} + \beta_1 \text{Threat}_{Terr} + \beta_2 \text{Threat}_{Mort} + \beta_3 \text{Threat}_{Mort} \times \text{Mood}_{GNA} + \beta_4 \text{Threat}_{Terr} \times \text{Mood}_{GNA} + \beta_5 \text{Personality}_{BAS\text{-}Imp} + \beta_6 \text{Personality}_{BIS\text{-}Anx} + \beta_7 \text{Threat}_{Terr} \times \text{Personality}_{BAS\text{-}Imp} + \beta_8 \text{Threat}_{Terr} \times \text{Personality}_{BIS\text{-}Anx} + \beta_9 \text{Threat}_{Mort} \times \text{Presonality}_{BAS\text{-}Imp} + \beta_{10} \text{Threat}_{Mort} \times \text{Personality}_{BIS\text{-}Anx} + \text{Covariates}$$

A multivariate ANOVA/GLM was used, with threat as a single fixed factor, and negative Mood, BAS-Imp and BIS-Anxiety as continuous predictor variables. Two-way interactions between Threat and Personality variables, and between Threat and negative Mood, revealed a significant interaction: Threat x BAS-Imp, $F(2, 66) = 8.85$, $p < .001$. A plot of mean Risk-Seeking against Low and High (median-split) BAS-Imp for the three Threat groups in Figure 3 makes it easy to observe that there was no difference under Dentistry; but under Terrorism, individuals high on the BAS-Imp factor showed lower risk-seeking; under Mortality individuals, those high on the BAS-Imp factor tended to show higher risk-seeking.

Formally, the GLM revealed a significant interaction of Terrorism x BAS-Imp, indicating that the effect of BAS-Imp on risk-seeking in Terrorism was significantly lower from that in Dentistry, $\beta(diff) = 1.65$, $p < .01$; however, the evidence only indicated a trending difference in the effect of BAS-Imp on risk-seeking in Mortality, as compared to Dentistry, $p = .16$. The effect of BAS-Imp in Terrorism was also significantly different from that in Mortality, $\beta(diff) = 2.78$, $p < .01$. Following Aiken and West (1991) procedure for decomposing an interaction, the estimated coefficients indicated a significant negative relationship between BAS-Imp and risk-seeking in Terrorism, $\beta = -0.59$, $\eta^2 = .11$, $p < .01$, a significant positive relationship in Mortality, $\beta = 0.64$, $\eta^2 = .12$, $p < .01$, but no evidence for an effect in Dentistry, $p > .01$. These results suggest that individuals higher on impulsivity were less risk-seeking under terrorism, which supports our hypothesis. Under mortality prime, individuals higher on impulsivity preferred gambles with higher risk – which is also in line with our hypothesis. This effect, however, was statistically indistinguishable from that in Dentistry condition which requires caution in interpretation.

The model also showed a significant interaction Threat x BIS-anxiety, $F(2, 66) = 3.39$, $p < .05$, which suggested that the effect in Terrorism was significantly different from that in Mortality, $\beta(diff) = 1.71$, $p = .02$;

there was no evidence of the effect in Terrorism being different from that in Dentistry, $p > .10$. These results do not support our hypotheses.

Delay

An ANOVA with Threat as fixed factor, and Sex, Age and negative Mood as covariates, with three orthogonal contrasts to assess overall effect of experimental conditions, showed no difference in mean delay-impatience in three threat groups, $p > .10$. This was anticipated, since in past literature effects were found only when individual differences were considered. The prediction about effect of high/low levels of Impulsivity, Anxiety and BAS-GDP on delay preference under threat was tested using the following model.

$$\text{Delay-Impatience}_{scale} = \alpha + \beta_0\,\text{Mood}_{GNA\,a} + \beta_1\,\text{Threat} + \beta_2\,\text{Threat}_{Mort} + \beta_3\,\text{Threat}_{Mort} \times \text{Mood}_{GNA} + \beta_4\,\text{Threat}_{Terr} \times \text{Mood}_{GNA} + \beta_5\,\text{Personality}_{BAS\text{-}Imp} + \beta_6\,\text{Personality}_{BIS\text{-}Anx} + \beta_6\,\text{Personality}_{BAS\text{-}GDP} + \beta_8\,\text{Threat}_{Terr} \times \text{Personality}_{BAS\text{-}Imp} + \beta_9\,\text{Threat}_{Terr} \times \text{Personality}_{BIS\text{-}Anx} + \beta_{10}\,\text{Threat}_{Terr} \times \text{Personality}_{BAS\text{-}GDP} + \beta_{11}\,\text{Threat}_{Mort} \times \text{Personality}_{BAS\text{-}Imp} + \beta_{12}\,\text{Threat}_{Mort} \times \text{Personality}_{BIS\text{-}Anx} + \beta_{13}\,\text{Threat}_{Mort} \times \text{Personality}_{BAS\text{-}GDP} + \text{Covariates}$$

A multivariate ANOVA/GLM was used, with threat as a single fixed factor, and negative Mood, BAS-Imp, BIS-Anxiety, and BAS-GDP as continuous predictor variables, with two-way interactions between Threat and Personality variables, and between Threat and negative Mood. The model revealed a significant interaction: Mortality x BAS-GDP, $F(2, 63) = 4.45$, $p < .05$. A plot of mean Delay-Impatience against Low and High (median-split) BAS-GDP for the three Threat groups in Figure 4 shows that under Dentistry individuals high on BAS-GDP were more impatient about financial gains than those low; under Terrorism high BAS-GDP individuals tended towards higher impatience; under Mortality, on the contrary, they tended towards lower impatience.

Formally, the effect of BAS-GDP on delay-impatience in Mortality was significantly lower than that in Dentistry, $\beta\textit{(diff)} = 1.31$, $p < .05$; however, the data did not indicate difference in the effect of BAS-GDP on delay-impatience in Terrorism when compared to Dentistry, $p > .10$. The effect of BAS-GDP on delay-impatience in Mortality was also significantly different from that in Terrorism, $\beta\textit{(diff)} = 1.64$, $p < .01$. Following Aiken and West (1991), the estimated coefficients indicated a significant negative effect of BAS-GDP on delay-impatience in Mortality, $\beta = -0.36$, $\eta^2 = .06$, $p < .05$, a trending positive effect in Terrorism, $\beta = 0.40$, $\eta^2 = .05$, $p < .10$, but no effect in Dentistry, $p > .10$[4]. This evidence supported the hypothesis that lower goal drive-persistence would heighten delay-impatience under Mortality. The data also suggested possibility of an opposite effect of BAS-GDP in Terrorism, which was not anticipated in the hypotheses.

The model also revealed a significant interaction Terrorism x BIS-anxiety, indicating that the effect of BIS-anxiety on delay-impatience in Terrorism was significantly higher than that in Dentistry, $\beta\textit{(diff)} = 1.28$, $p < .05$; there was a trending difference in the effect of BIS-anxiety on delay-impatience in Mortality as compared to Dentistry, $p < .10$. The effect of BIS-anxiety on delay-impatience in Terrorism was also significantly different from that in Mortality, $\beta\textit{(diff)} = 1.68$, $p < .01$[5]. These results suggest that individuals higher on anxiety were generally less impatient about delayed rewards, and there was a change in this preference under threat – which is an interesting evidence, but we do not consider it strong enough to support our hypotheses. There were no effects of BAS-Imp on delay-impatience in the data. The model with full set of covariates also revealed an overall negative effect of BAS-RI on delay-impatience, $\beta = -0.34$, $\eta^2 = .12$, $p = .01$.

There was clear evidence of participants higher on Impulsivity becoming less risk-seeking under Terrorism (displayed in Figure 3.B) and for participants lower on BAS-GDP becoming more delay-impatient under

Mortality (displayed in Figure 4.B). The effects of BIS-anxiety were less pronounced and mixed.

Comparing with past literature, Griskevicius et al. (2011) found similar size effects on risk-seeking under stimuli of life-threatening and treacherous future: when moderating role of socio-economic status at childhood (SES) was considered; the effects similarly divided into lower risk-seeking for higher SES ($\eta^2 = .10$) and higher risk-seeking for lower SES ($\eta^2 = .14$). The effects delay-impatience choices were similarly smaller ($\eta^2 = .08$, $\eta^2 = .12$), some of them of marginal significance. Yavuz and Van den Bos (2009) reported larger effects of mortality ($\eta^2 = .20$) and uncertainty ($\eta^2 = .46$) on the negative reaction towards an essay violating the cultural worldviews, which suggests that effects in the domain of economic preferences may be smaller than in domain of emotional judgments and cultural beliefs.

General Discussion

If you take a group of people who are similarly aware of the existence of terrorism threat in their life, and expose them to a media reminder of it, would this lead to change in their decision-making? If this is found then are there personality differences which predict these psychological reactions? Our study set out to answer these questions. Our results show that for impulsive individuals, exposure to media reminders of terrorism systematically increase their aversion to financial risk — compared to being exposed to routine life nuisances such as dental procedures. Becoming more conservative in risk-taking decisions can have strong effects on one's life; for instance, this could translate into missed life opportunities (e.g., changing jobs, pursuing new projects, and starting a family) when contact with the media (including social type) is extensive. Therefore, impulsivity influences not just attitude towards risk, but also behaviour.

To what extent it is rational to adjust decision-making in view of terrorism as a low probability but, potentially, high-impact, threat is still a matter of debate. The modern world, however, can be particularly anxiety provoking – great technical progress in the development of media also means that individuals with a pessimistic outlook on the world can 'feed' this worldview by selectively accessing negative news from around the world. The tendency of social media to show users 'more of a like' can create skewed impressions of the world. It is important that individuals are aware of susceptibility of their personality to such effects and do not let such effects prevent them from pursuing their goals and making well-weighted decisions.

In terms of limitations of our research, future work with larger sample sizes are needed to replicate and extend our findings. In addition, we measured only the immediate effect on economic preferences, so we cannot say anything about longer terms effects.

Conclusion

Understanding the mechanisms through which anxiety caused by news of terrorist attacks can affect economic preferences in daily life through perceived threat and uncertainty can help us not allow such news to distract us from important goals in our life — informing more objective decision-making on individual level, and relevant policy-making on country level. The way individuals perceive terrorism threat can result in changes of risk-taking and delay-discounting choices, and basic approach-avoidance personality factors shows that some people may be especially vulnerable to these effects. It is important to understand and anticipate citizens' reactions to terrorism as a threat to their usual way of life to mitigate negative impact. It is to be hoped that the findings we report serve to shed light on the important impact on key economic variables as well as the influence of personality factors in shaping these psychological reactions.

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: SAGE Publications.

Almlund, M., Duckworth, A. L., Heckman, J. J., & Kautz, T. D. (2011). *Personality psychology and economics* (No. w16822). National Bureau of Economic Research. doi:10.1016/B978-0-444-53444-6.00001-8

Andersen, S., Harrison, G. W., Lau, M. I., & Rutstrom, E. E. (2008). Eliciting risk and time preferences. *Econometrica*, *76*(3), 583–618. doi:10.1111/j.1468-0262.2008.00848.x

Ben-Zur, H., & Zeidner, M. (2009). Threat to life and risk-taking behaviors: A review of empirical findings and explanatory models. *Personality and Social Psychology Review, 13*(2), 109–128. doi:10.1177/1088868308330104

Ben–Zur, H., Gil, S., & Shamshins, Y. (2012). The relationship between exposure to terror through the media, coping strategies and resources, and distress and secondary traumatization. *International Journal of Stress Management*, *19*(2), 132–150. doi:10.1037/a0027864

Burke, B. L., Martens, A., & Faucher, E. H. (2010). Two decades of terror management theory: A meta-analysis of mortality salience research. *Personality and Social Psychology Review*, *14*(2), 155–195. doi:10.1177/1088868309352321

Corr, P. J. (2013). Approach and avoidance behaviour: Multiple systems and their interactions. *Emotion Review*, 5, 285–290. doi:10.1177/1754073913477507

Corr, P. J., & Cooper, A. J. (2016). The Reinforcement Sensitivity Theory of Personality Questionnaire (RST-PQ): Development and validation. *Psychological assessment*, *28*(11), 1427-1440. doi:10.1037/pas0000273

Costa, P. T., & MacCrae, R. R. (1992). *Revised NEO personality inventory (NEO PI-R) and NEO five-factor inventory (NEO-FFI): Professional manual*. Psychological Assessment Resources, Incorporated. doi:10.1037//1040-3590.4.1.5

Echebarria Echabe, A., & Perez, S. (2015). The impact of different procedures to arouse mortality awareness on various worldview dimensions. *European Journal of Social Psychology*, 46, 392–399. doi:10.1002/ejsp.2144.

Gigerenzer, G. (2006). Out of the frying pan into the fire: Behavioral reactions to terrorist attacks. *Risk Analysis: An Official Publication of the Society for Risk Analysis*, *26*(2), 347–51. Doi:10.1111/j.1539-6924.2006.00753.x

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the function of the septo-hippocampal system*. Oxford: Oxford University press

Griskevicius, V., Tybur, J. M., Delton, A. W., & Robertson, T. E. (2011). The influence of mortality and socioeconomic status on risk and delayed rewards: A life history theory approach. *Journal of Personality and Social Psychology*, *100*(6), 1015–1026. Doi:10.1037/a0022403

Hirsh, J. B., & Inzlicht, M. (2008). The devil you know: Neuroticism predicts neural response to uncertainty. *Psychological Science*, *19*(10), 962–967. doi:10.1111/j.1467-9280.2008.02183.x

Lambert, A. J., Eadeh, F. R., Peak, S. a, Scherer, L. D., Schott, J. P., & Slochower, J. M. (2014). Toward a greater understanding of the emotional dynamics of the mortality salience manipulation: Revisiting the "affect-free" claim of terror management research. *Journal of Personality and Social Psychology*, *106*(5), 655–78. doi: 10.1037/a0036353

Lauriola, M., & Levin, I. P. (2001). Personality traits and risky decision-making in a controlled experimental task: An exploratory study. *Personality and Individual Differences*, *31*(2), 215–226. doi:10.1016/S0191-8869(00)00130-6

Maguen, S., Papa, A., & Litz, B. T. (2008). Coping with the threat of terrorism: A review. *Anxiety, Stress, and Coping*, *21*(1), 15–35. doi:10.1080/10615800701652777

McNaughton, N., & Corr, P. J. (2004). A two-dimensional neuropsychology of defense: Fear/anxiety and defensive distance. *Neuroscience and Biobehavioral Reviews*, 28, 285-305. doi:10.1016/j.neubiorev.2004.03.005

Nicholson, N., Soane, E., Fenton-O'Creevy, M., & Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research*, *8*(2), 157–176. doi:10.1080/1366987032000123856

Paulus, M. P., Rogalsky, C., Simmons, A., Feinstein, J. S., & Stein, M. B. (2003). Increased activation in the right insula during risk-taking decision making is related to harm avoidance and neuroticism. *NeuroImage*, *19*(4), 1439–1448. doi:10.1016/S1053-8119(03)00251-9

Pavia, T. M., & Mason, M. J. (2004). The reflexive relationship between consumer behavior and adaptive coping. *Journal of Consumer Research*, *31*(2), 441–454. doi:10.1086/422121

Slovic, P. (2002). Terrorism as hazard: A new species of trouble. *Risk Analysis*, *22*(3), 425–426. doi:10.1111/0272-4332.00053

Solomon, S., Greenberg, J., & Pyszczynski, T. (2004). The cultural animal: Twenty years of terror management theory and research. In *Handbook of Experimental Existential Psychology* (pp. 13 –34). New York, NY: Guilford.

Sunstein, C. R. (2003). Terrorism and probability neglect. *Journal of Risk and Uncertainty*, *26*(2-3), 121–136. doi:10.1023/A:1024111006336

Van den Bos, K., Poortvliet, P. M., Maas, M., Miedema, J., & van den Ham, E. J. (2005). An enquiry concerning the principles of cultural norms and values: The impact of uncertainty and mortality salience on reactions to violations and bolstering of cultural worldviews. *Journal of Experimental Social Psychology*, *41*(2), 91–113. doi:10.1016/j.jesp.2004.06.001

Watson, D., Clark, L. a, & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology,* 54(6), 1063–70. doi:10.1037/0022-3514.54.6.1063

Yavuz, H., & Van den Bos, K. (2009). Effects of uncertainty and mortality salience on worldview defense reactions in Turkey. *Social Justice Research*, *22*(4), 384–398. doi:10.1007/s11211-009-0104-5

Zuckerman, M., & Kuhlman, D. M. (2000). Personality and risk-taking: Common biosocial factors. *Journal of Personality*, *68*(6), 999. doi:10.1111/1467-6494.00124

Web References

BBC Horizon. (2008). How much is your dead body worth? [Video webcast]. Retrieved September 16, 2015,

from http://www.bbc.co.uk/sn/tvradio/programmes/horizon/broadband/tx/bodyparts/

BBC One. (2015). The truth about...your teeth [Video webcast]. Retrieved September 16, 2015, from http://www.bbc.co.uk/programmes/b05y3953

Bloomberg Business. (2015). Dozens Killed in Islamic Militant Attacks in Four Countries–[Video webcast]. Retrieved September 16, 2015, from http://www.bloomberg.com/news/articles/2015-06-26/dozens-killed-from-tunisia-to-france-on-caliphate-anniversary

Watchwellcast. (2013). 5 Tricks for overcoming fear [Video webcast]. Retrieved September 16, 2015, from https://www.youtube.com/watch?v=GDjwfF

Notes

[1] The main article and supplementary materials contain all measures, manipulations, and exclusions in the study.

[2] four missing values.

[3] Full analysis in Supplementary Material 2.3.

[4] Full GLM table in Supplementary Material 2.1

[5] Full GLM table in Supplementary Material 2.1

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Designed to Fail: Modeling Terrorism's Losing Battle

by Giti Zahedzadeh

Abstract

Terrorism is costly and unlikely to survive any selection process that favors behaviors with higher payoffs. Only those displaying the fittest strategy choices will thrive and multiply. Fitness reducing strategies fail to pass on to the new generation. Our evolutionary game model and agent-based computer simulations show that group benefits offset the within-group behavioral selection against terrorism. By increasing the number of alliances and the size of their membership, terror groups can contribute to their longevity. We conclude that costly terror campaigns may reduce popular support among terror organizations' potential constituency and thus, hasten the demise of terror groups.

Why do terror groups fail? The prevailing view is that terrorism is a form of costly signaling that works (Pape, 2003, 2005), can hurt governments to make concessions (Thomas, 2014, 807–9), serves as a spur to mobilization (DeNardo, 2014), and while it can potentially backfire with nonlinear impact, it is overall effective (Bueno de Mesquita and Dickson, 2007; Gould and Klor, 2010). Much attention has been given to the root causes of terrorism (Piazza, 2006; Berrebi, 2007; Zahedzadeh, 2015). Terror campaigns' impact on public opinion within targeted population has also been largely addressed (Canetti-Nisim et al., 2009; Huddy et al., 2005; Sharvit et al., 2010). However, studies on terrorism's impact on their own communities are limited in number and scope. Sharvit et al. (2015) investigated the relationship between terrorism and public opinion. But they only addressed the relationship between Palestinian public opinion and activities by Palestinian groups. Few scholars have highlighted the failure to transit to the next generation and undermining of popular support as important explanatory variables contributing to the terror organizations' demise (Cronin, 2006). Thus far, this research program suffers from the impeding analytical clarity to address the important role of public backing within terrorist's own constituency who could potentially support them.

Most analysis study factors that shape Muslim public opinion on violence against the West (Mostafa and Al-Hamdi, 2007; Davis et al., 2012; Berger, 2014). However, terrorism creates immense human and economic costs on the communities they claim to represent. According to the Institute for Economics and Peace Report's Global Terrorism Index (GTI), Boko Haram and the Islamic State of Iraq and Syria (ISIS) were jointly responsible for 51% of all claimed global fatalities in 2014. In fact, the global economic cost of terrorism reached an all-time peak at US$52.9 billion in 2014 (GTI, 2015; see Figure 1). According to GTI, the ten countries most affected by terrorism have experienced decreased GDP growth rates of between 0.51 and 0.8%.
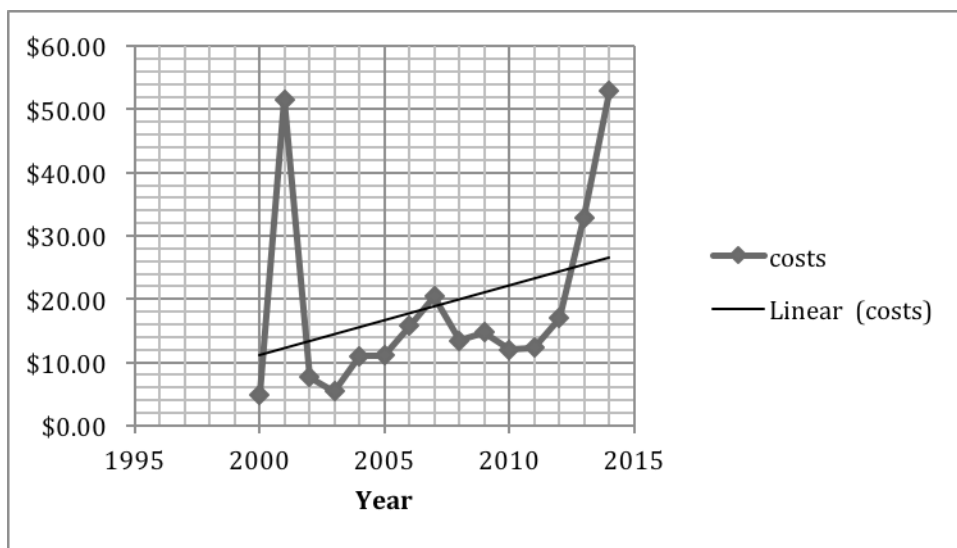
Figure 1. *The global costs of terrorism US $ Billions 2000-2014.*

The global cost of terrorism reached its highest value in 2014 ($52.9 billion). While compared to other type of conflicts, the costs of terrorism is smaller, the countries most affected by terrorism have their economic growth and FDI negatively affected. The methodology involves counting the lost wages of the injured and deceased and the immediate flow on effects on family and friends (Source: Global Terrorism Index 2015, p-62).

Community support can provide terrorists with logistical backing such as funding, transportation, safe housing, intelligence and technical expertise (Saggar, 2009), legitimacy and creation of an environment that valorizes sacrifice for the community's collective causes (Kimhi and Even, 2004; Krueger and Malečková, 2009), thereby, increasing the odds of its members joining terror groups (McCauley, 2004). While many studies point to the important role public opinion plays in creating an environment in which terror groups can flourish, relatively little research has been conducted to study the role of public support among communities, terrorists resurrect from and/or claim to fight for. According to GTI, the majority of deaths from terrorism in 2014 were concentrated in Iraq, Nigeria, and Syria. According to the report, ISIS has economically exploited the 10 million people and resources in the areas it controls leading to an increase in economic costs of terror activity. Thus, countries most affected by terrorism have their economic growth and foreign direct investment (FDI) negatively affected. For example in Nigeria, FDI decreased by 30% due to increased terrorism in 2010 (Economics and Peace Report 2015). Findings from Pew Global Attitudes survey (2005) on attitudes toward suicide bombing and other measures of support for terrorism finds that support has generally declined since 2002. In countries with significant Muslim populations, people overwhelmingly express negative views of ISIS (Pew 2015) (see Figure 2 and Table 1).
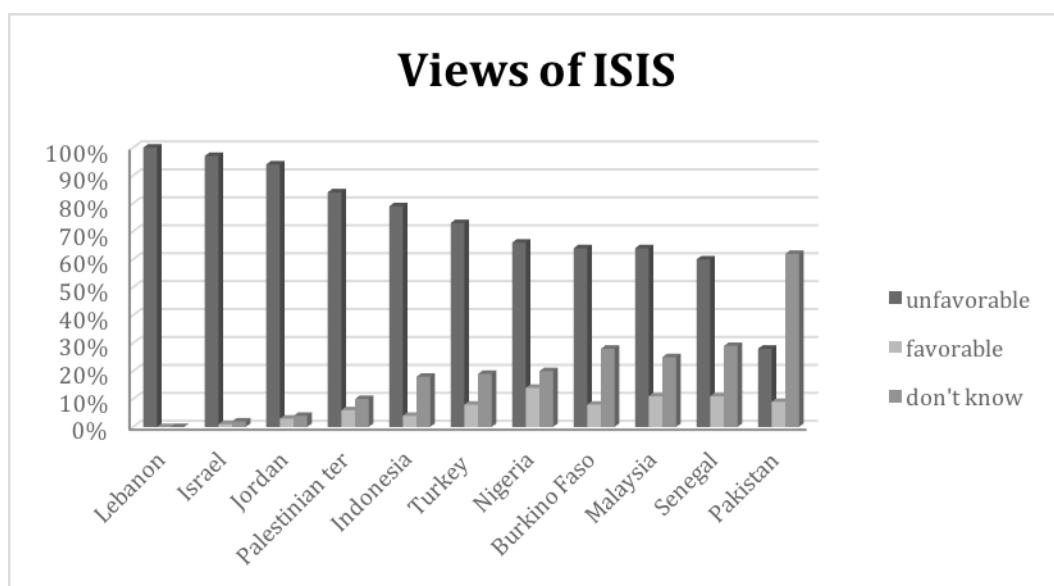
Figure 2. *Views of ISIS Overwhelmingly Negative.*

Do you have a ----- opinion of the Islamic militant group in Iraq and Syria known as ISIS? Source Pew Research Center (Spring 2015 Global Attitudes Survey)

Country	Group	Unfavorable	Favorable	Don't Know
Lebanon	-Christian	100%	0%	0%
	-Shia	100	0	0
	-Sunni	98	1	2
Israel	-Jewish	98	0	2
	-Arab	91	4	5
Palestinian	-Gaza	92	5	3
Territories	-West Bank	79	8	13
Burkina Faso	-Christian	66	5	29
	-Muslim	64	9	26
Nigeria	-Christian	71	7	22
	-Muslim	61	20	19
Malaysia	-Muslim	67	12	21
	-Buddhist	65	6	29

Table 1. *Views of ISIS by Religion, Ethnicity and Region. Do you have a ----- opinion of the Islamic militant group in Iraq and Syria known as ISIS? Source Pew Research Center (Spring 2015 Global Attitudes Survey).*

Many researchers view reduced public support for terrorism as a central measure of successful US counterterrorism efforts (Byman, 2003; Simon and Martini, 2004; Cronin, 2006). In fact, the most long-lived terror groups are the ones that have secured a considerable degree of public support (Crenshaw, 1981). Cronin (2006) notes that support for terror groups can dissipate for several reasons: i) the constituency's fear of government counteraction such as counterterrorism laws, regulations, sanctions, and raids; ii) terror group's aims may become outdated; and iii) terror group operations can cause revulsion among its claimed constituency. Herein, our focus is on terrorism's impact on own communities, which serves as a lifeline for its longevity. Terrorism is unlikely to survive any selection process that favors behaviors with higher payoffs. Thus, we expect the group benefits to offset the within-group behavioral selection against terrorism. Communities that avoid hostile interactions benefit from greater access to resources, which would otherwise be detrimental and costly. All terror groups end. But why do they? Our evolutionary game-theoretic analysis and agent-based simulations show that under conditions likely to be experienced by members of a community, terrorism cannot survive because it creates long-term costs. Therefore, we argue that costly terror campaigns can reduce popular support among terror groups' constituency and thus, hasten its demise. This article proceeds in five sections. Section I provides a brief review of the literature; in section II, we introduce an evolutionary model of terrorism and conduct computer simulations of the model; section III offers the results; section IV analyzes a historical case study; and finally we conclude. We will now proceed with a brief review of literature.

A Brief Review of Literature

Abrahms (2005, 2010, 2012) shows that the prevailing view of terrorism as a potent coercive strategy rests on scant empirical footing, and suggests that campaigns of violence that primarily target civilians almost never succeed. In fact, terrorism's poor success rate is inherent to the nature of its tactic (Abrahms, 2006). Other scholars have joined in to show the limited historical examples of clear victories of terror organizations (Neumann and Smith, 2007; Cronin, 2009; Dannenbaum, 2011). Rapoport (1992) contends that 90% of terror groups have a life span of less than a year and of those reaching a year mark, more than half disappear within a decade. It is argued that terror groups motivated by ethnonationalist causes have had the longest average life span; their greater longevity seems to result, at least partly, from support among the local population of the same ethnicity (Crenshaw, 1991, 69–87). Research has shown that larger memberships make terror groups resilient to alternative ways of ending (Gaibulloev and Sandler, 2013).

It has been suggested that failure is inherent to terrorism itself (Abrahms, 2006). Heightening the pain to civilians tends to backfire on the goals of terrorists by hardening the stance of populations (Gould and Klor, 2010, 1507); thus, consistently reducing their odds of success. Terrorism has many repercussions for the community it resurrects from, such as sociological outcomes dictated by losses (e.g. human life, property), economic consequences because of possible effects resulting from the reallocation of resources (Gupta et al., 2004), tourism flow biases, industrial moves, brain drain outflows, and emigration (Bassil, 2014). Laqueur (1976, 105) argues that terrorism creates tremendous noise; it is destructive and leads to the loss of human life while politically it is ineffective. In addition, their potential constituency can suffer backlash and discrimination. Evidence for a backlash after 9/11 is supported by data on hate crimes against Muslims (Gould and Klor, 2015); similar backlash took place across Europe (Aslund and Rooth, 2005; Hanes and Machin, 2012; Schuller, 2012). Cronin (2006) argues that terror attacks can undermine the group's cause by plummeting popular support and lead to the demise of the organization. If inherently a failure then one

may question why individuals engage in terrorism? Abrahams (2010) notes that terrorists overestimate the effectiveness of their actions when employing this tactic.

We argue that terrorism undermines rather than enhances success by creating community costs. From an individual perspective, participation in terrorism.is fitness reducing. The cost of participation (death, injury) is high, the effect it can have on the conflict's outcome is negligible, and, if one's group does in fact win, the benefits are public goods shared by all group members regardless of whether they have contributed or not (Bornstein, 1992, 2003). Herein, we use an evolutionary game model and simulations to show that terrorism is unlikely to survive any selection process that favors behaviors with higher payoffs. The model predicts that those displaying the fittest strategy choices will survive, and multiply. We hypothesize that terrorism fails because of its inherent deficiency to manufacture sustainable benefits for the community it arises from and aims to recruit from.

Method

Evolution supports behavior that is individually beneficial but socially costly (Friedman and Singh, 2004). The basic viability problem is that while the fitness benefits of terrorism often do not cover personal costs, at the community level, it has a negative fitness gradient. We model the evolution of genetically transmitted behavioral types in a population where decisions are repeated across time. Strategies that increase fitness by the current population will be played by a larger fraction of the population in the next period. The empirical importance of altruism and hostility towards members of other groups is well established (Choi and Bowles, 2007). Choi and Bowles (2007) argue that intergroup hostility and aggression are similar to altruism in that an individual adopting these behaviors incurs mortal risks or foregoes beneficial opportunities, therefore, contracting a fitness loss. Suicide terrorism can be defined as an altruistic behavior (Riemer, 1998), or even a combination of altruistic and fatalistic behavior (Pedahzur et al., 2003). When the members of an individual's group benefit as a result of one's hostile actions toward other groups, Choi and Bowles (2007), term the behavior *parochial altruism*. We will apply this definition throughout this paper. Next we introduce the model.

The Model

The model is implemented in Netlogo (5.3.1).[1] Agents of an evolutionary game occupy a lattice, which is fixed for the duration of the evolutionary dynamics. Norms emerge through within group interactions (Bornstein, 2003). Like multilevel selection models, we assume group conflict exists (Guzmán et al., 2007). All agents in our world (Θ)(are identifiable by heritable alleles. We represent their behaviors as the expression of two hypothetical alleles at each of two loci. Consider a population of N individuals consisting of parochials and altruists.[2] Hence, there are four types of heritable alleles and the probability of inheriting each is set at $p = ¼$. These are *parochial altruists* (*PA*, that is bearers of the *P* and *A* alleles), *altruists* (*A*), *parochials* (*P*), and non-parochial-non-altruists (Φ). Several authors have discussed the evolution of individual traits whose fitness depends on their prevalence in the group (Wilson and Sober, 1998); while others have discussed the evolution of conventions (Young, 1993). Individuals of various types may grow or shrink; over time a particular group's trait may drift or occasionally change abruptly as the members' common understanding reacts to experience (Friedman and Singh 2004).

Let K denote the set of all possible alleles: K = {PA,P,A, Φ}, then λ = {P, A, Φ} $\therefore$ $\lambda \subset$ K. M denotes all

members of the community. All λ are considered tolerant. There is no evidence that the hypothetical alleles in our model exist. For example, Choi and Bowles (2007) did not show that a warlike genetic predisposition exists, but only that one should exist; and that it may have coevolved with altruism and warfare. Individual values for terrorism converge to the level that maximizes one's fitness but then adjusts to the level that maximizes the group's average fitness; importantly a detailed micro-dynamic evolutionary model for a group trait needs to consider the joint time path of the traits across groups and the group size (Friedman and Singh, 2004). We are interested to know whether group traits will displace others, however, it does not matter whether the displacement occurs through changes in size or the number of groups; it is sufficient to use aggregate dynamics that track the population shares for each trait (Friedman and Singh, 2004).

We incorporate cost-benefit calculations in the model; the benefit of the act *(b)* is divided by its cost *(c)* $\therefore {}^b/_c$(Ohtsuki et al., 2006). Every generation produces offspring and each member *(i)* extracts benefits from the environment. Each *i* collects benefits from the environment *(E_b)* if available, and to which every *i* can contribute $\therefore$ *b(b + Eb)*but not if benefits become scarce resources where *b(b-x)* .[3] Members die if *b < 0*. Agents can build networks but who-meets-whom is not random, but determined by spatial relationships or social networks (Lieberman, 2005; cited in Ohtsuki et al., 2006). We incorporate Ohtsuki et al.'s (2006) finding who suggest natural selection favors cooperation, if the benefit of the altruistic act divided by the cost exceeds the average number of neighbors, *k*; thus, cooperation can evolve as a consequence of social viscosity even in the absence of reputation effects or strategic complexity. Thus, we assume *PAs* can build alliances if *($^b/_c$ > k)*.Alliances can be built with a benchmark probability of ¼.

The fitness of an individual is given by the baseline fitness plus the payoff that arises during her lifetime. Strong selection means that the payoff is large relative to the baseline fitness; weak selection indicates a smaller payoff compared to the baseline (Ohtsuki et al., 2006). The expected payoff to the community who adopts terrorism is PT = $[(\delta\eta(^b/_c) + \delta\iota(^b/_c]$, or not P'T = $[(\gamma\eta(^b/_c) + \gamma\iota(^b/_c)]$ (Anderton, 2014).[4]$\delta\eta$, $\delta\iota$, $\gamma\eta$ and $\gamma\iota$are probabilities and can be manipulated by the user at each simulation run.[5] The average community fitness is U = [PT + P'T] . The evolutionary replicator dynamics (Nowak, 2006; Anderton, 2014) is $\therefore \eta_{PA}{}^{\tau+1} = (\eta_{PA}{}^{\tau})(PT - \bar{U}) + \eta_{PA}{}^{\tau}$ Thus, evolutionary success depends on leaving behind the maximum number of copies of itself in Θ . We present the following update rule (*Rule M*) for evolutionary dynamics. Terrorism could be wiped out if PT< Ū (*Rule M*) If PT > Ū then selection favors this behavior (Figure 3). Next, we study graphical results of our simulations.
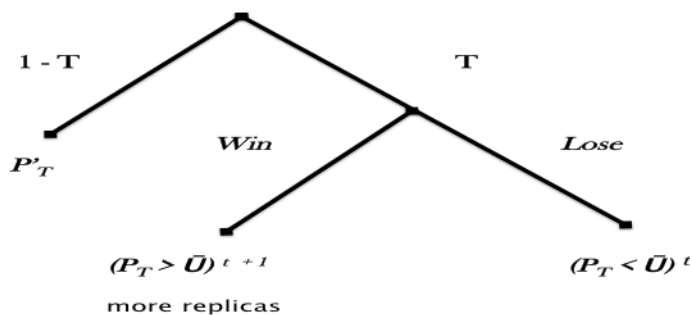

Figure 3. *The rules of the game.*

Each individual in the community occupies the lattice and derives a payoff from interactions with the environment, which is influenced by the behavior of all members. T denotes terrorism.

Results

The simulation begins by generating a random world. Starting from the center, the algorithm selects a pre-defined number of agents (Figure 4). Events transpire on a lattice and agents move around this space, where they act in accordance with (*Rule M*) . To explore the robustness of the model, 1000 simulation runs are executed—each initialized using the same set of standard values. The sequence of events in each generation is as follows: interaction occurs, followed by repopulation; members interact in public goods games, and they reproduce in proportion to their share of the group's total payoffs.
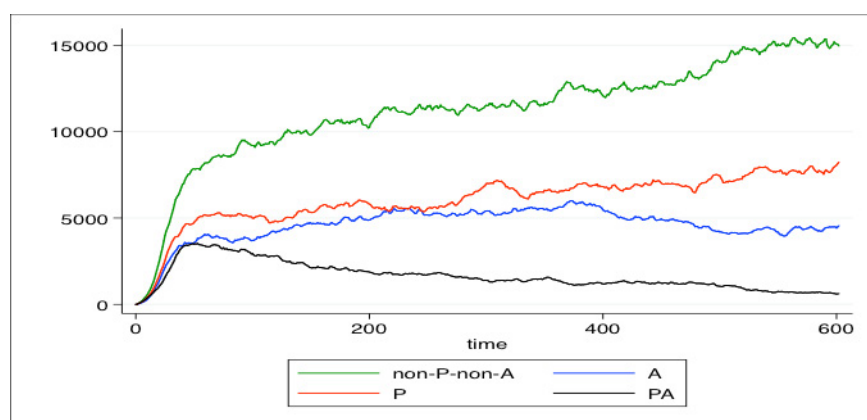

Figure 4. *This illustrates the number of hypothetical alleles inherited over time. Importantly we observe the number of PAs decline over time. Average values are the following for all traits: (non-P-non-A M = 11208.27, SD = 3015.73; A M = 4561.32, SD = 1057.68; P M = 6044.31, SD = 1488.16; PA M = 1638.30, SD = 791.62).*

We find that the number of tolerant individuals increases over time unlike the number of *PAs,* which seems to be in decline across time (Figure 5). *PA's* use of terrorism as a tactic is probabilistic; if employed it can create costs for the community. Figure 5 shows the cost-benefit calculations for the community over time. *PA*s who employ terrorism accrue costs and contribute less to the collective good. We fit the simulation results in an ordinary least square model and use robust standard errors (Table 2). The increasing number of *PA*s employing terrorism tactic inflate community costs ($p < 0.001$) and reduce collective goods ($p < 0.001$). A decline in the number of alliances is also observed with increasing community costs ($p < 0.001$). We find terrorism unsustainable as a tactic, and groups that utilize it will largely fail to transit to the next generation. Thus, failure to pass the legacy to next generations can explain why terror groups end.
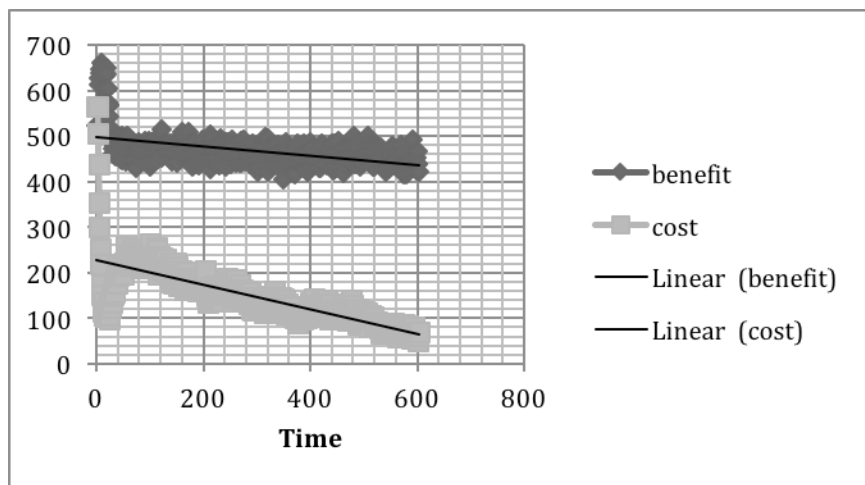
Figure 5. *This illustrates community benefits and costs over time. Terrorism produces costs and thus, this behavior is driven out. Average values are the following: (Benefits M = 466.34, SD = 35.97; Costs M = 146.34, SD = 59.76).*

Predictor	Coefficient (SE)	p value
Alliances	-1.82 (0.22)	<0.001
PA	0.04 (0.003)	<0.001
Tolerant	-0.02 (0.003)	<0.001
Benefit	-0.39 (0.10)	<0.001
R2	0.81	
Root MSE	25.75	

Table 2. *We use robust standard errors. Dependant variable is cost.*

Case Study

Our model and simulations show that costly terror activity can reduce popular support over time and facilitate the demise of terror groups. Cronin (2006) notes that support for a terror group can diminish for several reasons such as government engagement in strong repressive measures, loss of population interest in the ideology of the group, and revulsion in reaction to the group's operations. The lack of public support can drain the group of recruits and financial backing, and pave the path for its demise (Becker, 2015). Given this sensitivity to public support, terror groups may modulate their actions in order to avoid backlash (Bloom and Horgan, 2008). Civilian disenchantment with the group's operations can divest it of public backing, which is its lifeline (Becker, 2015). Becker (2015) argues that in order for terror groups to scale back attacks deliberately, two conditions need to be satisfied: first, the group's natural constituency must be negatively affected by the group's operations, and second, it must be reliant on—and therefore receptive to—its claimed

constituency.

The case of the IRA (Irish Republican Army) is often cited as an example of public disillusionment with a terror group (Cronin, 2006). Our study rests on a systematic analysis of the IRA's terror operations in order to evaluate our model's proposition. The IRA conducted a significant number of terror campaigns with the aim of driving out the British and aimed to animate the local population to back Irish unity (Hewitt, 1990). We choose to reflect on the IRA's operations for several reasons: i) repression was great in Northern Ireland since paramilitary feuding and sectarianism reigned (Curran, 1998); Catholics constituted a permanent minority in a system dominated by Protestants and characterized by elements of political discrimination (gerrymandering, disenfranchisement) (Sànchez-Cuenca, 2007), ii) the British army was heavily involved in Northern Ireland (the presence of the army is associated with more severe anti-terror methods);[6] the British response frequently involved punishing the wider population for IRA activities (English, 2003), iii) the conflict was a major source of social and economic dislocation (Besley and Mueller, 2012), iv) the IRA campaign took place in the context of an ethnic conflict between two communities divided by religion and many killings of civilians and paramilitaries were the result of retaliation and sectarian warfare (Sànchez-Cuenca, 2007), and v) the IRA abandoned the use of terror and joined the political process. Thus, the case of IRA is not only relevant to our model, but also feasible given the vast amount of scholarly information available on the group.

The IRA

The IRA was created in 1919; its primary goal was to reunify Ireland through the incorporation of the six counties of Northern Ireland, which had a Protestant majority (Sànchez-Cuenca, 2007). From the late 1960s a violent conflict flared up (Besley and Mueller, 2012); in 1968, the IRA mobilized to protect Catholics from police and Protestant harassment (Sànchez-Cuenca, 2007). Dissatisfied with the IRA's strategy, nationalist members of the Republican movement, split in 1969, and created the Provisional IRA (PIRA). PIRA killed around 1,640 people between 1969 and 2001(Sànchez-Cuenca, 2007). Over the past 35 years, the conflict in Northern Ireland caused more than 3,700 deaths and more than 40,000 injuries, with civilians bearing the burden of all deaths (53%) and injuries (68%) (Smyth, 1998; Smyth and Hamilton, 2004; cited in Ferguson and Burgess, 2008). It is estimated that 10% of the population has had relatives killed as a result of the conflict (whereas 50% of the population knows someone who was killed) (Smith, 1987). Over time, a series of important events effectively drove a wedge between the IRA and the very public it purported to represent. These are famously, the IRA's *proxy bombs* and the *Omagh bombing*. Bloom and Horgan (2008) argue that the proxy bombings may in fact have been the very incident that caused IRA to lose support once and for all. Cronin (2006) highlights the Omagh bombing to have caused colossal revulsion; Omagh reduced support for militant Republicanism, exhausting IRA's public backing. Next, we analyze both events in detail.

Proxy Bombs

In 1980s, the IRA would send a civilian with a bomb on a vehicle to detonate the target while his family was held hostage to ensure compliance; only after the civilian followed instructions, the IRA would release him and his family (Bloom and Horgan, 2008). In 1990s, the IRA changed tactics by introducing its proxy bomb. Bloom and Horgan (2008) note that the proxy bomb refers to the vehicle-borne delivery of an explosive in a manner that the driver-customarily a civilian- has been coerced into cooperating. The proxy bomb utilized the used of the civilian to deliver the bomb, while his family was held hostage, however, the

driver would not have the opportunity to get away (Bloom and Horgan, 2008). The new tactic involved the kidnapping of Catholic civilians who were not IRA members; these civilians were coerced to drive vehicle-borne improvised explosive devices (Bloom and Horgan, 2008). In 1990, the IRA executed simultaneous car bomb attacks at Londonderry (Derry), Newry, and a failed attack at Omagh (Coogan, 2002, 248). The two bombs that successfully detonated resulted in unprecedented outrage within both the Protestant and Catholic communities (Dettmer and Gorman, 1990). The devastation to mixed working-class neighborhood united many Catholics and Protestants in outrage and the Catholic clergy voiced its opposition (Bloom and Horgan, 2008). In the poor Catholic neighborhoods where support for the IRA was the strongest, the proxy bombs caused backlash against the group (Prokesch, 1990). In fact, the public opinion against the IRA became so negative that the group abandoned the tactic (Bloom and Horgan, 2008). The outrage caused by the civilian deaths exacerbated divisions within the group's leadership and the broad public repulsion strengthened the position of the doves in the group, particularly Gerry Adams, who was largely responsible for considering how the movement could effectively abandon violence (Bloom and Horgan, 2008). There is no doubt that the significance of the events of 1990 and the shift in tactics due to public disapproval were instrumental in shaping the future of the group. The public disapproval was echoed in reactions to Omagh in 1998, which finally entrusted the reign of terror to a historical footnote (Bloom and Horgan, 2008).

Omagh Bombing

The peace process proceeded in Northern Ireland in the late 1990s. Opposing the peace process, a dissident group, the Real Irish Republican Army (RIRA), was formed to continue the armed struggle for a unified Ireland (Becker, 2015). The group conducted the Omagh car bombing in 1998.[7] Omagh represented the largest loss of life in any single incident of the Irish troubles since 1969 (Johnson, 2012). It underlined the fragility of the peace process as it was developing through the 1990s and proved to be a debacle for the RIRA, eliciting vehement revulsion among the population (Becker, 2015). Ironically, it also served as a catalyst to the peace-making process, as Catholics and Protestants shared the grief of communal loss and trauma (Johnson, 2012). In contrast to the scarce attention paid by the republican publications to previous atrocities like Bloody Friday (1972), the Birmingham bombs (1974), the Enniskillen bomb (1987), and the Shankill Road bomb (1993), Omagh was largely covered (Alonso, 2001). Condemnation of the bombing came from a variety of sources including leaders on both sides of the conflict, signifying a watershed that distinguished this bombing from earlier acts of violence (Johnson, 2012). Denunciation of Omagh marked a historic transformation in the movement's thinking; it sidelined militarism that had obscured the political interests of the group (Alonso, 2001). Omagh not only failed to even rally tepid Irish support for RIRA's platform (Becker, 2015), but rather the Irish community reacted with such outrage that the group declared a cease-fire (Cronin, 2006, 21). The implementation of the Belfast Agreement in 1998 established a structure for governance, which installed the framework for a new power sharing (Johnson, 2012). In 2005, the IRA made a public statement ordering an end to the armed campaign and instructing its members to seek nonviolent political means (Besley and Mueller, 2012).

Conclusion

Herein, we utilized an evolutionary model to show that terrorism is unlikely to survive any selection process that favors behaviors with higher payoffs. Our simulations show an approximation of the explicit dynamics of the underlying Markov process. Terrorism fails due its inherent deficiency to manufacture sustainable

benefits for its potential constituency. We observe that the dynamics of the model favors behavior that inflates collective good and deflates costs over time. Therefore behavior that reduces the fitness of the community will be forced out. The concept of failure to transit to the next generation is closely related to our model and to the theories, which posit that terrorist violence is associated with the rise and fall of generations (Cronin, 2006).

Cronin (2006) notes that popular support for a terror group can dissipate for a number of reasons such as the loss of population interest in the ideology of a terror group or revulsion among its claimed constituency. Extreme violence can lead to civilian disenchantment with the terror group's operations. Conflict in Northern Ireland was a major source of social and economic dislocation since paramilitary feuding and sectarianism reigned. Over time, a series of important events effectively drove a wedge between the IRA and the very public it purported to represent. The IRA operations caused the group to lose public support by generating colossal revulsion among its constituency. Finally, the IRA abandoned the use of terror and joined the political process. The case of the IRA shows that costly terror campaigns can diminish popular support among terror group's potential constituency and facilitate its demise.

Why terror groups decline is an important question to inform counterterrorism agencies. Counterterrorism measures should not ignore the capabilities and the dynamics of the terror groups' constituency. A number of policy conclusions follow from our results. First, terror group's size matters for survival and sustainment of terror campaigns. Second, there is immense media attention spurred by terror groups; and the need to analyze and profile the perpetuators when targets are in the West is considerable. However, the plight of terrorism largely impacts and is deeply felt in countries where terror groups maintain control, claim territory, or conduct attacks regularly. It is important to note that terror groups present an ongoing threat to these communities. Reflecting the hardship imposed on such communities and highlighting their plight can help reduce support from terror group's potential constituency; this can be an effective mean of hastening terror groups' demise (Cronin, 2006). Third, it is important to take measures to counter the alienation of communities whose help are vital to counterterrorism agencies. Importantly, it is essential to curb discrimination against communities who share common religion and ethnicity with terror groups but live in targeted countries. For example, Gould and Klor (2014) investigated whether the 9/11 attacks affected the assimilation rate of Muslims in the U.S. They found that attacks by Islamic groups are likely to induce a backlash against Muslims, thereby raising the costs of assimilation. Further, Muslim immigrants living in states with the sharpest increase in hate crimes exhibit the following: a greater likelihood of marrying within their own ethnic group, higher fertility, lower female labor force participation, and lower English proficiency (Gould and Klor, 2012). These factors can further alienate communities and create vulnerable populations susceptible to terrorist recruitment within societies. Cooperation with communities where terrorists may tap into in order to recruit is essential to fight terrorism.

While our study was theoretically motivated, our model and simulations contribute to the emerging evolutionary explanation of why groups collectively and powerfully influence human behavior (Axtell et al., 2001; Hammond and Axelrod, 2006; Choi et al., 2007). In future research the genetic transmission process in the model could be modified via mutations, learning, and influential contagions. There is evidence that human parochialism can be redirected and even overridden by deliberate teaching, exposure, and indeed by other aspects of socialization (Choi and Bowles, 2007). While our aim is not to trivialize the potential of terror groups to cause harm, we argue that the burden of terrorism on its potential constituency is very high, making the tactic a failure by design. In future studies, we hope to use complementary data to test our model quantitatively, and compare it with alternative models.

References

Abrahms, Max. "Al Qaeda's miscommunication war: The terrorism paradox." *Terrorism and Political Violence* 17, no. 4 (2005): 529-549.

Abrahms, Max. "Why terrorism does not work." *International Security* 31, no. 2 (2006): 42-78.

Abrahms, Max. "Dying for Nothing? The Political Ineffectiveness of Suicide Terrorism." *Debating Terrorism Counterterrorism* (2010).

Abrahms, Max, and Karolina Lula. "Why Terrorists Overestimate the Odds of Victory." *Perspectives on Terrorism* 6, no. 4-5 (2012).

Abrahms, Max. "The Credibility Paradox: Violence as a Double-Edged Sword in International Politics." *International Studies Quarterly* 57, no. 4 (2013): 660-671.

Alonso, Rogelio. "The modernization in Irish Republican thinking toward the utility of violence." *Studies in Conflict and Terrorism* 24, no. 2 (2001): 131-144.

Anderton, Charles. *The Social Evolution of Terror and Genocide across Time and Geographic Space: Perspectives from Evolutionary Game Theory*. No. 1407. 2014.

Åslund, Olof, and Dan-Olof Rooth. "Shifts in attitudes and labor market discrimination: Swedish experiences after 9-11." *Journal of Population Economics* 18, no. 4 (2005): 603-629.

Axtell, Robert L., Joshua M. Epstein, and H. Peyton Young. "The emergence of classes in a multiagent bargaining model." *Social dynamics* (2001): 191-211.

Bassil, Charbel. "The Effect of Terrorism on Tourism Demand in the Middle East." *Peace Economics, Peace Science and Public Policy* 20, no. 4 (2014): 669-684.

Becker, Michael. "Why Violence Abates: Imposed and Elective Declines in Terrorist Attacks." *Terrorism and Political Violence* (2015): 1-21.

Berger, Lars. "Foreign policies or culture what shapes Muslim public opinion on political violence against the United States?" *Journal of Peace Research* (2014): 0022343314527983.

Berrebi, Claude. "Evidence about the link between education, poverty and terrorism among Palestinians." *Peace Economics, Peace Science and Public Policy* 13, no. 1 (2007).

Besley, Timothy, and Hannes Mueller. "Estimating the Peace Dividend: The impact of violence on house prices in Northern Ireland." *The American Economic Review* 102, no. 2 (2012): 810-833.

Bloom, Mia, and John Horgan. "Missing their mark: The IRA's proxy bomb campaign." *social research* (2008): 579-614.

Bornstein, Gary. "The free-rider problem in intergroup conflicts over step-level and continuous public goods." *Journal of Personality and Social Psychology* 62, no. 4 (1992): 597.

Bornstein, Gary. "Intergroup conflict: Individual, group, and collective interests." *Personality and social psychology review* 7, no. 2 (2003): 129-145.

Bowles, Samuel, Jung-Kyoo Choi, and Astrid Hopfensitz. "The co-evolution of individual behaviors and social institutions." *Journal of theoretical biology* 223, no. 2 (2003): 135-147.

Bueno de Mesquita, Ethan, and Eric S. Dickson. "The propaganda of the deed: Terrorism, counterterrorism, and mobilization." *American Journal of Political Science* 51, no. 2 (2007): 364-381.

Byman, Daniel. "Scoring the war on terrorism." *The National Interest* 72 (2003): 75-84.

Canetti-Nisim, Daphna, Eran Halperin, Keren Sharvit, and Stevan E. Hobfoll. "A new stress-based model of political extremism personal exposure to terrorism, psychological distress, and exclusionist political attitudes." *Journal of Conflict Resolution* 53, no. 3 (2009): 363-389.

Choi, Jung-Kyoo, and Samuel Bowles. "The coevolution of parochial altruism and war." *science* 318, no. 5850 (2007): 636-640.

Chicago Project on Security and Terrorism (CPOST). 2016. Suicide Attack Database (April 19, 2016 Release). Retrieved from http://cpostdata.uchicago.edu/

Coogan, Tim Pat. *The ira*. Palgrave Macmillan, 2002.

Crenshaw, Martha. "The causes of terrorism." *Comparative politics* 13, no. 4 (1981): 379-399.

Crenshaw, Martha. "Questions to be answered, research to be done, knowledge to be applied." (1990): 113-126.

Crenshaw, Martha. "How terrorism declines." *Terrorism and Political Violence* 3, no. 1 (1991): 69-87.

Crenshaw, Martha. "Why violence is rejected or renounced: A case study of oppositional terrorism." *The Natural History of Peace* (1996).

Cronin, Audrey Kurth. "How al-Qaida ends: The decline and demise of terrorist groups." *International Security* 31, no. 1 (2006): 7-48.

Cronin, Audrey Kurth. "How terrorist campaigns end." *Leaving terrorism behind: Individual and collective disengagement* (2009): 49-65.

Curran, Peter S. "Psychiatric aspects of terrorist violence: Northern Ireland 1969-1987." *The British Journal of Psychiatry* 153, no. 4 (1988): 470-475.

Dannenbaum, Tom. "Bombs, ballots, and coercion: The Madrid bombings, electoral politics, and terrorist strategy." *Security Studies* 20, no. 3 (2011): 303-349.

Davis, Paul K., Eric V. Larson, Zachary Haldeman, Mustafa Oguz, and Yashodhara Rana. *Understanding and influencing public support for insurgency and terrorism*. RAND NATIONAL DEFENSE RESEARCH INST SANTA MONICA CA, 2012.

DeNardo, James. *Power in numbers: The political strategy of protest and rebellion*. Princeton University Press, 2014.

Dettmer, Jamie, and Edward Gorman. "Seven Dead in IRA 'Human Bomb'Attacks." *The Times, October* 25 (1990).

English, R. "Armed Struggle: A History of the IRA (London: Pan Macmillan)." (2003).

Friedman, Daniel, and Nirvikar Singh. *Vengefulness evolves in small groups*. Palgrave Macmillan UK, 2004.

Ferguson, Neil, and Mark Burgess. "The Road to Insurgency: Drawing Ordinary Civilians into the Cycle of Military Intervention and Violent Resistance." *Political Violence, Organized Crimes, Terrorism and Youth* (2008): 83-93.

Gould, Roger V. "Collective violence and group solidarity: Evidence from a feuding society." *American Sociological Review* (1999): 356-380.

Gould, Eric D., and Esteban F. Klor. "The long-run effect of 9/11: Terrorism, backlash, and the assimilation of Muslim immigrants in the West." (2012).

Gupta, Sanjeev, Benedict Clements, Rina Bhattacharya, and Shamit Chakravarti. "Fiscal consequences of armed conflict and terrorism in low-and middle-income countries." *European Journal of Political Economy* 20, no. 2 (2004): 403-421.

Gaibulloev, Khusrav, and Todd Sandler. "Determinants of the demise of terrorist organizations." *Southern Economic Journal* 79, no. 4 (2013): 774-792.

Global Research, Centre for Research on Globalization. *The Little-Known Secret to Destroying ISIS Propaganda*, March 25, 2016. Retrieved (May 9, 2016) http://www.globalresearch.ca/muslims-are-the-victims-of-between-82-and-97-of-terrorism-related-fatalities-us-government/5516565

Gould, Eric D. and Esteban F. Klor. 2010. Does terrorism work? Quarterly Journal of Economics, 125 (4): 1459–1510.

Gould, Eric D., and Esteban F. Klor. "The Long-run Effect of 9/11: Terrorism, Backlash, and the Assimilation of Muslim Immigrants in the West." *The Economic Journal* (2015).

Guzmán, Ricardo Andrés, Carlos Rodríguez-Sickert, and Robert Rowthorn. "When in Rome, do as the Romans do: the coevolution of altruistic punishment, conformist learning, and cooperation." *Evolution and Human Behavior* 28, no. 2 (2007): 112-117.

Hammond, Ross A., and Robert Axelrod. "Evolution of contingent altruism when cooperation is expensive." *Theoretical population biology* 69, no. 3 (2006): 333-338.

Hanes, Emma, and Stephen Machin. "Hate crime in the wake of terror attacks: Evidence from 7/7 and 9/11." *Journal of Contemporary Criminal Justice* (2014): 1043986214536665.

Huddy, Leonie, Stanley Feldman, Charles Taber, and Gallya Lahav. "Threat, anxiety, and support of antiterrorism policies." *American journal of political science* 49, no. 3 (2005): 593-608.

Institute for Economics and Peace, Global Terrorism Index (2015). Retrieved (May 15, 2016) http://economicsandpeace.org/wp-content/uploads/2015/11/Global-Terrorism-Index-2015.pdf

Johnson, Nuala C. "The contours of memory in post-conflict societies: enacting public remembrance of the bomb in Omagh, Northern Ireland." *cultural geographies* 19, no. 2 (2012): 237-258.

Laqueur, Walter. "The futility of terrorism." *Harper's* 252, no. 1510 (1976): 99-105.

Lieberman, Erez, Christoph Hauert, and Martin A. Nowak. "Evolutionary dynamics on graphs." *Nature* 433, no. 7023 (2005): 312-316.

Kimhi, Shaul, and Shemuel Even. "Who are the Palestinian suicide bombers?" *Terrorism and Policical Violence* 16, no. 4 (2004): 815-840.

Krueger, Alan B., and Jitka Malečková. "Attitudes and action: Public opinion and the occurrence of international terrorism." *Science* 325, no. 5947 (2009): 1534-1536.

Mostafa, Mohamed M., and Mohaned T. Al-Hamdi. "Political Islam, clash of civilizations, US dominance and Arab support of attacks on America: A test of a hierarchical model." *Studies in Conflict & Terrorism* 30, no. 8 (2007): 723-736.

Neumann, Peter R., and Michael Lawrence Rowan Smith. *The strategy of terrorism: How it works, and why it fails*. Routledge, 2007.

Ohtsuki, Hisashi, Christoph Hauert, Erez Lieberman, and Martin A. Nowak. "A simple rule for the evolution of cooperation on graphs and social networks." *Nature* 441, no. 7092 (2006): 502-505.

Pedahzur, Ami, Arie Perliger, and Leonard Weinberg. "Altruism and fatalism: The characteristics of Palestinian suicide terrorists." *Deviant Behavior* 24, no. 4 (2003): 405-423.

Pew Research *Center. Where Terrorism Finds Support in the Muslim World, May 23*, 2006. Retrieved (May 15, 2016) http://www.pewglobal.org/2006/05/23/where-terrorism-finds-support-in-the-muslim-world/

Pew Research Center. *In nations with significant Muslim populations, much disdain for ISIS,* Nov 17, 2015. Retrieved (May 15, 2016) http://www.pewresearch.org/fact-tank/2015/11/17/in-nations-with-significant-muslim-populations-much-disdain-for-isis/ft_15-11-17_isis_views/

Piazza, James A. "Rooted in poverty?: Terrorism, poor economic development, and social cleavages 1." *Terrorism and Political Violence* 18, no. 1 (2006): 159-177.

Prokesch, S. "A World of Differences on a Unified Continent." *New York Times* 31 (1990): D2.

Rapoport, David C. "Terrorism, " in Mary Hawkesworth and Maurice Kogan, eds., *Routledge Encyclopedia of Government and Politics,* Vol. 2 (London: Routledge, 1992), p. 1067.

Riemer, Jeffrey W. "Durkheim's" heroic suicide" in military combat." *Armed Forces & Society* 25, no. 1 (1998): 103-120.

Sanchez-Cuenca, Ignacio. "The dynamics of nationalist terrorism: ETA and the IRA." *Terrorism and Political Violence* 19, no. 3 (2007): 289-306.

Sandler, Todd, and Kevin Siqueira. "Global terrorism: deterrence versus pre-emption." *Canadian Journal of Economics/Revue canadienne d'économique* 39, no. 4 (2006): 1370-1387.

Saggar, Shamit. "Boomerangs and slingshots: radical Islamism and counter-terrorism strategy." *Journal of ethnic and Migration studies* 35, no. 3 (2009): 381-402.

Schüller, Simone. "The effects of 9/11 on attitudes toward immigration and the moderating role of education." (2013).

Sharvit, Keren, Daniel Bar-Tal, Amiram Raviv, Alona Raviv, and Ronit Gurevich. "Ideological orientation and social context as moderators of the effect of terrorism: The case of Israeli-Jewish public opinion regarding peace." *European Journal of Social Psychology* 40, no. 1 (2010): 105-121.

Smith, David J. "Equality and Inequality in Northern Ireland: Perceptions and Views (Parts 1 and 3)." *London: Policy Studies Institute* (1987).

Smyth, Marie. "Remembering in Northern Ireland: Victims, perpetrators and hierarchies of pain and responsibility." *Past imperfect: Dealing with the past in Northern Ireland and societies in transition* (1998): 31-49.

Smyth, Marie and Hamilton, J. "The human cost of the Troubles." In O. Hargie and D. Dickson, *Researching the Troubles: Social Science Perspectives on the Northern Ireland Conflict* (pp.15-36). UK: Mainstream Publishing Ltd (2004).

Simon, Steven, and Jeff Martini. "Terrorism: Denying Al Qaeda Its Popular Support." *Washington Quarterly* 28, no. 1 (2004): 129-145.

Sprinzak, Ehud. "Rational fanatics." *Foreign Policy* 120 (2000): 66.

Thomas, Jakana. "Rewarding bad behavior: How governments respond to terrorism in civil war." *American Journal of Political Science* 58, no. 4 (2014): 804-818.

U.S. National Counterterrorism Center. *The National Counterterrorism Center: Report on Terrorism* (Retrieved May 10, 2016) https://fas.org/irp/threat/nctc2011.pdf

Young, H. Peyton. "The evolution of conventions." *Econometrica: Journal of the Econometric Society* (1993): 57-84.

Wilson, David Sloan, and Elliott Sober. "Unto others: the evolution and psychology of unselfish behavior." *Cembridge (Massachusetts)* (1998): 34-36.

Zahedzadeh, Giti. "Parochial Altruists or Ideologues? An Agent Based Model of Commitment to Self-Sacrifice." *Journal of Terrorism Research* 6, no. 3 (2015).

Notes

[1] The following link explains the Netlogo programming language in detail: https://ccl.northwestern.edu/netlogo/docs/programming.html

[2] We use Choi and Bowles' (2007) hypothetical alleles; our population can inherit a combination of these alleles. Terrorism is arguably a form of war; however, terrorists use asymmetrical violence because they are unable or unwilling to meet a status quo government on the battlefield (Cronin 2006).

[3] In our model, the benchmark for x is 2 ($x = 2$).

[4] Note that unlike Anderton's model (2014) we incorporate the cost-benefit calculations in our analysis.

[5] Our benchmark values were the following: $\delta\eta = 0.9$, $\delta\iota = 0.1$, $\gamma\eta = 0.2$, and $\gamma\iota = 0.8$ However, the user can manipulate these values using the model's slider.

[6] On Bloody Sunday (1972), British troops killed 13 unarmed civilians in Derry; this fueled a massive influx of recruits into the IRA (see Sànchez-Cuenca 2007).

[7] See "Omagh Bombing Kills 28," BBC News, August 16, 1998, http://news.bbc.co.uk/2/ hi/events/northern_ireland/latest_news/152156.stm.

Book Reviews

Right-wing Terrorism in the 21st Century: The National Socialist Underground and the history of terror from the far right in Germany by Daniel Koehler (Routledge, 2017) and Understanding Deradicalization: Methods, tools and programs for countering violent extremism by Daniel Koehler (Routledge, 2017)

by Cynthia Miller-Idriss

Daniel Koehler's formidable pair of books about terrorism and extremist violence offer a remarkable synthesis of scholarly and practical knowledge about pathways into and out of violent extremism. In *Right-Wing Terrorism in the 21st Century*, Koehler brings to an English-language audience one of the most pernicious terrorism cases of the past quarter-century through an analysis of German government documents, court verdicts, press reports and terrorism databases. The National Socialist Underground (NSU)'s terrorist activities took place over a decade, ultimately perpetrating ten assassinations, three bombings and fourteen bank robberies between 1998 and 2011. Koehler uses the NSU and the case of right-wing terrorism in Germany as a focal point, but situates the NSU and German cases within a broader analysis of right-wing terrorism post-World War II across Europe and North America.

Following a thorough review of the academic scholarship on right-wing terrorism at the first section of the book, Koehler turns in Chapter 3 to the challenge of defining the term "right-wing terrorism." He argues that right-wing terroristic activity needs to be considered separately from broader categories like "hate crimes" or "right-wing violence," which may lack the political and ideological underpinnings that motivate right-wing terrorism. The highlight of this section is Koehler's original analysis of the role that an ideology of violence plays in the communication strategies, tactics, and activities of right-wing terrorists. Violence, Koehler argues, is "not only a means to reach a certain political goal but [is] also the core essence" of right-wing terrorism (p. 55). The ritualization of violence, the clear demarcation of boundaries between 'us' and 'them,' between enemies and comrades, and the militaristic aim to eradicate weaker and inferior ethnic and racial groups in order to purify the nation are at the core of right-wing ideology, Koehler contends, and this ideology "cannot be understood or separated from violence in any form" (p. 56). In the second half of this chapter, Koehler creates a typology of right-wing criminal activity, ranging from non-political crimes, hate crimes, right-wing violence and right-wing terrorism. This latter category, the focus of this book, is defined by Koehler as an "escalated form of right-wing violent hate crimes" (p. 63). In the conclusion to this chapter, Koehler explicitly teases out similarities between right-wing terrorism and other forms of terrorism.

In Chapters 4 and 5, Koehler builds on the definitional and theoretical work done in the first parts of the book as he offers a detailed analysis of right-wing terrorism in Germany, focusing in particular on the case of the NSU but embedding that analysis within the broader context of far right wing violence in Germany post-World War II. These two sections are perhaps the most important parts of the book from a scholarly perspective, as they fill a surprising existing gap in the English-language literature on German right-wing

terrorism and thus make an important contribution to the global and comparative discourse on terrorism and extremism. Chapter 6 turns to an analysis of the intelligence and police agencies, delving into the frequently-asked question of how the NSU could have escaped detection for so long. Koehler narrates the historical account of failures across the military intelligence, domestic intelligence and federal and state criminal police agencies, ultimately arguing while the NSU's success in escaping detection was partly due to poor organization and lack of communication and coordination across these agencies, it can also be attributed to a major failure in the cultural assumptions underpinning authorities' work. Authorities drastically underestimated the capabilities of the far right for terroristic violence, leading them to consistently misattribute the murders of immigrants, for example, as being tied to in-fighting within the immigrant community. Because far right research has primarily focused on formal political parties, prison inmates, or youth subcultures like skinheads, Koehler argues, German policy and intervention paradigms tended to see far right violence through these lenses and not as something that could be strategically organized and planned. If I have one complaint about this book, it is that this latter point—one of the most astute critiques of the scholarship and policymaking on far right wing extremism and violence in recent memory—is not highlighted in greater depth. Pointing out that existing work has led to blind spots in not only scholarship but also in the very paradigms that intelligence officers and police officers hold about the violent, terroristic or extremist potential of any given group is a key contribution, and should be highlighted much more.

The empirical portions of the book wrap up in Chapters 7 and 8 with a description of right-wing terrorist metrics and German right-wing terrorist actors over the past fifty years. In his conclusion, Koehler aptly summarizes his overall arguments and traces lessons learned as well as directions for future research. *Right-Wing Terrorism in the 21ˢᵗ Century* is essential reading for scholars of terrorism and violence and will be a key source for policymakers, government analysts and intervention experts as well.

It is this latter category—interventionists and educators—to whom Koehler turns in his companion book, *Understanding Deradicalization*, in which he offers the first comprehensive synthesis of academic and practitioner knowledge about pathways away from extremism. Following an overview of the range of violent engagements to which de-radicalization can apply—from Jihadist fighters to urban gangs and cults—Koehler traces theoretical understandings of the radicalization and deradicalization processes and offers a typology of deradicalization and disengagement programs. While written for an English-language audience, one of the most important contributions is Koehler's integration of additional source material and scholarship written in his native German language, thereby making a field of (national) knowledge available to a global audience.

In Chapter 6, Koehler introduces family counseling as a special case of deradicalization, highlighting innovative programs from France, Germany, the Netherlands, Denmark and elsewhere to show how community-based, public-private partnerships between local police agencies, social workers, educators and families are working to prevent violent radicalization and rehabilitate returnees and violent offenders. Koehler points out the critical role of trust in the success of these partnerships and shows how family counseling programs work within a broader network of authorities, schools, religious organizations and youth agencies, ultimately concluding that these models are "a very promising and innovative approach to tackle the issue of home-grown radicalization processes leading to violence and terrorism" (p. 158).

Chapter 7 tackles what is perhaps the most central question asked of any intervention program: does it work? Koehler analyzes standards, program design, and evaluation across programs in an effort to tease out best practices for measuring impact. While careful to disavow any 'one size fits all' approach, Koehler argues that it is possible—and imperative—to establish clear methods for evaluating the effectiveness of deradicalization

and rehabilitation programs. This chapter makes a broad leap forward in analyzing the range of approaches that exist and is a critical starting point for opening the conversation around standards and methods for evaluation. Practitioners and policymakers would do well to spend the time required for an in-depth read. This is also the case for Chapter 9, when Koehler turns to tools and methods for deradicalization work, focusing on identifying standard tools used in the field. While still integrated into the kind of academic analysis that makes this book a true integration of scholarly and applied work, this chapter is the clearest and most accessible for practitioners, offering critical descriptions of intervention strategies like the role of former extremists, mentoring, the creative arts, vocational training, sports, and psychological counseling.

At a moment when the U.S. government is contemplating a major change in countering-violent-extremism (CVE) strategy in order to focus only on Islamist extremism, Koehler's analysis of deradicalization—which integrates examples of practitioner work across the spectrum of extremist violence—is a critical intervention in the literature. Together with its companion book on right-wing extremism, this pair of books makes a deeply significant contribution to the global scholarship on extremism engagement, radicalization and deradicalization. For scholars, practitioners, and policymakers working on terrorism, youth violence, radicalization or deradicalization, these are must reads.

About the reviewer

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About JTR

In 2010 the Centre for the Study of Terrorism and Political Violence launched the online Journal of Terrorism Research. The aim of this Journal is to provide a space for academics and counter- terrorism professionals to publish work focused on the study of terrorism. Given the interdisciplinary nature of the study of terrorism, high-quality submissions from all academic and professional backgrounds are encouraged. Students are also warmly encouraged to submit work for publication.

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